

Delivering It Right with UPS

A good uninterruptible power supply system is key to good business.

By John Dyslin, editor

We've all seen those UPS ads with the white board in which the guy with the freakishly long hair explains all the wonderful benefits to the various delivery platforms offered by UPS. Well the other "UPS," Uninterruptible Power Supply, is another delivery system that has to work right or risk suffering the wrath of an angered customer. And with the technology available today, attaining a sound and efficient UPS system is relatively easy to do and is most certainly required.

Because no business can successfully function without its IT system operating 24/7, UPS systems are necessary. And because energy costs continue to escalate, it's vital these systems use energy effectively and efficiently. And, it's also important to not neglect the role a backup generator can play in making sure all of this works right — and works nonstop.

UPS systems provide a host of benefits, from surge protection to enhancing energy efficiency to cooling data centers. Course, UPS systems are employed in a variety of applications and the need for a UPS system can vary depending on the needs of that business.

"Originally, UPS systems were sought to protect hardware. Then data storage and

In Brief

A properly designed UPS system must meet the needs of the application and provide constant, safe operation. Any properly designed system also should have generators for necessary backup and cooling needs.

Related Products:

UPS systems, generators, rack systems, batteries.



An effective UPS system should have at least one generator behind it to make sure the system operates and functions properly 24/7.

uptime became issues. More recently it is business availability," said Robert Bunker, business development manager, enterprise products, APC. "For industrial applications, for instance, avoiding any downtime or anything that results in the scrapping of expensive raw materials could be why that facility requires a UPS system."

Course, UPS systems can be another component that wastes electricity. However, manufacturers have come a long way in increasing efficiency to reduce energy waste. Bunker notes that 5 to 10 years ago, energy efficiency ratings for most UPS systems were in the 80 percent range. Today, he says efficiency levels are in the mid 90 percent range, with some systems even reaching the upper 90 percent range.

Power supply energy efficiency is a measure of how much power is lost between

the input and output of a server's power supply as it pertains to IT equipment, for example. As explained in an APC white paper, the easiest way to improve the efficiency of existing server power supplies is to increase the input voltage. The reason for the increase stems from a basic electrical principle. The paper says that for a given amount of power, as voltage increases, more current is required to maintain the same amount of power. As voltage increases, less current is required.

Of course, as voltage decreases, more current is required to maintain the same amount of power. As an example, 120V x 10A = 1,200 volt-amperes. The white paper explains that if the voltage is doubled, only half the current is required (240V x 5A = 1,200 volt-amperes). The more current that wires, transformers and other power





UPS systems provide a host of benefits, especially in this IT age.

supply components carry, the hotter those components get. As more heat is carried by the air-conditioning system, it only further increases the amount of electricity required to support a server.

120V vs. 208V

One reason a 120V system is utilized is because of convenience. In fact, nearly all small and departmental servers are installed with 120V plugs, according to APC. However, typical 120V building wiring has a serious and fundamental limitation, which is that the majority of wall receptacles are rated at 15A and a growing number are rated at 20A.

The 15A rating of a 120V office power is important and a significant limitation, APC's white paper notes. Underwriters' Laboratory specifies that a single piece of electronic equipment is not permitted to continuously draw more than 80 percent of a receptacle's rating, or 12A for a 15A circuit, which places the limit to about 1,440 volt-amps on a standard 15A receptacle.

Most servers, however, are said to have power factor corrected supplies with nearly a 1-to-1 correlation between volt amps and watts. This means that the maximum corresponding watts available through a receptacle is 1,440, which is the maximum power that a server can draw from a single 15A plug. Due to losses of the server power supply, it equates to about 1,250W of power supply output rating on the server.

Hence, because of power capacity, a 208V system is often preferred. Cost and efficiency also contribute.

"For most IT applications, they run on a 208V system," Bunger said. "There are many advantages, but less cost and

greater efficiency lead the way. Because of these advantages, 208V versions are the fastest growing segment."

The most common ratings for 208V receptacles are 20A and 30A, which corresponds to about 3,600W and 5,400W of power supply output rating on a server, according to APC literature.

There are other practical reasons for 208V systems as well. For instance, typical rack systems configurations draw in the range of 1,600W to 5,000W, which is a poor match for 120V receptacles.

And with energy prices soaring, the trend is toward more energy efficient data centers, which means 208V receptacles. The less current a server draws, the less heat is produced, which also means less cooling necessary. All of this adds up to less energy needed. Because of these savings, the data center industry is moving to 230V distribution.

"Three-phase distribution is also advantageous," Bunger adds. Three-phase power still has limited availability, however. But, both 120V and 208V single phase can be derived from North American three-phase voltage via simple wire connections.

The role of the generator

Generators play a critical role in the reliability of a UPS system. For any outage longer than the runtime capacity of the UPS batteries, the reliability of the entire system defaults back to the reliability of the generator, explains Mike Kirchner, training manager, Generac. And generators can play a much greater role than just backup power.

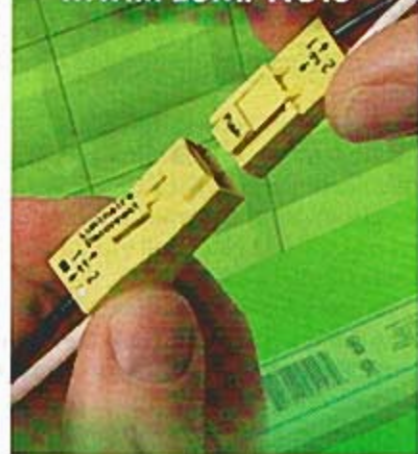
For today's high density server environments, cooling the server is just as important as the server power. Generators power cooling, especially in the event of power outage, is critical to a good system design, Kirchner notes. For many sites, if the generators are not quickly available to support cooling needs, extended runtime capabilities built into UPS batteries may not offer any value, Kirchner contends.

"Two hours of battery operation doesn't improve system reliability if thermal shutdown occurs in 15 minutes," Kirchner says. "These applications require a highly reliable generator configuration utilizing paralleled generation."

Because of this, the relationship between UPS systems and generators has

Luminaire Disconnect...

...with LUMI-NUTS®



From the inventor of the pushwire connector comes the new 873 Series LUMI-NUTS® to meet and exceed the new NEC and CEC requirements for safe servicing/wiring of non-residential luminaires with ballasts.

LUMI-NUTS® Exclusive Features

- 2 connections per pole for daisy chaining of power to additional ballasts - reduces wiring time, components and errors
- Max. 600V/6A rating supports daisy chain applications - no de-rating
- Molded in color coding and inkjet marking for easy wiring - no labels
- 35+ years experience in pushwire technology with billions installed

Additional safety features include built-in locking latch, touch proof design, keying for protection against mis-mating and a UL 94V-0 flame rated housing.

For more information on the new LUMI-NUTS® contact WAGO at 1-800-DIN Rail (346-7245) or info.us@wago.com
www.wago.us/lumi-nuts.htm

WAGO
INNOVATIVE CONNECTIONS

Circle 367 for Free Product Information
May 2008 ▶ Power Quality World 37

been evolving, and evolving around compatibility. Kirchner explains that generators are not a "stiff" infinite bus like the utility. "When load steps are made on a generator system, voltage and frequency will dip," he says. "In addition to transient conditions, generators are more limited when it comes to handling harmonic currents."

Kirchner says most three-phase UPS systems will implement a filtering strategy to limit harmonic currents. They also will switch that filtering off when the UPS is operating at light load levels to avoid voltage instability on the generator system. He adds the most recent UPS technology shift toward IGBT rectification also targets lower UPS harmonics.

As noted generators play a strong role in the cooling process of data centers. "Generators help the cooling process," Bunger concurs. "If running on batteries or longer run times, generators are key to cooling batteries."

Furthermore, it's vital the complete system – including the generator – be properly maintained. Generators must be maintained to remain reliable, which includes belts, hoses and fluids.

It's the design

It goes without saying that in the end it's the design that really matters. Bunger points out that it's necessary to understand the initial



A proper UPS system design will incorporate generators into the mix as support and backup.

and final load of the application, which is helpful when scaling the system. Other important criteria include run time, as in how many batteries are needed; availability requirements of the load, which factors in with UPS redundancy; and, of course, the needs of the business.

It's also critical to plan the implementation of the generator into the system and to have a reliable generator. Kirchner notes that for larger applications, designers immediately implement paralleled generation to address the limited reliability constraint of a single generator. For small- and medium-sized applications, Kirchner says this represents a design dilemma.

"Typically, applications less than 1,000 kW are often served with just a single generator due to cost and complexity constraints," Kirchner explains. "Thankfully, today's market is lifting the design dilemma by offering integrated paralleling generation solutions without the cost and complexity of the traditional UL891 dead front panel board approach. It is now possible to get paralleled solutions that can compete with single generator price points."

Kirchner adds that another significant concern in designing high reliability systems is fuel reliability; meaning too much fuel onsite and the fuel goes bad, too little fuel and the generators run out. He adds these two competing constraints must be met to ensure system reliability.

In addition, even though a single engine generator can be made more reliable through good design, it still has many single-point failure modes (batteries, starters, solenoids, belts, hoses and others). To significantly improve the reliability of the backup power system, the system cannot rely on any one single generator. Just as UPS systems use a modular approach, so must the backup power system. This is accomplished by using multiple generators operating in a paralleled configuration resulting in power system redundancy for the systems most critical loads.

Of course, there are constraints, which can include cost, space, issues of single source responsibility and a significant level of complexity. To help work out these issues, companies such as APC and Generac help electrical contractors and others when designing, sizing and specifying systems. ▸



"Basic Business Boot Camp"

Three days of intensive business training guaranteed to increase your profitability!

\$100 off! (mention this ad)

DATES/LOCATIONS

May 13-15	Tampa, FL
May 12-14	San Francisco
June 10-12	Denver, CO
Aug. 5-7	Owensboro, KY
Sept. 9-11	Milwaukee, WI

Receive \$1000 in marketing and training materials!

Grandy & Associates

800-432-7963

www.GrandyAssociates.com

Circle 368 for Free Product Information

Backup Power System

Gaia Power Technologies' PowerTower M is a mid-sized residential system designed to provide backup power for

the essential circuits of a home, such as heating, lights and pumps. The line of battery back-up power products provides an alternative to generators for extended backup power for homes and businesses. The unit installs indoors, produces no noise

or polluting emissions, does not require a generator permit and provides hours to days of backup power during an outage. The series provides a simple and cost-effective solution to keep homes safe and families comfortable during an outage. It is available in a 6 kV size that comfortably covers the critical circuits of a home and provides 240V power. www.gaiapowertech.com

Circle 291 for Free Product Information

Scalable UPS

The Liebert NX UPS with Softscale technology, from Emerson Network Power, combines the industry's most flexible approach to scalability with an efficiency rating of up to 97 percent. Designed for small- and medium-size data centers that are facing unpredictable changes in their IT systems, it can be sized to current requirements and then

easily scaled with a simple software key as needs change. Modules can adapt from 40 kVA to 60 kVA to 80 kVA or from 80 kVA to 100 kVA to 120 kVA. Modules with different ratings also can work in parallel to handle higher capacities. www.liebert.com

Circle 293 for Free Product Information



Power Converter

AutomationDirect has extended its Rhino PSP line of power supplies to include DC-to-DC converters. Available with wide input ranges (9½ to 18 VDC and 18 to 75 VDC), the four available models can be operated from all popular DC supply voltage systems. Tightly regulated output voltage provides a reliable power source for applications such as industrial process controls, factory automation, and other equipment exposed to critical industrial environments. Rhino DC-to-DC converters can be used to isolate a specific load from the 24 volt bus voltage, and offer easy installation with snap-on DIN-rail mounting and detachable screw terminal blocks. www.automationdirect.com/dc-converters.

Circle 292 for Free Product Information



UPS Battery

The DataSafe 16V battery, from EnerSys, provides more power in less space, easier access and cost benefit. DataSafe 16V front-terminated batteries require only 44 square feet to support a typical 750 kVA UPS system with a full 15 minutes of run time. The VRLA batteries used for UPS applications are designed to back-up the primary power system, typically supplying power for 15 minutes until the backup generator is fully operational. Batteries require 20 percent less space and scale easily to large capacity systems, minimizing the number of strings needed for larger UPS systems thereby reducing costs. www.savebatteryspace.com

Circle 294 for Free Product Information

WHO CAN STOP DAMAGE TO YOUR FLUORESCENTS?

STI CAN!



- STI Wire Guard offers lifetime protection against vandalism and accidental damage.
- Helps assure continued light in critically important areas.
- Reduces frequent and costly replacement of bulbs.

Plus Protect All These With STI Wire Guards



CLOCKS & BELLS



COMMERCIAL LIGHTS



SMOKE DETECTORS



EXIT SIGNS



MOTION DETECTORS



EMERGENCY LIGHTS AND MORE

And you can rely on STI



Makers of the Stopper® II device, world's #1 false fire alarm fighter for over 25 years.

We Protect the Things that Protect You

Safety Technology International, Inc.



www.sti-usa.com

800-888-4784

Circle 290 for Free Product Information