

Texas power consultant keeps uninterruptible power supplies up and running

Application Note



Testing Functions Case Study

Critical systems run smoothly with regular maintenance and reliable tools

An uninterruptible power supply (UPS) system provides backup power for critical plant loads in every industry. Those loads include plant emergency and safety shutdown systems, plant alarms and controls, emergency lighting, generators, steam and fire control systems, telephone centers, and even hospital life support systems, among others. Needless to say, the UPS system can't fail...period.

Jerry Rainwater, Power Consultant for Industrial Power and Battery, Inc., deals with that challenge on a daily basis. "Our company's mission is to ensure the continuity of critical power to make sure businesses stay in business," says Rainwater. Rainwater got his start in the US Navy nuclear submarine program as a system expert working on the Trident missile system and subsystems. "I knew I had found my calling," Rainwater recalls. "Working with electricity is a rewarding job as long as you never forget 'safety first.'"

Jerry has been with Industrial Power and Battery—based in Wallisville, Texas—since 2003. The company services UPS systems in refineries, petrochemical plants, telephone centers, power plants, and hospitals throughout Texas.

Keeping the UPS up

A UPS system includes a battery, a battery charger, an inverter, a static switch, and a manual bypass switch. This system converts the stored energy of the battery into ac power. "The inverter keeps the plant systems running so that if there is an abrupt interruption in power, plant staff can continue to monitor all of their safety equipment and other systems and control the process of bringing the systems down safely with no environmental—and hopefully no human—impact," says Rainwater. This is especially crucial for petrochemical plants where interrupting the refining process could have explosive results.

Tools: Fluke ScopeMeter® Series II portable oscilloscope, digital multimeter, clamp meter, thermal imagers

Operator: Jerry Rainwater, Power Consultant with Industrial Power and Battery, Inc.

Applications: Maintaining uninterruptible power supply (UPS) systems

After making sure his work area is safe and he's wearing appropriate personal protective equipment (PPE), Jerry Rainwater hooks up a Fluke 381 Clamp Meter to check the performance of a recently installed UPS system. After the remote display is unlocked from the 381 and placed outside the enclosure, Jerry will be safe to conduct his tests with the cabinet closed up and PPE off.





Jerry uses a Fluke Ti32 Thermal Imager to check every component of a UPS system, looking for loose connections, heat dissipation, and overall performance.

A typical preventive maintenance call finds Rainwater first checking all of the electrical systems for hot spots or loose connections. He has been using mostly Fluke test tools since his time in the Navy. "Fluke really is the standard, whether you're working on a nuclear sub or in a petrochemical plant," says Rainwater.

He usually starts by surveying the power cables going into the UPS system with his Fluke thermal imager to make sure that there aren't any hotspots, and that none of the readings are trending higher than reported during the previous maintenance inspection. Next he moves to the electrical distribution panels to survey the status of the plant electrical environment. If he finds problems, he makes a verbal note using the audio recording capabilities on the camera so he can review it later with the client.

Once the overall environment is squared away, Rainwater focuses on the UPS system. "I start by taking 'as is' readings on the battery charger with my Fluke 189 True-rms DMM," he says. "Then I take individual cell voltage readings, measure the voltage drop across each cable or bus bar connection, and measure ac ripple voltage and frequency, and cell temperature and hydrometer readings, on each battery," says Rainwater.

"With these measurements, you can determine the overall health of the battery."

Choosing highly rated safety tools and test equipment

With the types of environments he works in, safety is paramount. "When you're installing a new UPS system or replacing a battery, the battery is always energized so you have to use electrically rated hand tools and proper personal protective equipment (PPE) based on the hazards you may be exposed to," says Rainwater. Safety is even more important for his test equipment. It helps that the Fluke 189 has a CAT III 1000 V/CAT IV 600 V safety rating. And when he needs to enter an area that requires intrinsically safe equipment, he can take his Fluke 87V Ex Industrial Multimeter.

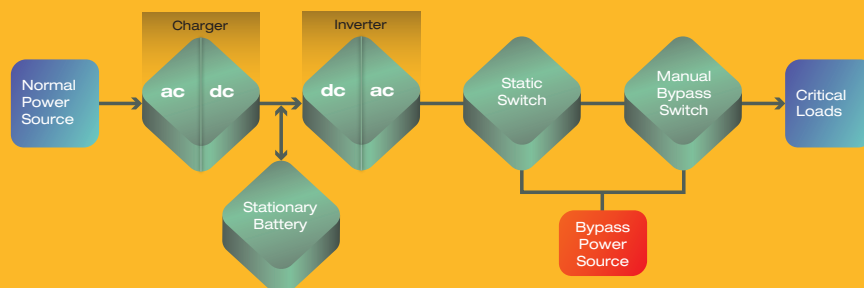
After testing the charger and the batteries, Rainwater uses a 100 MHz ScopeMeter® 105B Series II portable oscilloscope to check inputs and outputs and highs and lows for the circuit boards that control the battery charger, the inverter, and the static switch. "All those UPS components have their own controls, and all have to talk to each other to make sure they're all working right," says Rainwater. He also uses his ScopeMeter test tool to record the static switch transfer from the normal inverter power source to the bypass power source. "A mechanical switch is too slow, so we use a static

switch consisting of a group of fast-operating silicone controlled rectifiers (SCRs) to switch the critical loads," Rainwater says. "The SCRs must transfer from normal to bypass power in less than 4 milliseconds so the computers stay energized and the lights don't blink. Fortunately, my ScopeMeter can accurately measure the static switch at that speed."

He estimates that his job is about 90 percent scheduled maintenance and 10 percent emergency response. In addition to installing and maintaining UPS systems, Rainwater also maintains generators, generator controls, automatic transfer switches, emergency lighting systems, ac and dc distribution panels, fire pump controllers, and motor control centers, and analyzes power quality.

Sizing systems to the job

Industrial Power and Battery is helping one of its long-time customers, Zeon Chemicals LP, more than double the size of its UPS system in its Bayport, Texas plant. Zeon Chemicals is the leading developer and supplier of innovative polymers, including synthetic elastomers that are used in the manufacture of hoses, seals, gaskets, belts, and other parts for automotive, industrial, oil field, and printing markets. In addition to the Bayport plant, Zeon has plants in Hattiesburg, Mississippi and Louisville, Kentucky, where it is headquartered.



Timing is critical for UPS systems. The static switch must transfer from normal to bypass power in less than 4 milliseconds.

Industrial Power and Battery will replace Zeon's 7.5 KVA UPS system with a new 20 KVA UPS system later in 2012. The increased size was based on a load analysis of current use and projections for added demand resulting from Zeon's expansion plans. They plan to expand production, increasing capacity by 25 percent in 2012.

The 22-year-old Zeon Bayport facility includes a maintenance shop, laboratory, and administration building, in addition to the 20,000-square-foot plant. Approximately 50 people work at that location, including Debbie Miller, an Instrument Electrical Technician responsible for repairing and maintaining plant instrumentation and automation equipment.

She surveys all of the electrical equipment in her area with the Fluke Ti25 Thermal Imager;

calibrates instruments with the Fluke 789 ProcessMeter; and troubleshoots pumps and motors with the Fluke 1587 Insulation Multimeter. "I find Fluke meters to be accurate, durable, and designed with features a technician appreciates," says Miller.

Because Miller has her hands full with maintenance and troubleshooting, she's glad to have the services of Industrial Power and Battery to take care of the UPS system. "We depend on the UPS system to back up our emergency lighting, fire alarm system, telephones, plant security equipment, and, of course, the DCS controls," says Miller. "Since we're a small facility and the UPS system is a critical system for us, it's nice to work with a full service company like Industrial Power and Battery that has the knowledge and expertise to maintain and service it for us."

Realizing ROI with thermal imaging



Checking the contact buss in the back of a battery bank cabinet (these lugs are tight). With a thermal imager, hands stay out of the cabinet.

Zeon Chemicals first used the Fluke Ti25 at six-month intervals. Since correcting findings that first year, that interval has been extended to once a year, and the results are remarkable.

"The Ti25 has probably paid for itself in the two years we've had it," says Debbie Miller, Instrument Electrical Technician for Zeon Chemicals. Company technicians have used the Ti25 Thermal Imager to identify several problems during routine inspections, including loose wires on some of the switchgear, control fuses that were undersized, and even blown fuses on a power factor correction unit. "Finding the blown fuses potentially saved us a lot of money, because we can be penalized by our power provider for having a poor power factor," Miller notes.



New generator-test function available

The new Fluke 435-II Power Quality Analyzers have a feature called PowerWave designed specifically for testing backup generators and motors. When backup generators are started, there are a couple of critical seconds when the generator is ramping up while loads are drawing power from it. This can slow down the generator and potentially cause it to fail. To test motor and generator switchover readiness, electricians need to see the full detail of voltage and current interaction during switching operations. PowerWave is an all-new "fast capture" system that samples and displays half cycle rms voltage and current values in full detail, immediately showing the operator the information needed to commission generators and assure start-up.

Fluke. *Keeping your world up and running.®*

Fluke Corporation

PO Box 9090, Everett, WA 98206 U.S.A.

Fluke Europe B.V.

PO Box 1186, 5602 BD Eindhoven, The Netherlands

For more information call:

In the U.S.A. (800) 443-5853 or Fax (425) 446-5116
In Europe/M-East/Africa +31 (0) 40 2675 200 or Fax +31 (0) 40 2675 222
In Canada (800)-36-FLUKE or Fax (905) 890-6866
From other countries +1 (425) 446-5500 or Fax +1 (425) 446-5116
Web access: <http://www.fluke.com>

©2012 Fluke Corporation.
Specifications subject to change without notice.
Printed in U.S.A. 7/2012 4202848B_EN

Modification of this document is not permitted without written permission from Fluke Corporation.