



An Inside Look Into the POWERVAR **Proving Grounds**

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By AMETEK®-POWERVAR

Guaranteed reliability can't happen overnight. Many innovative technologies fail to catch on because they lack the durability and resilience that can match their creative heights. It's one thing to develop a product that changes the game, but to make sure that it functions the way it is supposed to for a long time is another. Not every company can stand behind the guarantee of reliability because they don't have an effective way of showing the long-term integrity of their products. But POWERVAR can.

This is an inside look at the POWERVAR Proving Grounds (PPG) - the place where POWERVAR ensures that every single guarantee we put behind our products is supported by rigorous testing and hard data. The testing lab leaves no stone unturned, ensuring that all new designs hit the market with complete, long-term functionality assured. It's what unassailable power conditioning equipment requires.

At POWERVAR, it's our job to understand the many nuances of power quality and know how to optimally condition any disturbances that arise. As part of this effort, we want to help clients and asset manufacturers understand the problems bad power can cause and the range of support that power conditioning tools provide. It's the difference between being stuck with disrupted power systems and having peace of mind that no matter what factors conspire to impact energy flows, your electronic assets can continue functioning at full capacity.

Our PPG lab is a hub of activity. It's the place where we make sure that our designs not only meet the high expectations of POWERVAR's engineers, but also of our partners and customers. At our labs, we continue to push ourselves to not just be satisfied with "just good enough" but rather to explore every possible real-world scenario that could affect power quality. Only when our power conditioning equipment passes all of our tests are we ready to start installing them.

To understand why we designed and built the POWERVAR Proving Grounds, we must first look at the often misunderstood importance of power quality.

in the new XBRL format. "We were already having a lot of dialogue with our existing printer on how they would deliver that to us," says Nielsen.

Don't Overlook Power Quality

When an analytical system seems to be spitting out inconsistent data or a point-of-sale system suffers a brief outage, most users would diagnose the problem as a hardware or software failure. Companies may end up calling in tech support or replacing the system. Few would intuitively know that the problem actually lies in poor power quality.

Most power disruptions aren't readily apparent. A lightning storm that cuts off power is obvious, but a short spike in voltage caused by several large machines being plugged in at the same building might not be. It won't shut down the power or dim the lights, but it could throw off the operation of a clinical diagnostic system in the same building for a split-second - enough to make a difference, either in accurate data collection or the completion of its high-level process.

Power disruptions and anomalies can be expensive - for example, analytical instruments can cost anywhere from \$75,000 to \$1.3 million per asset, so if a company needs to (or thinks it has to) replace it prematurely, they could

be taking a serious hit. Power disruptions can be costly. According to the Electrical Power Research Institute, U.S. industry pays up to \$188 billion per year in lost data, productivity and material. Here's how the frequency of power disturbances breaks down:

- **Sags** (momentary dips in voltage): 74.5 percent
- **Brownouts** (drops in voltage): 10 percent
- **Outages**: 10 percent
- **Overages** (spikes in voltage): 5 percent
- **Surges** (momentary increases in voltage): 0.5 percent

The variety of power anomalies that can affect the quality of power being supplied to vital, always-on assets emphasizes the need for comprehensive power conditioning tools. Many companies offer solutions in the form of uninterruptible power supplies, but in reality they're not much more than power strips and can't be effectively customized to their environment. At POWERVAR, we set out to develop solutions that could handle power conditioning issues in any environment.

The POWERVAR Proving Grounds: *The Asset 'Torture Chamber'*



Inside the POWERVAR Proving Grounds (PPG) Lab there are a variety of testing devices that run all power quality equipment through a gamut of evaluations, which assess how the equipment performs when subjected to environmental forces. The 21-day "soak" program puts the assets up against the different conditions that can affect power quality, including heat, humidity, voltage and a host of other factors. This program is called strife testing, and according to POWERVAR President and CEO George Lannert, it's POWERVAR's way of ensuring that no unit will be sold or marketed unless it passes the tests with flying colors.



"Strife testing really is a torture chamber testing. It's a routine, systematized way of testing our products under corner case situations."

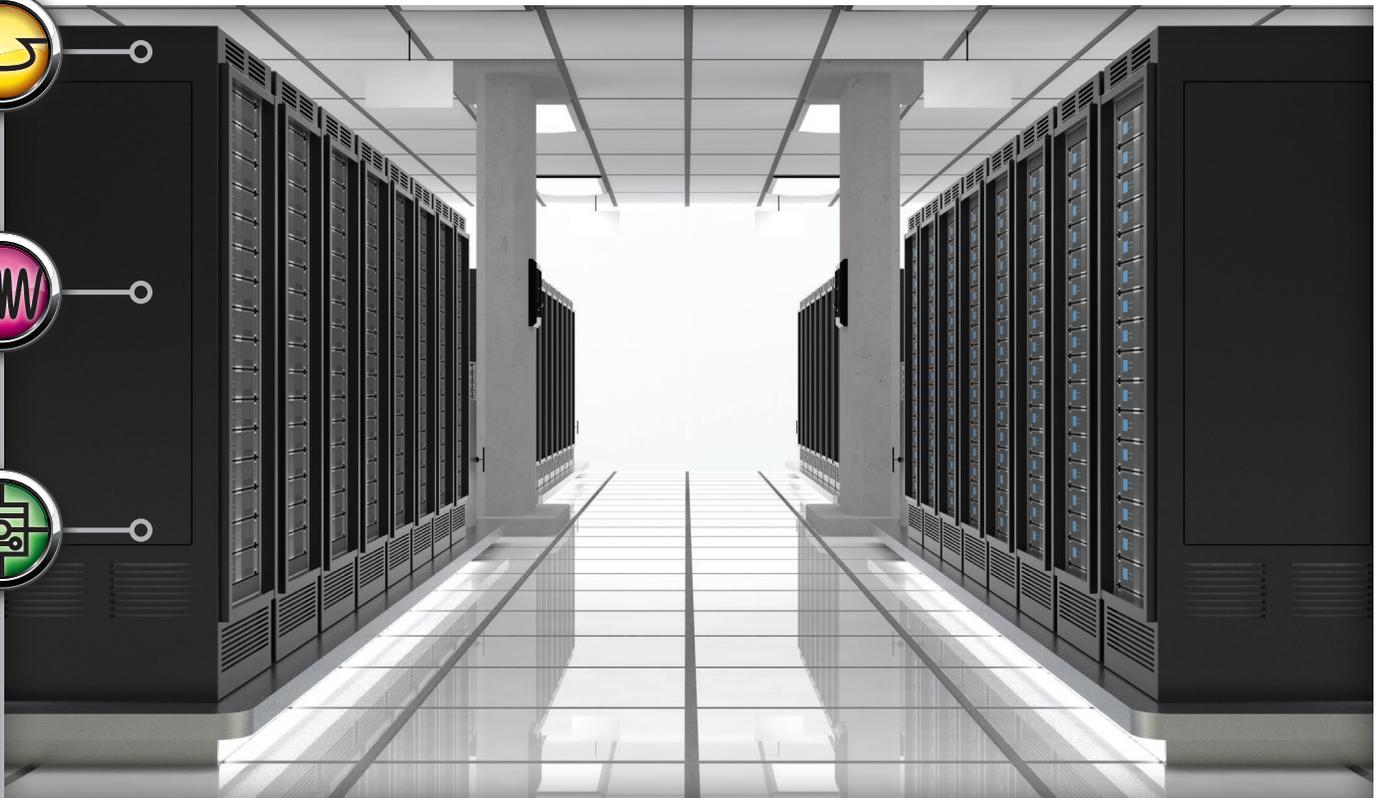
George Lannert
POWERVAR President and CEO



Among the corner case situations are complicating factors such as load, temperature and voltage. POWERVAR engineers test equipment at both the maximum and minimum load, input voltage and temperature, cycling those three variables in various combinations and recording the results. That's how we know our equipment can withstand a range of adverse environmental situations.

POWERVAR's Vice President of Sales, Tom Gornick, echoed Lannert's statements, observing that the "strife testing" is ruthlessly hard on power conditioning equipment because it's the degree of evaluation needed to ensure clarity, performance and operational certainty.

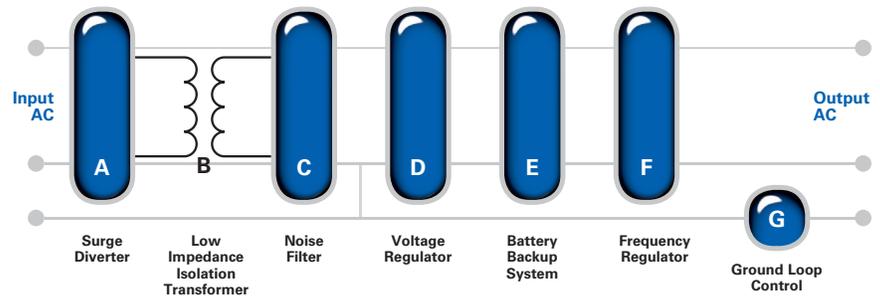
"To have a lab where we can run our products through some grueling tests really guarantees us that we've developed a rock-solid product that can perform through anything that's thrown at it in the environment," he said.



Building the Proving Grounds

Since the company's founding in 1986, POWERVAR has continued providing industry leading power conditioning products to the ever-expanding marketplace. Our first power conditioners debuted the following year, and we've been designing power solutions for the medical sector since 1991. At the same time, we've always believed in the importance of education. That's why we created and trademarked "The ABC's of Power Conditioning" in 1987 as a way of explaining the seven basic power protection elements used to build an effective power quality system. Demystifying power quality issues and educating our customers have been part of our company's lifeblood since the beginning.

The ABCs of Power Conditioning



The POWERVAR Proving Grounds came into existence as a way of combining our commitment to designing the best power quality solutions available and our responsibility for helping clients and partners understand power quality issues firsthand. We opened the PPG to not only enhance the solutions we make, but enable curious and sometimes reticent users to truly grasp the importance of clean, controllable power sources.

"The idea was to have a real state-of-the-art, centralized facility with the right equipment and the right environment to be able to do the kind of testing our products require," said Lannert. "We like to think that our OEM customers buy our products to eliminate electrical power as a variable affecting the performance of critical instruments."

How Strife Testing Works

When we say strife testing, we mean it: Over our 21-day process, we subject our designs to every arduous condition short of freezing them solid. We place our equipment in thermal chambers, where they're hooked up to a filtered power source, as well as equipment that allows us to record the asset's response to different environmental pressures. Then we start the testing. First, it's a baseline magnetics testing for thermal and load limits. Data from this first procedure goes through a data logger. If the equipment passes this first test, we move to the next step in the process.

We adjust temperature, humidity and voltage, assessing different combinations of the three to simulate the many kinds of facilities in which our products could later be located in. Products must be tested on both high and low voltages to deal with electrical overload, and must also function in temperatures ranging from 0 degrees to 40 degrees Celsius (32 degrees to 104 degrees Fahrenheit). We conduct class A and class B emissions testing on our products. These are key metrics to have on hand because we can take them to regulatory agencies for approval.

Following the thermal chamber, the next strife test occurs at the surge station. That's when we evaluate the equipment's ability to contain a surge in voltage after a drastic event, such as a lightning strike. We crank up the voltage to simulate the surge that occurs on a power line after it gets hit by lightning and record how much voltage gets through. Although lightning strikes don't happen every day, they do occur, and often at inopportune times. In a medical or industrial setting, critical instruments have to be able to withstand a lightning strike, and anything more than a small amount of voltage let-through is usually enough to disrupt their operation. We make sure that our power conditioning solutions can maintain equilibrium during a voltage surge to keep your assets functional.

Occasionally, we mark equipment with failing grades. But when we say failure, we don't mean that a piece of equipment blew up. According to the high standards we've set for ourselves, any real-time behavior that cannot be immediately explained is classified as a failure. As Michael Creighton, Director of Engineering, pointed out, it not only ensures the highest quality of the product, but "keeps engineering honest."

"You go in, you surgically fix it. You try to get root-cause analysis, make changes and re-submit it."

Michael Creighton
Director of Engineering

Passing the Benefits to Our Customers

The POWERVAR Proving Grounds also allows us to take a more comprehensive, granular approach to product development. It's an organic product development cycle, built from the ground up. From the first conceptual designs to full-scale production, we know we have the in-house expertise and capability to conduct real-world testing on our equipment. Through data reporting and a zero-tolerance policy for unexplained behavior, we've generated benefits for our entire product development lifecycle.

"There's a two-dimensional look in most product development programs," Creighton said. "You can do simulations but nothing replaces truly taking it through all the phases of operation."

We don't just want to tell our users and the manufacturers with whom we work about our Proving Grounds, we want to show them. Many customers have brought in the power supplies they use into the PPG lab where we can show them firsthand how even subtle changes in the surrounding conditions can affect power quality. Then we are able to show them how our solutions can effectively filter out the noise and deliver clean, reliable power. It's helped solidify the value of our offerings in more than one customer's mind, said Gornick.

"To do the testing in front of their eyes - now they become believers," stated Gornick. "POWERVAR has always focused on the transformer element - the ability to deliver clean, isolated power for today's electronics," he added. "If you address the clean power side, it really provides great benefits to the manufacturer, and also to the customer - increased uptime, less service calls and the [overall] reliability of the system."

From Proving Grounds to Market

Different vertical markets bring unique challenges, for example:

- Our biggest market, the medical industry, is filled with intricate machines that need to be on all the time, including clinical diagnostic machines, patient monitoring equipment and analytical instrumentation. Medical facilities often contain high electrical noise due to such a concentration of machines. Our power conditioning solutions keep voltage fluctuations in check.
- Companies in the retail sector depend on point-of-sale systems in stores, as well as terminals in banks and restaurants to process transactions and connect with customers. Our power conditioning tools ensure that power quality can supply adequate support for these assets' heavy use.
- The industrial sector is filled with machinery like mass spectrometers, large-format printers and other fabricating equipment. Anything less than full power support can slow productivity and curtail supply chains. Our power conditioning equipment maintains its high performance regardless of the facility's location or conditions.

The POWERVAR Proving Grounds is part of our promise to the customer. From the first conceptual design to their time in operation, our power quality solutions provide the level of continuous support that your company needs to thrive in an increasingly electronic age.

"We sell the best quality products available on the marketplace, and we need to test them not only during development but even after the fact, to make sure that what we're delivering is in fact the best it can be. When we're designing something new, it's an important step to make sure that our design is sound."

George Lannert
POWERVAR President and CEO

About the author

AMETEK-Powervar is a global provider of power management solutions, headquartered in Waukegan, Illinois, with international sales and distribution offices in Swindon, United Kingdom, Toronto, Canada, Mexico City, Mexico and Germany. All AMETEK-Powervar solutions incorporate a high energy surge diverter, a noise filter and a low impedance isolation transformer. Together, these components prevent power disturbances from destroying, degrading or disrupting system operations.