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PowerLabs, Paragon, *and the* Parts Quality Initiative

By David Mueller

I still clearly remember a day in 2005. I was sitting at my desk when my boss at the time, Roosevelt Groves (then supply director of operations at Exelon), called me into his office with a select group and announced that we needed to figure out this "parts issue thing."

Why was this "thing" such a pressing issue that it required an impromptu meeting? It was because manufacturing defects were having a significant impact on Exelon's reliability. And this problem was well out of our direct control.

Resolutions to problems can be tackled in a variety of ways. Sometimes great ideas are captured on napkins. Some are drawn on blackboards. But fixing this parts issue was going to be a challenge, and the real question was, where could we start with an issue so far out of our team's direct control? At Exelon, we already had a robust supplier performance process, so our suppliers knew we would react and provide immediate feedback if there was a problem. What could we do beyond continued communication with our suppliers? We did, in this case, find a better solution.

With the help of Exelon PowerLabs, a small team of individuals quickly evaluated the trends, or as we called them, the "bad actors," which really meant the type and manufacturer of the components that had the most negative impact on our nuclear power plants. This analysis helped define a much smaller and more manageable scope of the problem parts and enabled us to develop a process that would include an independent and more rigorous test of suspect components before receipt and, more important, prior to installation.

We dubbed the resulting new program the Parts Quality Initiative, or PQI. Launched in 2006, the program had an immediate positive impact at Exelon. We experienced a dramatic drop in plant events caused by parts quality issues. In fact, in 2018, the Nuclear Energy Institute awarded its Top Innovative Practice Award to Exelon for this initiative.

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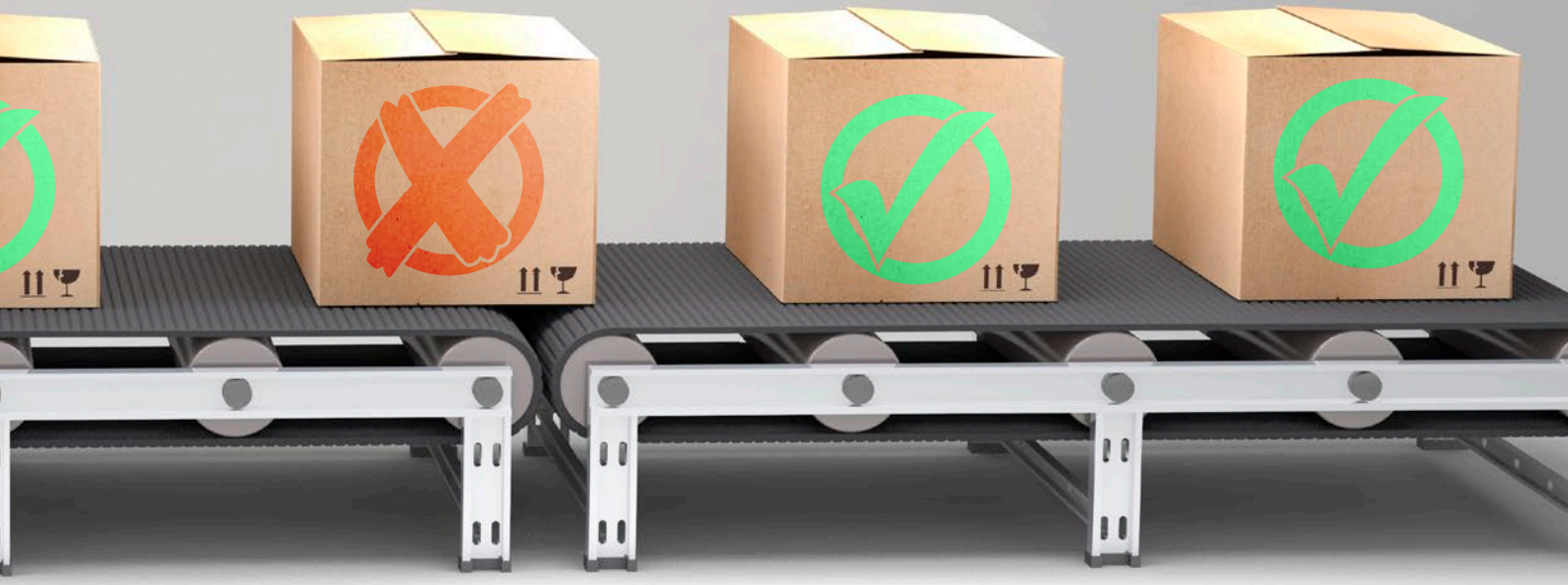
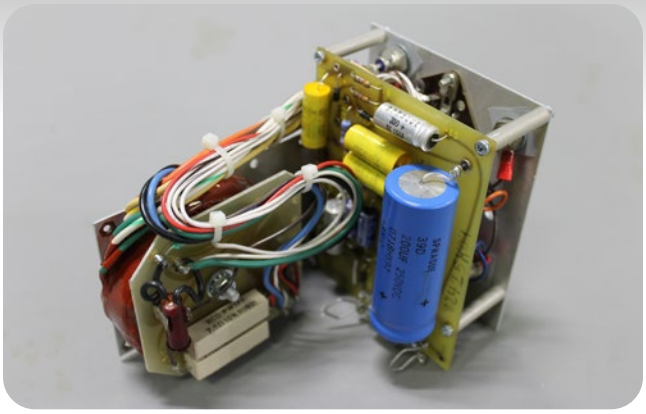
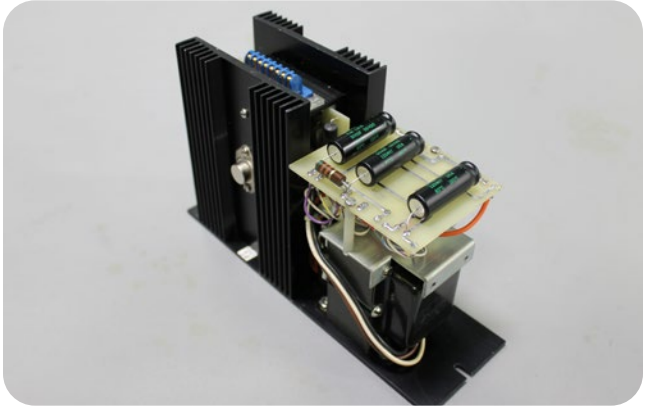
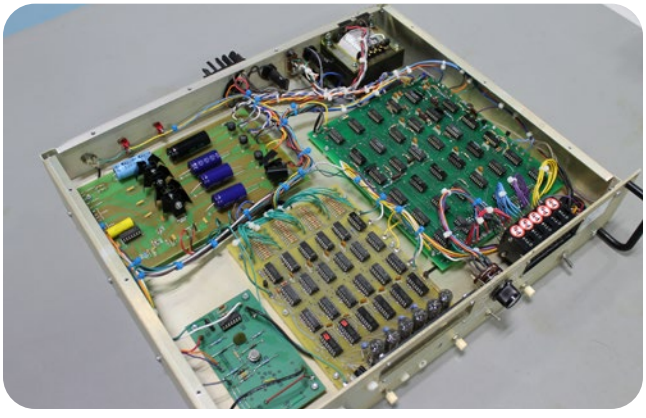




Power supply with electrolytic capacitors provided for repair by Exelon's Ginna nuclear power plant. Rochester Instruments P/N: 1003-853, 125VDC input +/-12V output. This is a good candidate for parts quality testing.



Power supply with electrolytic capacitors provided for repair by Duke, Westinghouse P/N: 475031 120VAC input +/-15V and -22V output. Another good candidate for parts quality testing.



Timer control provided for repair by Duke, Westinghouse P/N: 1530/ST101.

Since that 2005 challenge from Roosevelt Groves, parts quality has been part of my DNA. The topic comes up in almost all of my conversations, both internally with my co-workers now at Paragon, as well as in my numerous meetings and visits with industry customers. Parts quality is at the core of what nuclear supply is all about. More specifically, the goal is to provide facilities a quality part that will reliably perform its intended use.

The PQI is a plantwide, continuous learning process that uses internal and external operating experience to drive the testing of parts that are critical to safe and reliable plant operation. This crucial testing process ensures that parts reliably perform their operable functions once installed. Or more directly to the point, testing improves equipment reliability and reduces generation losses via proactive identification of poor-quality parts and components prior to installation.

At Paragon, where the PQI continues, we assist and provide oversight to the industry as stakeholders look to implement their own parts quality programs. While it can be said that there is no one type, cookie-cutter way to perform a parts quality process, it is true that doing nothing or not directly addressing the issues of parts quality is not the answer either.

Paragon chooses to be transparent in its process and attack the issue head on. Its approach is to first work with the customer, understand existing processes, and then design and implement a program aligned with that specific nuclear plant or utility. The bottom line is to design a parts quality process that will work for that plant.

Lori McGuire, parts quality process lead at Energy Harbor, spoke about the initiative. "The parts quality program is helping Energy Harbor take the next step in achieving equipment reliability excellence," she said. "Quality testing of critical parts has prevented two single point vulnerability failure opportunities in the first two months of program implementation. The parts quality program was also used to test a relay that has historically performed poorly in our chiller applications, and when 10 of 12 new relays failed parts quality testing, engineering initiated an evaluation for a replacement that would improve overall chiller performance and reduce repetitive failures in non-critical applications. It is rewarding to see firsthand how the parts quality program is improving the reliability of our nuclear fleet."

The PQI has provided the industry a unique and improved view of those potentially suspect parts. PowerLabs is engaged with the vendors early in the process

in order to solve problems from the start. This works to ensure that delivered components are of high quality and are reliable.

John Makar, Exelon senior supply operations specialist, speaking about the need for better quality in the manufacturing of parts, said, "That affects not just us; it affects the whole industry."

Makar explained that the PQI is viewed by the fleet senior leadership as one of Exelon's equipment reliability pillars. "The PQI, along with other equipment reliability initiatives, such as preventive maintenance optimization, single point vulnerability elimination, and rework reduction, has been successful in driving significant fleet performance improvements." Exelon fleet performance leads the U.S. nuclear industry in scram reduction, as well as capacity factors. The report on U.S. nuclear capacity factors in the May 2021 issue of *Nuclear News* (page 28) indicates that in the period 2018–2020, the top three performing reactors were Exelon units; furthermore, 10 of the top 20 performers were Exelon units.

"The most effective PQI programs test the subject components as soon as they hit the warehouse receiving dock, as part of the receipt inspection process," Makar added. "An often overlooked, value-added aspect of PQI is that the testing ensures that the components you are putting on the shelf meet the operational and technical requirements of the station and are ready when you need them. Components that fail PQI testing can be immediately returned to the supplier for prompt repair or replacement under warranty. Internal Exelon reviews have indicated that the replacement value of these components returned under warranty has been as high as 170 percent of the total PQI program implementation costs for the year. Thus, the PQI program more than pays for itself by ensuring defective components are not put in inventory and would have to be written off later as an expense."

Industry requirements state that "controls are established to monitor supplier performance" and that "performance data and metrics that could have an impact on plant reliability or nuclear safety are trended and promptly communicated back to the supplier to ensure supplier action and continuous improvement." One can imagine the impact when a supplier receives a documented failure test analysis, as compared to the more subjective feedback that is normally provided when there is a failure in the plant or during testing. Overall, suppliers and manufacturers want to provide a quality part. Over the years, the PQI process has demonstrated results by improving parts quality.

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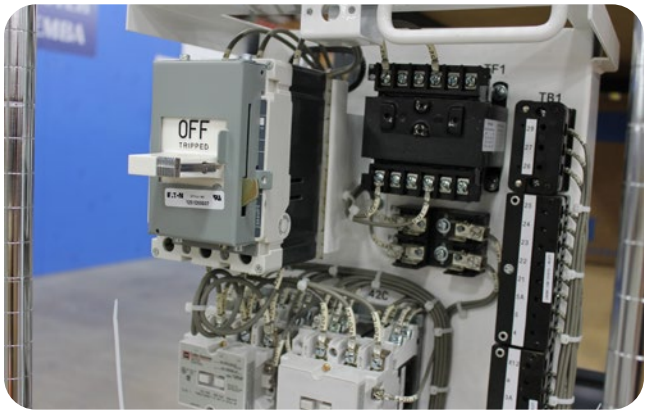
Breaker for dedication, Eaton Navy type: AQB-A103 RMS. An example of a commercial product with high reliability that may be excluded from testing.



A motor control center sample bucket that goes into a motor control center. Having multiple components that make up this assembly and many subcomponents, it may be subject to parts quality testing.

Another example of a breaker for dedication.

Tom Wait, Exelon PowerLabs' operations manager, said, "The more test data you have, the more visibility and clarity you have around trends. The PQI process is the best opportunity we have right now to drive reliability across the industry."

PowerLabs has tested more than 70,000 critical parts for its customers. This provides valuable trending information to not only help identify the parts that will most likely fail (ones that most plants already have sitting on the shelf), but also assist customers as they fine-tune the testing performed to ensure that all known failure modes are tested.

Since the inception of the PQI in 2006, the industry and parts quality have changed. One of the goals of a good parts quality oversight program is to ensure that there is a continuous learning process. That need was certainly evident during the past year and throughout the pandemic.

First and most obviously, the pandemic significantly accelerated the trend toward remote work, with an increase in the number and percentage of virtual meetings and digital collaboration. This new and immediate impact has led to less face-to-face contact oversight and management observations, which flies in the face of methods I have successfully used in the past. During my years at Exelon, I supported numerous supplier performance meetings and always stressed the need to document management and peer observations. The pandemic put a halt to (or at least greatly reduced) those observations without warning or notice, and many suppliers and manufacturers were caught off guard.

A second key new element is the industry's increased focus on single point vulnerability and critical spares to ensure that suppliers and manufacturers understand and are focused on areas that have a direct impact on plant performance. Failure of these components causes latent costs—costs that are buried but still have a great impact on a utility's bottom line. Nuclear energy is becoming a smaller part of many companies' businesses. That translates to fewer staff members who understand the enhanced quality standards and the expectations that should be required. As I like to put it: "Mr. Vendor, we obviously want every part or component order we have with you to be perfect. However, this smaller, select group is what we call 'critical to plant operation,' and we want you to make sure that greater focus and attention is placed on these critical parts. More to the point, we want your 'A team' working on these parts above all others."

A third new objective is to increase the oversight of both fast-tracked projects and expedited critical spare orders or repairs. Supplier resources are limited. Access to experienced management and project managers becomes more difficult with the rise of remote work. In addition, there is a longer lead time for subcomponent parts. All of this adds up to the industry increasing the number of required "run to maintenance" components, which has increased or at least contributed to the need to expedite parts and components. There is a critical need for more frequent and enhanced communication, as well as the establishment of robust and key milestones if they are not already in place.

These three additional focus areas—remote work, single point vulnerabilities, and attention and focus on expedited orders—are some of the significant enhancements that are essential to a strong parts quality process.

The road to improving equipment reliability is a multifaceted path, one that requires planning, the identification of suspect or potentially suspect parts, robust procedures, detailed change management, and above all, leadership to support what must be a station-owned process.

David Mueller is vice president of strategic programs at Paragon Energy Solutions.