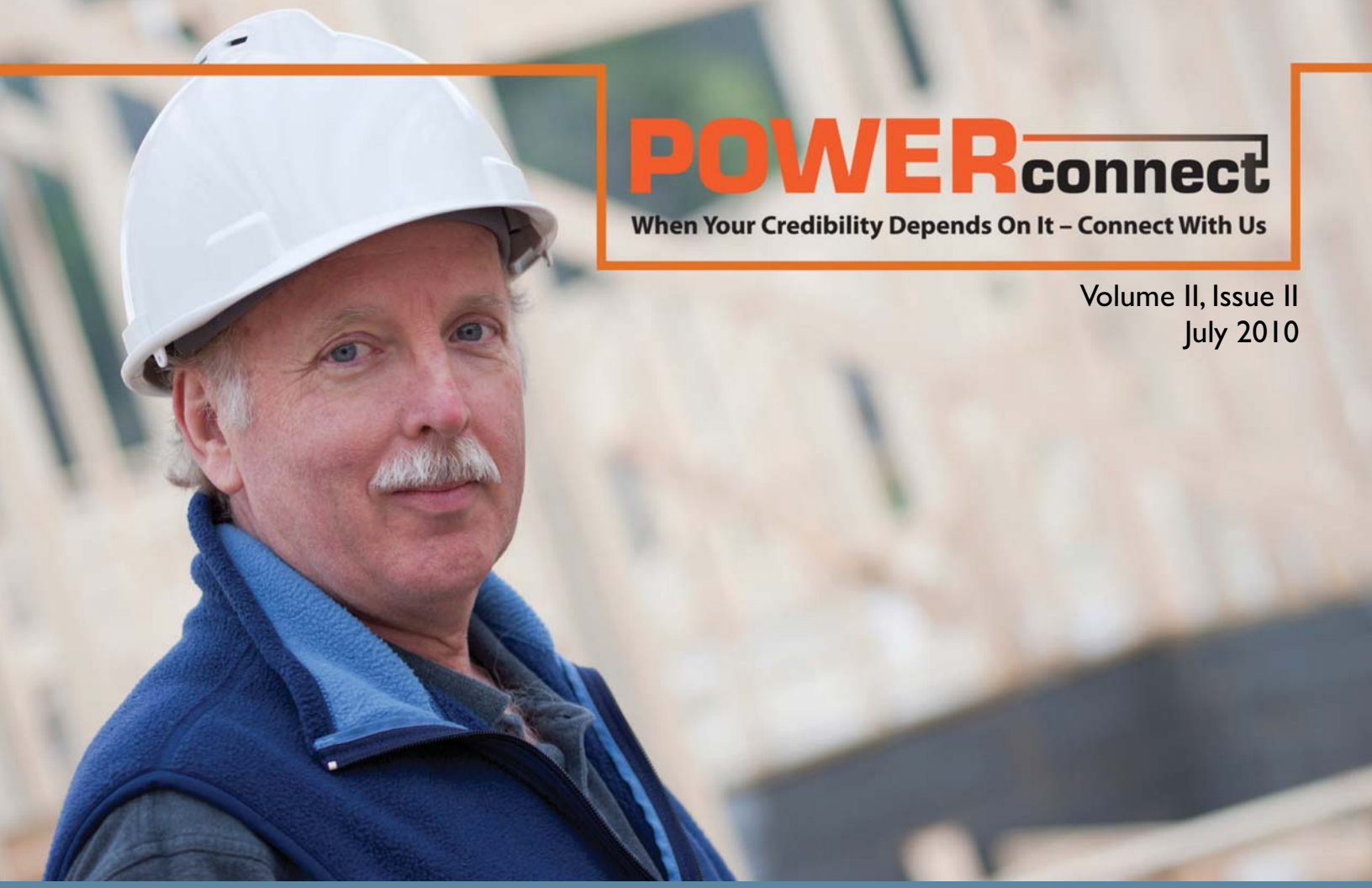

POWERconnect

When Your Credibility Depends On It – Connect With Us

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In This Issue:

Generator Reliability: Why Generac is a Leader

Third party studies have found the average generator system within the market has a reliability of around 99 percent. Generac Power Systems believes this level of generator reliability is unacceptable. It has been Generac's mission to design generators that exceed the market norm for reliability. Generac has addressed the following key reliability issues through superior product design.

Lack of Maintenance

Generators must be maintained to remain reliable (batteries, belts, hoses, fluids, etc.). However, many customers loose site of this reality as time passes. Generac's advanced generator controls include predictive maintenance algorithms that warn the user when maintenance is required. Competitive systems in the market don't include this feature.

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Generator Reliability, continued from page 1

Sensors, Connection and Circuit Board Failures

Generators are a long-life product making age deterioration the main failure mode. An area of significant concern is the oxidation of sensor connections resulting in intermittent or false sensor reading. Generac's advanced generator controls use a sealed wiring harness to limit this failure. In addition, the sensors utilize a premium 4-20 mA signal common in mission critical process control. This type of signal is more accurate, less sensitive to corrosion and resistant to electrical noise. Current industry standards for on-site generators use a less expensive voltage-based feedback. Circuit board design can be a significant element in generator system reliability. Generac uses an integrated approach for generator control, combining multiple control functions into a single, secure, all-digital controller. This reduces component count and interconnected wiring resulting in increased reliability. Generac's advanced controls use surface mount technology for vibration immunity and are sealed inside an aluminum casing for environmental and electrical protection. Many generator controls available today are multiple devices with non-sealed boards and vibration sensitive components.

Fuel Failures

Though smaller kilowatt (kW) applications are dominated by natural gas powered generators, diesel generators are the industry standard for applications larger than 150 kW mainly due to their lower capital cost. Though cost effective, diesel does not come without reliability issues. A typical generator application may take 10 years to empty its diesel fuel tank. This demands that customers maintain their diesel fuel; if not aggressively maintained, it will become unreliable. The other significant failure mode is running out of fuel. When an area-wide outage occurs (hurricane, flooding, ice storms or grid failures), refueling the generator becomes extremely difficult.

To address these issues Generac has developed two alternatives to the standard diesel approach. To minimize the amount of on-site fuel that must be maintained while maximizing the generator's run time, Generac has applied its Bi-Fuel™ technology to standby power generation. Bi-Fuel engines simultaneously run on diesel and natural gas. In this configuration, a diesel engine will operate on 25 percent diesel and 75 percent natural gas, extending the run time of on-site fuel by a factor of four. The Bi-Fuel configuration also has the ability to automatically revert to 100 percent diesel operation in the unlikely situation of concurrent electric and gas service interruption.

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Generator Reliability, continued from page 2

Within most areas of the country, natural gas has proven itself extremely reliable. For customers that are not 100 percent committed to diesel maintenance and refueling contingency planning, natural gas may be the more reliable fuel choice. To make this a real choice for the market, Generac has developed natural gas powered generator solutions that are cost effective above 150 kW. In this effort Generac maximized the power density of automotive- and industrial-based natural gas engines and applied its modular power system paralleling technology. The combined effect is highly reliable natural gas solutions (infinite supply of good fuel) while effectively maintaining a diesel price point.

Removing Single Point Failures (N+1)

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, etc.). To significantly improve the reliability of the backup power system, the system cannot rely on any one single generator.

Just as an HVAC or UPS system uses 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 system's most critical loads.

Parallel power solutions have always offered the standby power generation marketplace significant advantages. However, the implementation of these solutions has been limited to mission critical applications and large kilowatt projects. This is largely due to the constraints in implementing traditional paralleling solutions. These constraints include costs, space, issues of single source responsibility and a significant level of complexity. To assess the benefits of parallel generation while removing the cost and complexity limitations, Generac has integrated the generator paralleling into the genset package.

Generac's Modular Power System (MPS) is a completely integrated, UL listed, paralleled power solution. The MPS solution utilizes a paralleling switch mounted inside the generator connection box and an integrated digital controller. This approach achieves all of the simplicity and cost points of single engine solutions while maintaining parallel generation benefits: redundancy, scalability, flexibility and serviceability.

Total Solution Approach to Reliability

Generac doesn't look at generation as a capital equipment supplier but rather as a power solutions supplier. With that in mind, Generac strives to address all elements of on-site power production reliability.

For more information about Generac's products and features, please contact your local Generac Industrial Power dealer.

This 3 x 500 kW Diesel MPS installed at Doctors Hospital, Edinburg, TX, provides redundant power for critical loads. The MPS provides all the benefits of parallel generation in a simple, single-source system that allows end-users to quickly and easily add units as additional power is needed.

Case Study

Gordon Food Service® is the largest family-owned and managed food service distributor in North America. In June 2008, Gordon Food Service announced it would build a new 480,000-square-foot distribution center on 80 acres east of I-94 in Kenosha, Wis. To read about Generac's installation of a 5 x 600 kW Gemini® MPS Bi-Fuel generator (75 percent natural gas/25 percent diesel), click here.

Selecting Breakers for Use with Fire Pumps

The sizing of overcurrent protection at the generator and between the generator and the fire pump is often a greatly debated topic. Some projects will use a magnetic-only breaker or a breaker sized for locked rotor current, while others will use the standard generator breaker. Much of this confusion is a result of National Electric Code (NEC) 695 intermixing requirements for a utility feeder with the requirements of a generator source. This article attempts to clarify this issue by reviewing the requirements in NEC 695.

NEC 695.3(B)(1): Generator Capacity

"An on-site generator used to comply shall be of sufficient capacity to allow normal starting and running of the motor driving the fire pump while supplying all other simultaneously operated loads. Automatic shedding of one or more optional standby loads in order to comply with this capacity requirement shall be permitted. A tap ahead of the on-site generator disconnecting means shall not be required. The requirements of 430.113 shall not apply."

Handbook notes:

"When the alternative source of power is an on-site generator, the alternative source disconnecting means and the alternative source overcurrent protective device for the electric-drive fire pump are not required to be sized for locked-rotor current of the fire pump motor. Rather, the circuit components of the alternative source are permitted to be sized according to Article 430, provided they are selected or set to allow instantaneous pickup and running of the fire pump load. The code recognizes that the alternative source (generator) has a disconnecting means (breaker) integrated into it. It also states that it is not required to tap ahead of this disconnect means which is a significantly different requirement than a utility service. So we begin to see that the rules for the generator are different than the utility feed, but what about the size the generator disconnecting means and overcurrent protection? "

The code clearly identifies the output requirements of the generator along with its internally integrated breaker are sized for normal starting and running of the fire pump motor. Furthermore, the NEC handbook interpretation specifically states that the generators over-current protective devices

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Engineers Praise Symposium

As you may have heard, we held our second annual Generac Engineering Symposium at the Hyatt Regency, Milwaukee, in April. More than 170 engineers from across the country attended the four-day event to discuss trends and developments in the world of standby power. In addition to daily educational seminars for which attendees earned Professional Development Hours (PDH) accredited by the Milwaukee School of Engineering, engineers were invited to tour Generac's Eagle and Waukesha facilities and to participate in special outings to local area attractions.

"I found the 2010 Generac Industrial Engineering Symposium to be very educational and fun at the same time," said Terry Hamilton, electrical engineer, Tier IV Consulting Group, Lee's Summit, Mo. "The quality of experts assembled by Generac was outstanding. I highly recommend the training and service they offer."

Barry Arenson, project construction manager, Motorola, Schaumburg, Ill., also had positive feedback about the seminar. "I would like to say well done to all who presented and organized the Engineering Symposium. This event was second to none of the seminars I've attended in my 40+ years in the industry."

Stay tuned for information about next year's seminar! To learn more about Generac's products and services, please visit www.generac.com.

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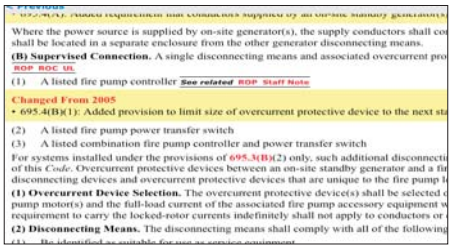
Selecting Breakers, continued from page 4

are not required to be sized for the locked-rotor current of the fire pump. By the fact that this is stated so strongly in the handbook seems to imply that it is a common misinterpretation of the code to size the generator breaker for lock-rotor current.


Where the power source is supplied by on-site generator(s), the supply conductors shall co
shall be located in a separate enclosure from the other generator disconnecting means.
(B) Supervised Connection. A single disconnecting means and associated overcurrent pro
ROP ROC UL
(1) A listed fire pump controller *See related* ROP Staff Note
Changed From 2005
• 695.4(B)(1): Added provision to limit size of overcurrent protective device to the next st
(2) A listed fire pump power transfer switch
(3) A listed combination fire pump controller and power transfer switch
For systems installed under the provisions of 695.3(B)(2) only, such additional disconnecti
of this *Code*. Overcurrent protective devices between an on-site standby generator and a fi
disconnecting devices and overcurrent protective devices that are unique to the fire pump l
(1) Overcurrent Device Selection. The overcurrent protective device(s) shall be selected
pump motor(s) and the full-load current of the associated fire pump accessory equipment w
requirement to carry the locked-rotor currents indefinitely shall not apply to conductors or
(2) Disconnecting Means. The disconnecting means shall comply with all of the following

The confusion starts with NEC 695.4 (continuity of power). In this section, the code focuses on inadvertently disconnecting the electric supply from the fire pump. The code defines two options for continuity of power: 695.4(A) direct connection and 695.4(B) supervised connection. Under the supervised connection the code states, "A single disconnecting means and associated over-current protective device shall be permitted to be installed between a remote power source and the fire pump controller." Many people misinterpret this section to include the generator breaker as the referenced supervised connection. These requirements are only required for remote power sources (serving utility), not the back-up generator located on-site.

NEC 430.62 requires that the protective device be sized per 430.52 which limits the maximum breaker size to 250 percent of the motor nameplate rating. This sets the maximum size of the breaker, but what about the minimum size of the breaker? What does "provide short circuit protection only" mean? NEC provides for short circuit, ground fault and overload protection. Thus, short circuit only protection means no protection against ground fault or overload. NEC 430.32 defines overload protection at a maximum of 125 percent of the motor nameplate rating. The result of all this is that any overcurrent devices from the on-site generator source to the fire pump must be sized between 125 percent to 250 percent of the fire pump rating.

NEC 695 presents a significant interpretation challenge to system designers. After carefully reviewing NEC 695, the use of magnetic only breakers, tapping ahead of the generator breaker, and breakers sized for locked rotor amps seems to be a misinterpretation for the generator source. The requirement to carry lock rotor amps indefinitely applies only to the utility source. As with all code interpretation issues, please consult with your authority having jurisdiction (AHJ) to ensure a common understanding on these issues prior to installation.

For more information about Generac's products and services, please visit www.generac.com.

Generac's Daniel Barbersek Addresses EGSA Fall Technical & Marketing Conference

Daniel Barbersek, Generac power solutions manager, has been invited to speak at the Electrical Generating Systems Association (EGSA) 2010 Fall Technical & Marketing Conference, Newport Beach, Calif., Sept. 12-14, 2010. EGSA is the world's largest trade association dedicated to On-Site Power Generation. Headquartered in Boca Raton, Fla., EGSA is made up of nearly 800 member companies comprised of manufacturers, distributors, specifying engineers, contractors, integrators, and more.

Thanks to reduced emissions, lower fuel costs and longer runtimes, Bi-Fuel™ engines are growing in popularity among end users. Barbersek's presentation will provide an outline of Bi-Fuel engine operating systems as well as a general overview of the market opportunities for Bi-Fuel engine applications in North America, highlight any specific markets where Bi-Fuel operations have significantly increased and reveal any government initiatives on the local, state or federal level that may help grow the market potential for Bi-Fuel operations.

Barbersek has nearly 30 years of experience working with some of the energy industry's leading manufacturers. He began his career with Piller, Inc., Middleburg, N.Y., as a field service technician, ultimately becoming a regional sales manager servicing 19 states and Canada. As senior sales engineer for Davidson Sales, Daytona Beach, Fla., Barbarsek worked with The VMC Group supporting a number of manufacturers in obtaining IBC Seismic Certification before joining Generac.

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