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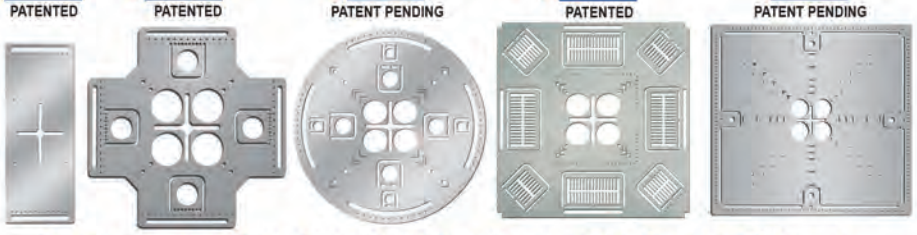

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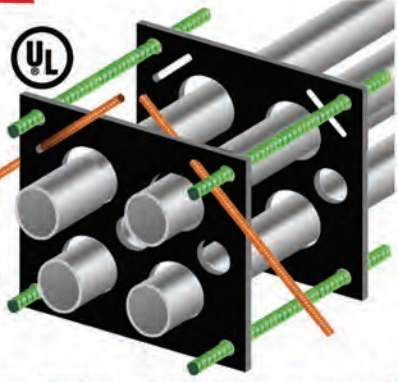

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CONTENTS

COMPANY PROFILE

COVER STORY

FEATURE

DEPARTMENTS

ON THE COVER

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Generator InterLock Technologies, LLC

Generator InterLock Technologies, LLC, is a small-based company that manufacturers and sells its products across the country. The company was founded after Hurricane Isabel hit the east coast in 2003. The product was developed to meet the need for a safe way to use portable generators to power homes in the event of power loss.

The initial inspiration for the product came from a persistent friend of an electrician working for Master Electrical Services. As electrical contractors, they had seen various unsafe and illegal methods that people had used to try to power their houses with their portable generators. The electrician set out to develop a product that would meet National Electrical Code requirements and at the same time be cost effective and convenient for the homeowner. From that original inspiration came a new company: Generator Interlock Technologies or GIT.

The Interlock Kit is a simple safety product that locks out the Main breaker in the existing home panel and allows for the portable generator to power the home through a back feed generator breaker. While many electrical inspectors liked the product; they all agreed that the product would have to be listed to UL standards. After thousands of dollars in fees, rigorous tests, a year of changes and modifications, the Interlock Kit was finally approved for production to be used with panels listed under UL Standard 67.

The company started filling orders in early 2005, using Master Electrical Services as its basis for customer awareness. Starting with a few kits that fit the most recent Square-D and Cutler Hammer panels, the offerings grew to over 30 different models in less than one year. Generator Interlock Technologies now has kits for panels from 30 years ago to the most current and they continue to add new kits to meet their customer's needs. While contractors in Florida and the North East are the biggest customers, Interlock Kits have been sent throughout the United States and parts of Canada. Whether the power loss is due to costal hurricanes or from crippling ice storms in the northern , GIT has a kit that will allow customers to keep the power on in their homes.

The Interlock Kits are designed to be installed by licensed electricians and are cost effective for both the customer and the installer. Other products on the market such as generator sub-panels and transfer switches require extensive rewiring of the home panel, often taking the electrical contractor 6 to 8 hours to install. With the Interlock Kit, a qualified electrician can install a complete system in 2 hours or less by simply mounting the correct kit to the face of the panel and wiring a generator convenience outlet to a breaker installed in the panel.

With the Interlock Kit, a qualified electrician can install a complete system in 2 hours or less by simply mounting the correct kit to the face of the panel and wiring a generator convenience outlet to a breaker installed in the panel.

To use their portable generator, a homeowner plugs an extension cord from their generator to the new generator convenience outlet. He then starts the generator, turns off the main breaker, slides the Interlock Kit, turns on the generator breaker and selects the circuits for use up to the capacity of the generator.

Generator Interlock Technologies' Kit is a defining safety product that has been recognized as a Innovation Award Winner by *Electrical Contracting Products* magazine and one of the Top Products by *Electrical Products and Solutions* magazine.

Generator Interlock Technologies, LLC, has taken a problem of safety and convenience and developed a system to keep danger and expenses to a minimum. Starting with an idea of helping a friend in need, to helping thousands across the country, GIT continues to grow due to its commitment to deliver a quality product. Visit www.interlockkit.com for a complete list of products and details. ❑

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Vince Miller started Miller Safety Consultants, a veteran owned business in 1999. The goal of the business was to provide cost effective safety consulting, employee training such as: confined space entry, fall protection, electrical safety and provide sales of electrical shock and flash protective equipment and fall protection equipment to businesses in the Washington DC area.

Reliance Industries provided fall protection products and much of the sales and training was on behalf of the supplier. In 2000, the owner decided to retire from his business, and Vince decided to discontinue the fall protection line of his business and concentrate more in the electrical training and products.

Vince had been a distributor for Certified Insulated Products (CIP), a manufacturer of electrical insulated tools and electrical arc flash clothing manufactured by Otex in Rochester, New York. As a distributor, Vince provided sales through his internet website and much through relationships with electrical contractors. His training was a classroom environment and was provided directly to customers but he also taught as a sub-contractor for other safety consulting companies and the Chesapeake Safety Council in Baltimore, Maryland. In 2005, Vince partnered with Vivid Learning Systems in Cascades, Washington to provide on-line training in safe work practices.

Training in electrical safe work practices is still provided locally in the Washington DC area and as a partner with an electrical engineering firm and online. The training is based on the Occupational Health and Safety Administration (OSHA) standards and the National Fire Protection Association (NFPA) 70E standard.

Miller Safety Consultants is now a distributor for Cementex USA, Burlington, New Jersey, for insulated tools and equipment and clothing from OTEX Protective, Rochester, New York.

The majority of his sales of products are from the web-based store. Cementex is nationally known for their quality equipment. Otex Protective is becoming more known for their quality clothing. For years, they have manufactured their products under other provider labels. Vince chose to not create his clothing line, but to sell the manufacturer product.

Vince has worked with many electrical company employees to fine-tune the clothing to be more comfortable for the user. Working closely with the manufacturer, they have made slight changes in how the cloth pattern was modified to meet final production. An example is the lightweight 40 Calorie vented hood offered by Otex.

The material is of the latest technology. The vented assembly is constructed for balance on the back of the hardhat and the airflow is 27 CFM to prevent fogging of the face shield and provide cooling to the worker. It took over a year to develop the product with the user prior to having the hood "flash tested". This product is now standard issue with many electrical contractors.

Being a small business and having quality providers has resulted in satisfied customers for Miller Safety Consultants. Being a direct supplier for OTEX Protective, another small business means customized customer needs can be met. ❑

For more information, visit Miller Safety Consultants at: www.electricalsafetysupply.com, email Vince at: sales@millersafetyltd.com or give him a call at (703)367-0404.

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Quality Matters

Awareness of the Basic Issues of Power Quality and How To Tackle Them [PART 1 OF 2]

BY JOHN OLOBRI

IF YOU OWN OR RUN A BUSINESS, it's very likely that one of the things you're least likely to think about on a regular basis is the quality of your electricity. For a start, what is power quality and how can it vary? Surely you can depend upon your energy supplier to look after this sort of thing, and anyway, does power quality really matter or is it just something for specialist engineers to worry about? In this article we're going to answer those questions, but let's start off by saying that power quality is most definitely a concern for us all.

Have you ever had a piece of equipment – most likely a computer or other electronic item – that functioned poorly or failed regularly for no apparent reason?

Maybe you have lights that flicker, or if you operate a factory, motors that run hot and fail sooner than expected. All of these could be the results of poor power quality and if you don't realize this, the time and money you spend on trying to fix the symptoms is likely wasted. Power quality issues can also increase your energy bills, eating further into your hard-earned profits.

For these reasons, everyone who owns or runs a business needs to be aware of the basics of power quality, to understand how to assess it, and to know what to do if and when problems are identified. A few minutes spent reading this article could save you a lot of time, trouble and money.

What is Power Quality?

In a perfect world, you would expect your electricity supplier to provide you with an AC supply at a constant voltage, a fixed frequency, and with perfectly sinusoidal waveforms that have no nasty spikes on them. Also, if it is a three-phase supply, you would expect the voltages of the three phases to be exactly the same. This would be perfect power quality. However, as we don't live in a perfect world, your supply may not actually meet these requirements and even if it does meet them at the point it enters your premises, it may well become degraded as it passes through the electrical installations at your site.

As this suggests, if you have power quality issues, in many cases it's not the fault of your utility company. The operators do, in fact, go to great lengths to ensure that they deliver clean supplies, but some of the factors that affect supply quality, such as thunderstorms and the equipment you've got installed in your own premises, are beyond their control.

That said, what can possibly go wrong with power quality? In practice, almost all power quality issues can be divided into six main areas. These are: harmonics, sags and surges, transients (spikes), interference, voltage imbalance and poor power factor. Let's examine each of these issues.

Harmonics

In an ideal power system, voltage and current waveforms would be perfectly sinusoidal. This would not be too difficult to achieve if all the loads connected to the power system were linear – that is, the loads where the current drawn from the supply is always proportional to the applied voltage. Basic heaters and incandescent lighting are examples of linear loads and, until the last few decades of the 20th century, loads were predominantly of this type.

Within the last 30 years, however, there has been a big increase in the number of non-linear loads connected to the electrical network. These include computers, uninterruptable power supplies, variable speed motor drives, electronic lighting ballasts and LED lighting, to name a few. The growing use of such equipment, and the use of electronics to control nearly all types of electrical loads, have an effect

on the electricity supply and on individual site installations. It is estimated that today over 95% of the harmonics present on a given site are generated by equipment installed at that site.

As we have stated, when a linear load is connected to the supply it draws a sinusoidal current at the same frequency as the voltage. Non-linear loads, however, draw currents that are not necessarily sinusoidal. In fact, the current waveform can become quite complex, depending on the type of load and its interaction with other components in the installation. Non-linear loads produce distorted current waveforms in the supply system, and in severe cases this can result in noticeably distorted voltage waveforms. The consequences can include significant energy losses, shortened equipment life and reduced operating efficiencies of devices.

The distortion of the waveform produced by non-linear loads is equivalent to adding components at integer multiples of the supply frequency to the pure supply frequency waveform.

That is, for a 60 Hz supply, the distortion takes the form of additional components at 120, 180, 240, 300, 360 Hz and so on – an example is shown in Figure 1.

These additional components are the harmonics, and in theory, they can go all the way up to infinity. In practice, however, it is rarely necessary to consider harmonics above say, the 50th, which has a frequency of 50 x 60 Hz = 3 kHz and, in most cases, only the lower order harmonics, up to the 15th, will be of importance. Unfortunately, unless they are prevented from doing so, harmonics from a non-linear load will propagate through the supply system causing problems elsewhere.

Knowing that a distorted current waveform can always be represented as a series of superimposed sine waves (using a mathematical procedure known as Fourier analysis) (CONTINUED ON PAGE 10)

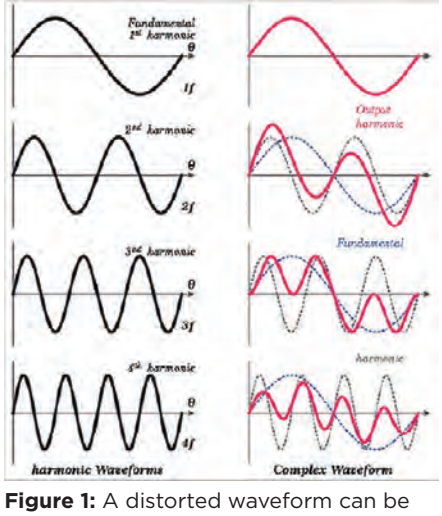

Figure 1: A distorted waveform can be analyzed as multiple sine waves added together

AEMC® INSTRUMENTS (CONTINUED FROM PAGE 9)

makes it possible to devise a measure of the amount of harmonic distortion present in the current in a supply system. This is known as total harmonic distortion (THD)

Harmonic currents have negative effects on almost all items connected to an electrical system; they upset sensitive electronic devices, they increase heating, and they produce mechanical stresses. Among the most common effects of harmonics are computers crashing, lights flickering, electronic components failing in process control equipment, problems when switching large loads, overheating of neutral conductors, unnecessary circuit breaker tripping and inaccurate metering.

While some of these effects could be dismissed as no more than irritants, others such as process equipment failures, can lead to costly downtime. Worst of all are failures of electrical distribution equipment like cables, transformers, motors and standby generators.

Here the replacement equipment is likely to be expensive and today, may only be available on a long lead time. In these cases, both the repair costs and the resulting costs can be substantial. Even if there are no outright failures, the presence of harmonics will cause reduced electrical efficiency within the installation leading to excessive power consumption which you will be paying for.

Eddy current heating in motors and transformers is proportional to the square of the harmonic frequency, so it follows that as the presence of higher order harmonics in the supply system increases, the heating effect will increase even more dramatically. Not only does the generation of heat waste energy – which you are paying for – it also increases the risk of failures of or even fires in wiring, motors, transformers and other distribution equipment.

In addition to the losses that result from heating effects, harmonics in motors can give rise to torsional oscillation of the motor shaft. Torque in AC motors is produced by the interaction between the air gap magnetic field and induced currents in the rotor. When a motor is supplied non-sinusoidal voltages and currents, the air gap magnetic fields and the rotor currents will unavoidably contain harmonic frequency components.

+Sequencing	1, 4, 7, 10, 13
- Sequencing	2, 5, 8, 11, 14
Zero Sequencing	3, 9, 15, 21

These are grouped into positive, negative and zero sequence components. Positive sequence harmonics (1, 4, 7, 10, 13, etc.) produce magnetic fields, and hence torque, rotating in the same direction as the field and torque produced by the fundamental frequency of the supply. Negative sequence harmonics (2, 5, 8, 11, 14, etc.) produce magnetic fields and torque that rotate in the opposite direction. Zero sequence harmonics (3, 9, 15, 21, etc.) do not develop torque, but produce additional losses in the machine.

The interaction between the positive and negative sequence magnetic fields and currents produces the torsional oscillations of the motor shaft, which appears as shaft vibrations. If the frequency of these vibrations coincides with the natural mechanical frequency of the shaft, they become amplified and severe damage to the motor shaft may occur.

Some of the most troublesome harmonics are the 3rd, and odd multiples of the 3rd, i.e. the 9th, 15th etc. called “triplens”. The triplen harmonics on each of the supply phases are in phase with each other so they add rather than cancel in the neutral conductor of a three-phase four-wire system. This can overload the neutral conductor if it has not been sized to allow for the potential presence of harmonics.

While the harmonics usually cannot be removed, since they are generated in the course of the normal operation, they can be prevented from spreading throughout the distribution system.

This is usually done by installing passive or active (CONTINUED ON PAGE 12)

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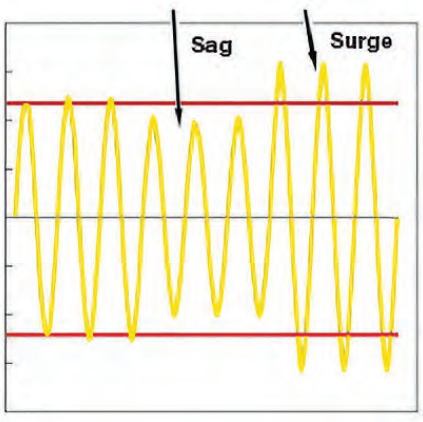
filtering close to the source of the harmonics, and in some cases, by the use of tuned power factor correction equipment. Bringing harmonics under control will eliminate, or at least mitigate, all of the problems we have discussed.

A note of caution is needed. Adopting measures to alleviate harmonics is unlikely to be a once-and-done solution. In today's changing business environment, it's likely that new loads will be connected to your electrical installation. Without measuring, you won't know how these are affecting overall harmonic performance? Therefore, regular monitoring of harmonics is strongly recommended if the benefits of harmonic reduction are to be maintained.

Sags and Surges

If electrical equipment is to operate correctly, it requires electrical energy to be supplied at a voltage (and frequency) that is within a specified range.

In practice, what really matters is it compatible with the loads that are connected to that supply. Sometimes this is not the case, mostly due to voltage sags and surges.



What are voltage sags and surges?

A voltage sag is a sudden reduction in the supply voltage of between 10% and 90%, which typically lasts between 10 ms and 1 minute. The depth of a voltage sag is defined as the difference between the minimum RMS voltage during the sag and the declared supply voltage. Voltage changes that reduce the supply voltage by less than 10% are not considered to be sags.

Voltage sags may be caused by external factors on the supply or internal factors within an installation.

They can be single events that occur at random, or a series of events that repeat in some pattern. In all instances, monitoring and recording the supply voltage over time will show exactly what is happening and help to locate the cause.

External factors are more likely to produce single events and include load switching and fault clearance in the supply network. A similar effect can occur when switching between the line supply and uninterruptible power supplies or emergency back-up generators. Common causes of voltage sags within an installation are the switching of large loads, such as motors, arc furnaces and welding equipment, and the operation of loads with fluctuating current demands. Often voltage sags produced within an installation occur at regular intervals or at particular times.

The effect that sags have on electrical equipment and building occupants varies widely and is dependent on the kind of event and the type of equipment connected to the supply system.

Supply voltage sags can cause particular problems, with varying degrees of severity, for AC induction motors. As the supply voltage to the motor decreases, its speed tends to decrease. Depending on the depth and the duration of the voltage sag, the motor may return to its normal speed when the supply voltage recovers. If the magnitude of the sag or its duration exceed certain limits, however, the motor may stall, or it may be disconnected from the supply by a contractor dropping out or the operation of an under- voltage trip.

For motors fed from a variable speed drive, the drive may shut down to prevent potential motor damage.

Voltage surges are defined as a sudden increase in the supply voltage of 10% or greater for a short period, after which the voltage returns to its normal value. This time period for a surge is generally between 10 ms and 1 minute. Surges are mostly caused by a large load being switched off somewhere on the power supply network or in the local installation.

Although the effects of sags may be more noticeable, voltage surges are often more destructive. Regular and sustained voltage surges can cause insulation degradation in motors because of the increases in current flow and heat generation, with this degradation ultimately leading to premature failure of the motor. Surges can also cause breakdown of components in power supplies and damage to electronic equipment, which is often sensitive to overvoltage.

Fortunately, there are ways to mitigate the effects of sags and surges but an essential first step is always locating the cause of the problem. This is achieved by conducting a site survey, which involves moving around the electrical installation, measuring current and voltage at various locations and using this information to identify the source of the sags and surges.

Site surveys are most easily performed with a power and energy logger or power quality analyzer. These instruments can be connected quickly and non-intrusively to distribution panels and other key points within the installation and left in place to gather and record information. In many cases, there is no need to even turn the power off while connecting the instrument.

In many cases the source of the problem will be within your own installation and, once you've identified the equipment causing the sag or surge, you can work on solutions which might include supplying the equipment in question from a dedicated circuit, installing a UPS or, in the case of motors, adding a soft start or variable speed drive to reduce sudden changes in the current the motors draws from.

Transients

Transients – which are also called spikes – can have an effect on equipment and installations (CONTINUED ON PAGE 14)

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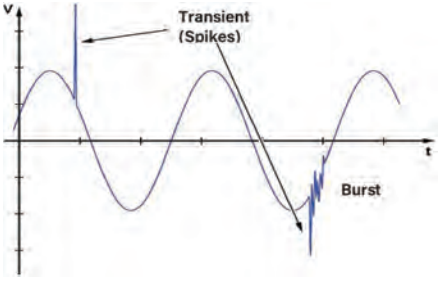
that ranges from mildly irritating to extremely damaging and costly. An electrical transient is a very fast, short duration spike in voltage that can be several thousand volts in magnitude. It may be a single event, but it can also come in bursts. The voltage spike produces an increase in current in the load, seen as a current spike, which results in a momentary increase in the energy transferred from the supply to the load. Depending on the magnitude and duration of the transient, the amount of extra energy may be no consequence, or it may be enough to cause serious damage.

Most transients are generated by events external to the installation that is affected. These include as lightning strikes, load switching and fault clearance in the utility company's supply equipment. Because of their high voltages and energy content, transients produced by lightning pose the highest risk of equipment damage and failure, but studies have shown that most transients – more than 80%, are generated within the installation itself.



Lightning induced transients are potentially damaging because the current typically rises quickly to its maximum level within 1 to 10 microseconds, then it decays more slowly in around 50 to 200 microseconds. This rapidly changing current creates electromagnetic radiation (radio waves) that travels outward from the location of the strike. If this radiation encounters an electrical conductor, such as a power line, a communication line or a metallic pipe, the conductor acts like an aerial and a high voltage – the transient – is induced into it. The conductor doesn't have to be struck directly by the lightning. A strike to the ground near to the conductor can induce large transients.

Other external factors like load switching and fault clearance within the utility supply can generate transients. Load switching transients result from the sudden release of electrical, magnetic, or in the case of rotating machines, mechanical energy stored in a device at the instant it is turned on or off.

A much more frequent source of transients is load switching within an industrial facility. The event that gives rise to the transient could be something like bus transfer is likely to be something simple like a circuit breaker or a contractor opening or closing. Even operating a light switch can create transients and, in every case, the level of transients will be increased if the switching device has faulty or corroded contacts. Office equipment, such as photocopiers and laser printers, are notorious for generating transients, as are HVAC systems. In fact, whenever an inductive or capacitive load is switched on or off, it will almost certainly produce a transient – although a small one, that propagates through the electrical installation.

It is generally the case that the transients generated internally within the installation, which are usually small, are likely to cause slow degradation over time. The much larger transients produced by lightning and the switching of large inductive loads can, however, cause immediate insulation breakdown and subsequently deliver large amounts of energy into the equipment, resulting in failure and, in the worst cases, fire or even an explosion.

The mechanism of these dramatic failures is that when equipment is subjected to a transient that has a voltage higher than the breakdown voltage of the equipment's insulation, a flashover is likely to occur. This flashover is a low impedance electric arc through which current from the supply can flow. With all of the energy of the supply voltage behind it, the strength of the arc and the heat it produces increase almost without limit, creating the risk of fire, explosion and can be life threating.

Traditional electrical equipment is likely to suffer damage only if exposed to large and/or high energy transients, but electronic equipment is much more sensitive and, unless protected, it can be irreparably damaged by comparatively small transients. This is because microcontrollers and similar components rely on thin areas of silicon to insulate them, and such insulation can be damaged by over voltages that would go completely unnoticed in traditional equipment. It's worth noting that transient damage to electronic devices doesn't necessarily result in immediate failure but may reveal itself as a random failure at some future time. Given the present day reliance of almost every aspect of commerce, business and manufacturing on electronic systems, such failures are a real concern, leading to costly downtime and consequential costs.

Even when transients do not lead to equipment failure, they can still be disruptive causing computers to crash and lose data, for example, process control systems to shut down unexpectedly and cause ground fault current devices (GFCIs) to trip for no obvious reason.

A wide range of (CONTINUED ON PAGE 16)

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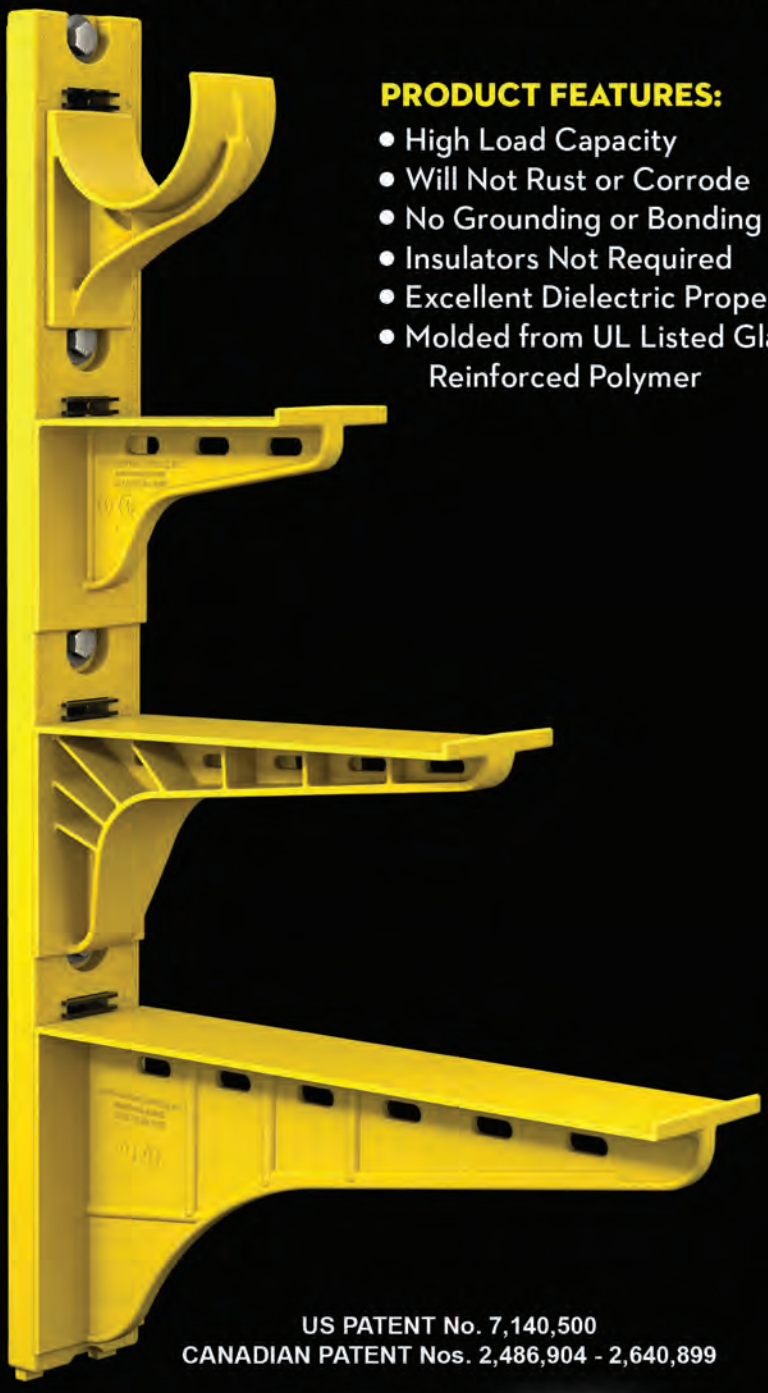

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AEMC® INSTRUMENTS (CONTINUED FROM PAGE 14)

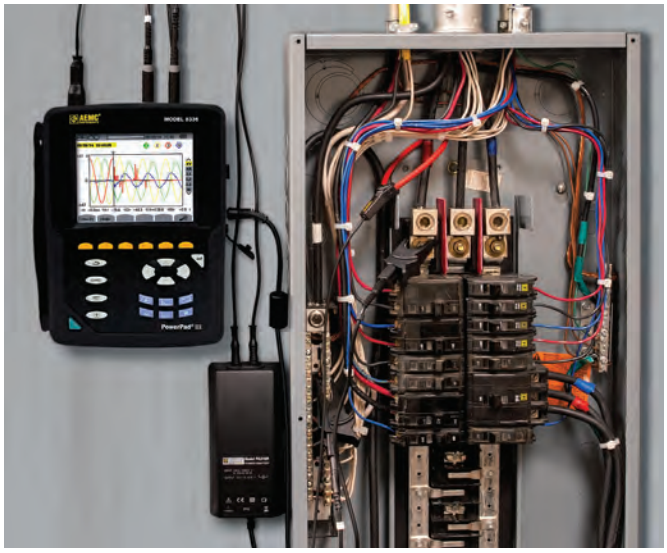
measures are available for providing protection against transients, and selection of the most appropriate type must take into account the voltage, duration and power level of the transients, and the type of equipment that is to be protected. Some types of equipment, such as motors may be designed to withstand transients on a typical supply system without further protection, but this should never be taken for granted. Electronic equipment may also feature integral protection, but this is unlikely to be adequate on its own if no other form of protection is installed on the distribution system of the premises in which it is being used.

It may at first seem unnecessary to provide transient protection for test equipment like multimeters and power analyzers but, in reality, such protection is essential. An electrical installation is just as likely to experience transients while tests are being carried out as at any other time and if the energy released as a result of the transient is enough to destroy an unprotected instrument, the user, who is likely to be close to it or even holding it, may well be injured or worse.

The need for transient protection in instruments is reflected in the international electrical standard IEC 61010 entitled "Safety requirements for electrical equipment for measurement, control, and laboratory use". This requires test equipment to be able to withstand levels of transients appropriate to the point in the installation where the instrument will be used. (See table)

IEC 61010-1 Transient Overvoltage Tests				
Supply Voltage	Transient Overvoltage			
	CAT I	CAT II	CAT III	CAT IV
150 V	800 V	1500 V	2500 V	4000 V
300 V	1500 V	2500 V	4000 V	6000 V
600 V	2500 V	4000 V	6000 V	8000 V
1000 V	4000 V	6000 V	8000 V	12000 V

IEC 61010 recognizes that externally generated transients will be at their most severe at the point where the supply enters the building and will gradually reduce in magnitude as they travel through the electrical installation, because of the inductance, capacitance and resistance of the wiring and other equipment. Put simply, this means that instruments connected at the point of supply need to be able to withstand transient voltages higher than instruments designed to be connected to fixed wiring within the installation, which in turn need to be able to withstand higher transient voltages than instruments that will be used solely on equipment plugged into outlets. This is summarized in the category (CAT) ratings shown in the table.



CAT I rated instruments can be used for measurements performed on secondary circuits not directly connected to main power. This category is rarely used today. CAT II instruments are suitable for measurements performed on equipment connected to a standard 120/240v power outlets.

CAT III instruments are suitable for measurements performed on the fixed wiring within a building installation, typically near the point of entry which includes distribution panels, circuit-breakers, bus-bars, junction boxes and industrial equipment.

CAT IV instruments can be used for measurements performed at the source of the low voltage installation which is generally on the utility company side of the meter.

Since instruments with a particular category rating can also be used in lower category applications – a CAT IV instrument can be used in any location within a low-voltage installation – it is often worthwhile investing in instruments with a high CAT rating since this will reduce the risk of an unsuitable instrument being used to carry out a particular task.

Transients can be mitigated using surge protection devices (SPDs), which are designed to prevent voltage spikes and surges damaging the installation wiring, infrastructure and equipment. If an overvoltage occurs, the SPD diverts the resulting excess current flow to earth and limits the voltage to a predetermined maximum value. Depending on circumstances, SPDs can be installed close to the internal source of the transients or close to the loads that need protection, or both.

Three types of SPD are currently available. Type 1 SPDs can discharge partial lightning currents and are used in buildings that are supplied via overhead lines or that have a roof- mounted lightning protection system. Type 2 SPDs are suitable for use in all other types of installation and are often installed at the incoming supply point and/or in sub-distribution panels. Type 3 SPDs have a low discharge capacity and are used to provide localized protection for sensitive equipment. Much more detailed information on the selection and application of SPDs is available on the manufacturers' websites and reference should also be made to the latest edition of the NEC standards. See NEC article 285.

To decide whether your installation is experiencing problems created by transients, the first action is to use a power quality analyzer and, since transients are almost always intermittent, this needs to be equipped with data logging functionality so that recordings can be made over appropriately long periods of time. A good analyzer will allow limits and alarms to be set to alert you when a significant transient has been detected, you can then examine the data stored by the instrument to gain further information about the form and duration of the transient. This information is invaluable in determining the source. ❑

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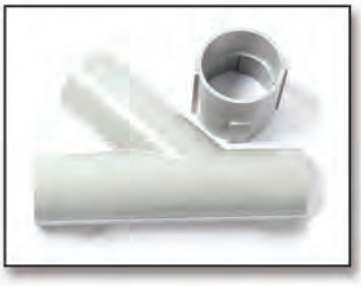

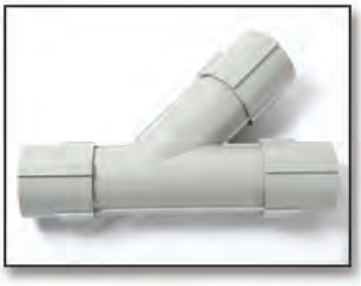

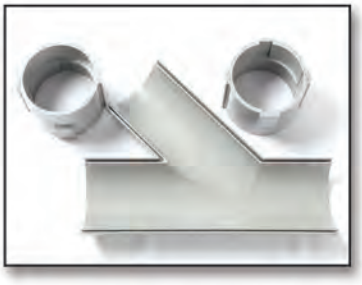

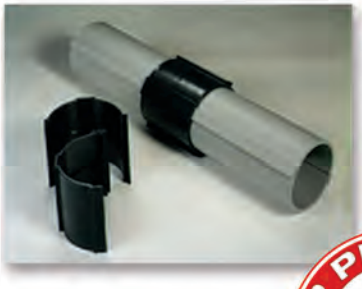

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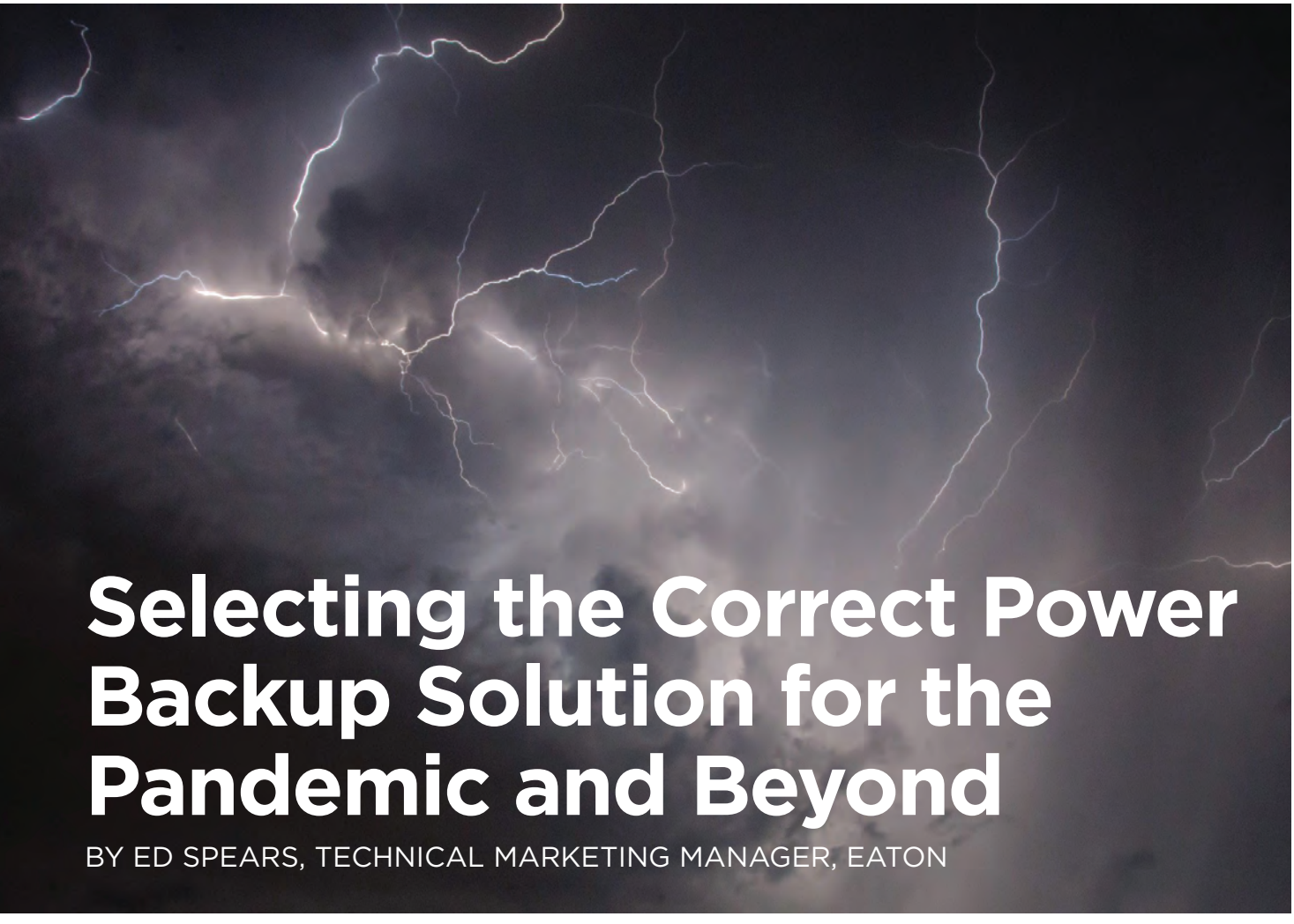

Selecting the Correct Power Backup Solution for the Pandemic and Beyond

BY ED SPEARS, TECHNICAL MARKETING MANAGER, EATON

WHILE 2020 HAS BEEN A CHALLENGING YEAR for businesses, many have responded by making technology advances that they will be able to leverage for years to come. COVID-19 has forced many IT departments to rely more on digital infrastructure to keep workforces and operations running. And just as the trend toward digitalization had already begun prior to the pandemic, every indication is that it will continue far beyond the current crisis.

As the pandemic has accelerated the digital transformation, Mother Nature has reinforced the importance of redundancy. This year the United States has already run out of names for hurricanes based on the traditional format and transitioned to the Greek alphabet for the first time since 2005's devastating storm season. Simultaneously, the West Coast has been facing wildfires of historical significance – turning skies orange and producing smoke visible from the other side of the country.

It's important for electrical contractors to consider how these dynamics impact their customers' power management demands and their ability to maintain business continuity. In this article series, I'll explore some key considerations for deploying the right uninterruptible power systems (UPSs) for reliable power backup.

A Guide to a Stronger Infrastructure

The digital evolution has pushed many companies away from a centralized IT framework – meaning network closets and intermediate distribution frames (IDF) are often scattered about in different building locations or facilities. Exacerbated by elements of the pandemic, businesses may not have dedicated IT staff close by to respond if something happens. Yet, an IDF or network closet being knocked out of commission can cause significant problems – including financial loss and equipment losses – due to downtime from a power outage.

Having the right UPS battery backup system in place at these locations can help alleviate vulnerabilities – providing enough power to ride through brief or extended outages. (CONTINUED ON PAGE 20)

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Eaton (CONTINUED FROM PAGE 18)

However, electrical contractors should weigh multiple considerations as they tailor the right solution for a customer. Below are some tips to help guide this process and create IT networks that are resilient and reliable.

1. Consider the right UPS battery backup form factors

A UPS form factor might seem confusing – but it simply refers to how a UPS is shaped.

Rackmount UPSs are measured in U, or rack units, which is equivalent to 1.75 inches of vertical rack space. Rackmount UPSs typically come in 1U or 2U models, though some larger models are 3U. The good news with rackmount UPSs is that they slide in alongside IT equipment off the floor away from water leaks and spills. Technicians should be sure that the proper 2- or 4-post mounting hardware is included with the UPS battery backup or they will need to purchase it separately. When it comes to installing the UPS, it's almost always the heaviest component in the rack so bottom placement in the rack is recommended – especially if there are external battery packs present.

A UPS rated at 1000 VA / 900 watts provides one third more real power than one rated at 1000 VA / 600 watts even though at first glance it appears that they have the same power rating.

2. Evaluate battery runtime needs

The most common questions about UPSs are those about pricing and how long the batteries will last during a power outage. UPS batteries are heavy (though lithium-ion batteries are about 40% lighter than lead-acid ones) and extra battery packs can quickly increase costs. Most power interruptions are short—less than two minutes—so users usually look for approximately seven to 10 minutes of battery runtime. As a general rule, when cutting the load (equipment plugged into the UPS system) in half, the runtime could be doubled, or even tripled. For example, if a company's 1500 volt-amperes (VA) UPS lasts for five minutes at full load, it will run for approximately 15 minutes if the load was cut down to 750 VA.

In addition to adding battery packs to a UPS, another common practice is to combine the immediate power backup of a UPS with the long-term power of a generator.

3. Determine the right capacity

The first step should be to total up the wattage of all the equipment IT teams are planning to connect to the UPS and then multiply that total by 1.2 to account for future expansion. With this grand total in watts, contractors can work with IT teams to find a UPS that has enough power capacity.

A UPS battery backup is rated in both VA and watts. Watts is a measurement of real power and is the key rating. However, it's easy to be fooled by VA ratings. For example, a UPS rated at 1000 VA / 900 watts provides one third more real power than one rated at 1000 VA / 600 watts even though at first glance it appears that they have the same power rating. Learn more about the difference between watts and VA. (CONTINUED ON PAGE 22)

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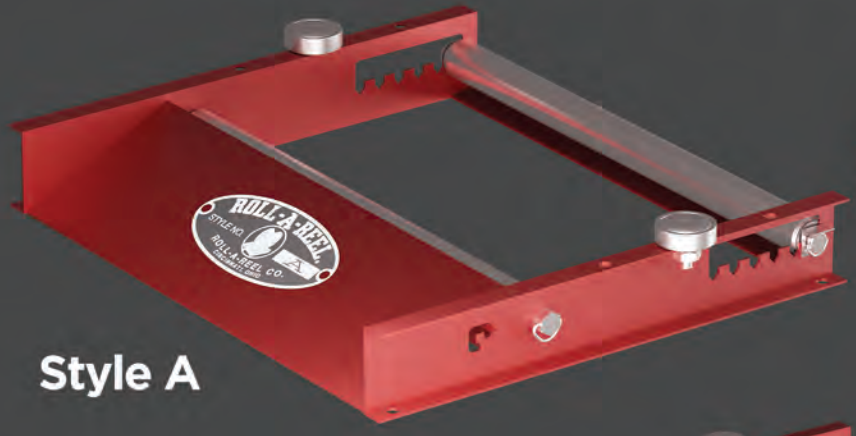

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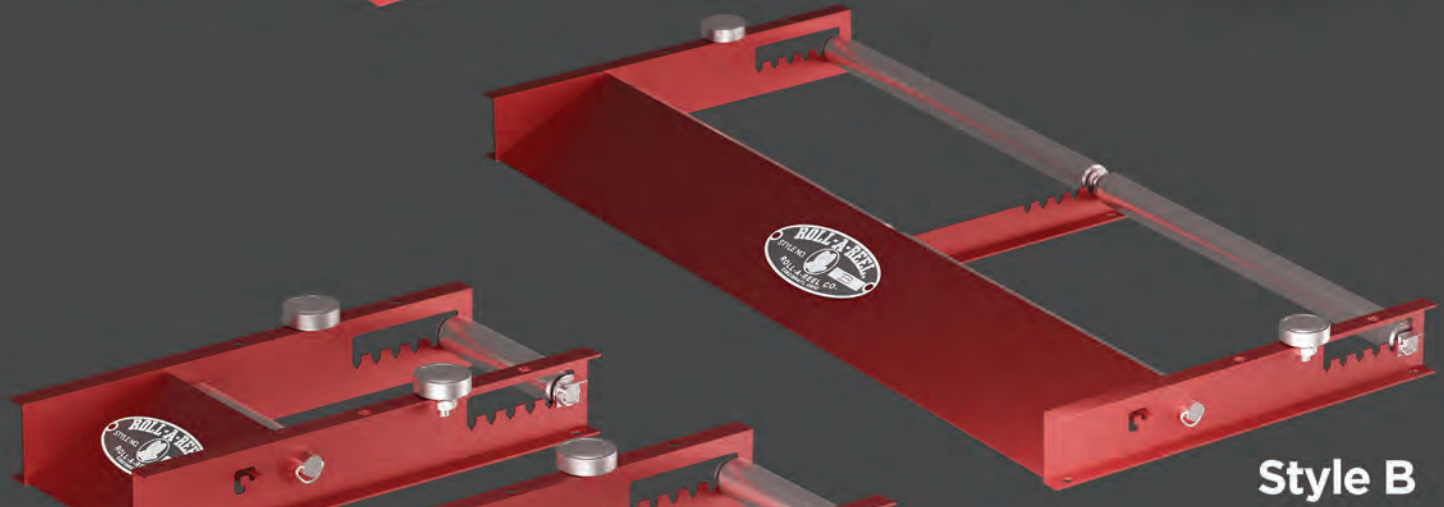

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Eaton (CONTINUED FROM PAGE 20)

4. Choose the correct input plug and facility site voltage

Once the correct wattage for the UPS is determined, contractors should review UPS models with an adequate power rating. In North America, the National Electrical Manufacturers Association's number for the standard wall socket is called a 5-15R. UPS models 1500 VA and below use a matching 5-15P input plug rated at 15 amps. Some sites may have a 5-20R as the standard, which accommodate both 5-15P and 5-20P UPS input plugs. If companies want a larger UPS system and don't have a 20- or 30-amp wall socket, then an electrician can work with them to install the right socket.

In North America, the typical office outlet delivers 120V and convenience is the primary benefit. Users could simply plug in the uninterruptible power supply and they're ready to go. While it's the most convenient method, total requirements may exceed what 's available with 120V outlet. It's also possible to deploy a 120/208V split-phase UPS. Using 208V single-phase power is an even more flexible and energy efficient solution.

5. Make sure the UPS has enough output receptacles

A UPS battery should have enough output receptacles so that it can accommodate all the devices that need to plug into it. If you are short on output receptacles, an option for adding additional outlets is to deploy a flexible power distribution unit (PDU) – which can serve as a short power cord for easy, close mounting to a UPS system. PDUs are available with a variety of output receptacles for connection to a wide range of equipment.

While choosing the right UPS is a process, taking a careful approach will allow electrical contractors to ensure they are deploying the best solution for their customers. Being strategic is especially important considering how IT demands are evolving in our current circumstances – and the uncertainty that always underlies Mother Nature. In a follow-up article, I'll offer a few more tips to consider for the design and organization of UPS solutions to keep critical data processes protected. ❑

Ed Spears is a product marketing manager in Eaton's Critical Power Solutions Division in Raleigh, North Carolina. A 40 year veteran of the power-systems industry, Ed has experience in UPS-systems testing, sales, applications engineering and training—as well as working in power-quality engineering and marketing for telecommunications, data centers, cable television and broadband public networks. He can be reached at EdSpears@Eaton.com, or find more information at Eaton.com.

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ELECTRI-FLEX COMPANY, Roselle, IL, announces product Types ATLA and LAFG have passed additional testing and now conform to Annex A "Heavy-Duty" for CSA Certification. Types ATLA and LAFG join Liquatite® product Types LA, CSA, ZHLA and CBLA, and offer a variety of Heavy-Duty flexible conduits to choose from that are ideal solutions for any application. Only conduit trade sizes ½" through 4" qualify for the (HD) "Heavy-Duty" designation.

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ABOUT ELECTRI-FLEX COMPANY

Electri-Flex Company, a leader in electrical conduit design and manufacture for over 65 years, produces Liquatite®, the most diverse line of liquidtight flexible electrical conduit in the industry. The company offers custom design, engineering, quality assurance and testing capabilities. For more information on Electri-Flex Company, call (630) 529-2920 or (800) 323-6174; fax: (630) 529-0482; e-mail: mktg@electriflex.com; visit: www.electriflex.com; or write: 222 West Central Avenue, Roselle, IL, 60172-1994.

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Vantage and AiSPiRE Lighting Brands Team Up to Form Strategic Alliance

Alliance Pairs Vantage's Customizable Lighting Controls With AiSPiRE's Human-Centric Luminaires to Deliver End-to-End Dynamic Lighting Solution

Legrand's Building Control Systems division recently announced that its Vantage brand has formed a strategic alliance with WAC's AiSPiRE brand. The alliance pairs Vantage's industry-leading, customizable lighting controls with AiSPiRE's human-centric luminaires to create a comprehensive low and high voltage solution.

AiSPiRE's lighting fixtures are tuned to create vibrancy using light from the full visible color spectrum. When combined with the ease of programming provided by Vantage's Design Center software suite, integrators can create customized lighting scenes that provide seamless pairing to AiSPiRE luminaires. With Vantage's InFusion Controller, the end-to-end solution enables control of saturation, hue, intensity, and color temperature via standard DMX protocols. This allows for the rendering of near-perfect natural light tones capable of tracking the sun's light throughout the day — all from the simple button press of a Vantage keypad or an astronomical event timer.

"With human-centric lighting programming readily available, and stunning keypad designs, Vantage provides best-in-class lighting control solutions," said Dave Keller, Vice President of Sales, Vantage. "Paired with AiSPiRE integration-only lighting products, which combine elegant aesthetics with advanced functionality, this alliance makes it easier than ever for integrators to bring dynamic lighting to their clients."

"We are proud to collaborate with Vantage Controls for this strategic alliance, the goal of which is to provide integrators with an end-to-end solution for elevating the human experience through lighting design and interactivity," said Patrick Laidlaw, Director of Business Development -Integration for AiSPiRE Lighting. "Together, our lighting and control tools allow them to paint with light and effortlessly customize a scene — whether it's accenting works of art with downlights or programming garden lights to follow the sun — to bring any space to life."

As part of the Alliance, Vantage and AiSPiRE have also introduced the Brighter Together Dealer Profit Promotion (DPP). Through the DPP, projects featuring both Vantage and AiSPiRE products will receive a 5% discount from both brands when the order is placed. To qualify for the promotion — which runs through July 30 — projects must be registered by dealers or their sales representatives here. ❑

> ***"With human-centric lighting programming readily available, and stunning keypad designs, Vantage provides best-in-class lighting control solutions."***
>
> — Dave Keller
> Vice President of Sales, Vantage

ABOUT AISPIRE

Announcing the next step towards Connected Lighting, WAC has launched AiSPiRE, a new lighting brand designed with custom integration in mind to elevate the human experience of light while connecting on a deeper level in the space. The new AiSPiRE Integration-only brand reveals comprehensive, groundbreaking low voltage and line voltage lighting systems that offer human centric lighting with flexible tuning, control, dimming, and installation ease while reducing the carbon footprint. AiSPiRE's AURORA is an unprecedented upscale offering of luminaires designed for connected living, featuring Full Visible Spectrum color tuning LEDs with color correcting optical technology. AiSPiRE's ATMOSPHERE is a sophisticated line of Natural Tunable White Fixtures for the discerning client as it mimics the natural light of the Sun and offers a full blackbody curve with a CCT range of 2700K to 6500K. Visit www.aispire.com.

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Legrand is the global specialist in electrical and digital building infrastructures. Its comprehensive offering of solutions for use in commercial, industrial, and residential markets makes it a benchmark for customers worldwide. Drawing on an approach that involves all teams and stakeholders, Legrand is pursuing its strategy of profitable and sustainable growth driven by acquisitions and innovation, with a steady flow of new offerings — including connected products stemming from Legrand's global Eliot (Electricity and IoT) program. Legrand is one of the most sustainable companies in the world, as ranked by the Corporate Knights, and is committed to achieving carbon, water, and waste reductions in its operations, deepening its community relationships, and continuously improving the environmental profile of its products. Legrand reported sales of around $7.1 billion (USD) in 2018. Legrand has a strong presence in North and Central America, with a portfolio of well-known market brands and product lines. Legrand is listed on Euronext Paris and is a component stock of indexes including the CAC40. www.legrand.us

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Milwaukee Tool to Expand Corporate Operations into Downtown Milwaukee

Alliance Pairs Vantage's Customizable Lighting Controls With AiSPiRE's Human-Centric Luminaires to Deliver End-to-End Dynamic Lighting Solution

Milwaukee Tool is proud to announce the expansion of their corporate operations into downtown Milwaukee, Wis. The company's current global headquarters in Brookfield, Wis., will remain the central location for the company's corporate operations. This new expansion will provide increased space to accommodate the company's rapid growth. Anticipated to open in October, this building will house 1,200 employees within the next 3 years.

"Over the past ten years we've grown at an incredible rate, not just across the country and the world, but also at our global headquarters in Wisconsin. By extending our corporate presence into downtown Milwaukee, we are poised for continued growth. As one of the largest employers in Southeastern Wisconsin, we're thrilled to expand our presence in the city, as we continue to attract, retain, and recruit from a diverse pool of local talent," said Steve Richman, Milwaukee Tool Group President.

Milwaukee will invest more than $30 million to purchase and renovate a vacant 333,000-square-foot building in downtown Milwaukee. This building will act as an extension of the company's global headquarters in Brookfield. Milwaukee Tool's initial plans include housing at least 1,210 employees at this location within the next 3 years; however, the company has the option to expand the office space by adding 150,000-square-feet, for up to an additional 790 employees.

While U.S. manufacturing and distribution are an integral part of Milwaukee Tool's global footprint, the disruptive innovation for the trades all starts at the Global Headquarters in Southeastern Wisconsin. Over the last decade, the company redeveloped 190,000-square-feet of space in Brookfield to accommodate research and development, product development, proto-typing, packaging design, marketing, sales, training facilities, and administrative offices. In 2017, Milwaukee Tool completed construction and took occupancy of a new 200,000-square-foot, four-story office building on the same campus, and took occupancy of an additional 116,300-square-foot building in January 2020. With a recent announcement of a new campus in Menomonee Falls, a West Bend-based manufacturing plant, and this new expansion into downtown Milwaukee, the company is positioned to stay in the heart of Wisconsin long-term.

By the end of 2021, the company will have over 3,100 employees located in Wisconsin. ❑

MORE ABOUT MILWAUKEE'S GROWTH & U.S. INVESTMENTS

Milwaukee has designed, engineered, and manufactured products in the United States since 1924 and is dedicated to driving growth and creating jobs in the U.S. "Throughout the last decade, Milwaukee Tool has experienced rapid growth across the globe, with sales growing more than 20% each year. Amid this growth, we're going to continue aggressively investing in our product development, and diversifying our manufacturing base through expansion projects in the United States," said Joe Galli, Chief Executive Officer at Techtronic Industries. In the last five years, Milwaukee has invested $368 million in domestic expansion projects and now employs more than 5,900 people in the U.S. Currently, the company has manufacturing, distribution, and operations presences around the nation in Greenwood, Grenada, Olive Branch, and Jackson, MS, as well as in Brookfield, Menomonee Falls, Mukwonago, and Sun Prairie, WI, and Greenwood, IN.

Womack Electric Supply President, Burke Herring, Announces Retirement

Womack Electric Supply Company has announced that Burke Herring, President of Womack, will be retiring after nearly four decades of service with the company.

"Over the course of his 37 years with Womack Electric Supply, Burke's unwavering commitment to our employees, customers, and supplier partners speaks for itself," said Scott Teerlinck, President and CEO of Crescent Electric Supply Company. "He is a respected veteran, who leaves behind a legacy of strong leadership, integrity and dedication that is unparalleled. On behalf of the entire Crescent organization, I want to personally thank him for all he has done for us and for the industry, and we certainly wish him, his wife Ginny, and his entire family the best during his retirement."

Burke began his career at Womack back in November of 1983, and has played an integral part in the company's growth during that time. In addition to the success he has achieved while leading the Womack team, Burke has also demonstrated a strong commitment to the electrical industry by serving on numerous committees and advisory boards, as well as focus groups within other market organizations.

"I want to express my sincere gratitude to our team at Womack and the Crescent organization, as it has been an honor to serve our company and this industry all of these years," said Burke Herring, President of Womack Electric Supply. "I value not just the partnerships we've made over the past four decades, but more importantly, the friendships, and I certainly look forward to continuing those in retirement."

Al Stewart, who has served as Greensboro District Manager for the past 12 years, will take over as Area Vice President/President of Womack Electric Supply. Al and Burke will be working in conjunction with the Crescent executive management team to ensure a smooth transition. ❑

Burke Herring

ABOUT WOMACK ELECTRIC SUPPLY COMPANY

Womack Electric Supply is part of Crescent Electric Supply Company, one of the largest electrical supply distributors in the U.S. The family-owned business has served contractors, institutional, and industrial customers with a broad line of electrical, industrial, and datacomm products from 135+ branch locations in 26 states for over a century. In addition to the Crescent Electric brand, customers are served by BA Supply in Missouri, Interstate Electric Supply in Idaho, Mesco Electrical Supply in Ohio, Womack Electric Supply in Virginia and North Carolina, Stoneway Electric Supply in Washington, Oregon, and Idaho and National Electric Supply in New Mexico. The Company received the Best of the Best Overall Distributor Marketing Award for 2018 from the National Association of Electrical Distributors (NAED). For more information, visit www.cesco.com.

WOMACK ELECTRIC SUPPLY "What Customer Service Is About!"

Electri-Flex Announces New Regional Sales Manager

ELECTRI-FLEX COMPANY, Roselle, IL, has selected Nick Giardini for the role of Regional Sales Manager. Nick has over 10 years' experience in the Electrical Distribution Channel, working many roles at Anixter/Wesco, such as buyer, product manager, marketing/sales, and category management. Most recently he was the Director of Category Management, where he managed a team in the electronic wire and cable category. He previously graduated with a BA Degree from the University of Iowa.

Nick will serve as Regional Sales Manager, covering the central region of the U.S. In this role, he will work with a network of top manufacturer representatives to sell and market Liquatite® products, while also maintaining distributor relationships, and ensuring customer expectations are exceeded. "Nick is a dynamic addition to our sales team," said Brock Klein, National Sales Manager. "Nick brings with him a wealth of distribution experience and new market knowledge that will help Electri-Flex continue our growth strategies and bolster our market leadership in the flexible conduit category."

To meet the entire Electri-Flex Executive, Sales, and Customer Service teams, visit https://www.electriflex.com/about/meet-the-team/.

Nick Giardini

Birchwood Lighting Announces Launch of RGBW Capabilities in Kelsey and Jake 325 Luminaires

New capabilities providing a true RGBW solution for linear lighting

Birchwood Lighting, a Leviton company, announced the launch of RGBW technology in the Kelsey and Jake 3.25" linear luminaires. Ideal for applications requiring both static white and color changing capabilities, the new RGBW transforms spaces with customized tones while delivering quality illumination.

"Adding RGBW to our popular Kelsey and Jake products was a no brainer for us," said Adam Zepeda, director of product management and marketing, Birchwood Lighting. "Compared to standard RGB, our RGBW adds a separate white LED to provide exceptional white color and provides our customers more options to customize their space."

Utilizing DMXR and DALI dynamic controls, RGBW produces a wide range of colors from saturated, sharp RGB tones to soft pastel colors. Kelsey and Jake linear luminaires with RGBW provide a pop of color to any office, retail, hospitality, residential, institutional, corridor applications or stairwell installations.

"We are excited to see how our customers leverage the new RGBW capability to add dynamic color and take their spaces to the next level," added Zepeda.

Incredibly versatile and efficient, RGBW is available in surface, recessed, and direct or indirect suspended mountings. Additional features include seven lens options, 90 CRI at 4000K, and up to 900 lm/ft.

For more information, visit www.birchwoodlighting.com

Emerson Uninterrupted Power Supply Maximizes Machine Availability and Minimizes Unplanned Disruptions in Harsh, High Temperature Industrial Environments

SolaHD SDU AC-B offers optional network communications for advanced control and diagnostics

As more power-sensitive devices are deployed in automated industrial processes, the need for reliable battery backup power is growing exponentially, yet serious challenges remain in the design of traditional Uninterrupted Power Supplies (UPS). Most UPS are simply too large or heat-sensitive to be installed in control cabinets or to be integrated into machines, and virtually all lack network communications required for remote diagnostics.

To address these challenges, Emerson today launched its SolaHD™ SDU AC-B UPS that combines a compact footprint with a wide operation temperature range, plus offers optional network communications supporting all major industrial protocols. Built rugged for harsh and hazardous locations, the SolaHD SDU AC-B supports organizations by bridging power failures during outages to allow for safe shutdowns of machinery, and by mitigating power quality issues that adversely affect critical loads, therefore minimizing work interruptions, long restart cycles and the loss of data at the point of use.

As a current Emerson customer expressed "We have a hard time selling when we can't keep our datacenter up all the time. One outage is a multi-million-dollar loss along with damage to our Brand. The SDU B-Series avoids these significant losses while reducing our total cost of ownership through advanced battery health checks and user replaceable batteries "

For information, visit www.solahd.com

Klein Tools® Pairs Two Essential Electrical Testers in Convenient Value Kit

Klein Tools, for professionals since 1857, introduces the AC/DC Voltage and Receptacle Electrical Tester Kit (Cat. No. ET45VP) for electricians, technicians and more to quickly diagnose potential electrical problems.

AC/DC Voltage Tester, ET45

- Tests AC voltages from 24V to 240V AC at four levels
- Tests DC voltages from 32V to 330V at four levels
- Built-in test lead holder on back of tester holds the leads in one of two positions; one so that they are spaced correctly to test tamper-resistant US-style outlets and the other for convenient storage of the test leads
- Batteries not required; tester is powered by applied voltages
- Safety Rating: CATIII 350V, Class 2, Double insulation
- Pocket clip secures tester to pocket
- Ingress protection IP44 dust and water resistant
- Drop protection of 9.9' (3 m)

GFCI Outlet Tester, RT210

- GFCI Tester detects the most common wiring problems in standard and GFCI receptacles
- Works on GFCI outlets and confirms operation of the ground fault protective device
- A convenient chart on the tester helps determine wiring condition in outlet, based on LED lights results
- Conditions indicated: open ground, reverse polarity, open hot, open neutral, hot/ground reversed
- Nominal Voltage: 110/125V AC at 50/60Hz in 3-wire outlet
- Drop protection of 6.6' (2 m)

"Both of these testers are tools that electricians use on a daily basis," said Sabrina Kalsi, product manager at Klein Tools. "Pairing them together makes sense for the purpose of diagnosing potential electrical problems and allows us to feature two of our best-selling testers in a convenient value kit."

For more information, visit www.kleintools.com

Convenient Temporary Lighting Anywhere

Topaz Introduces New LED Temporary Lighting and Tripod

Topaz introduces their 120/277V dual-voltage LED Temporary High Bay Fixtures in 100 and 150W models and compatible tripod for convenient use anywhere.

Damp location rated, and vibration, shock and impact-resistant, these temporary lighting fixtures are suitable for use in new construction and renovation applications. Lightweight temporary high bay fixtures come ready-to-use with 6-foot power cord, 20" safety cable, and corrosion resistant heavy-duty safety cage.

Michael Balsamo, Vice President of Product Management said, "Topaz understands the challenges of illuminating construction sites. As we developed these fixtures, we wanted to create a product that installs easily. The threaded hub allows for easy hanging with the eyebolt ring or pendant mount, or use anywhere temporary lighting is needed with the sturdy and durable tripod."

Topaz is a leading manufacturer of electrical fittings, traditional lighting, ballasts, LED fixtures and lamps.

For more information, visit www.topaz-usa.com

KOHLER Unveils Electrically Operated Transfer Switches

Line of electrically operated bypass-isolation transfer switches features advanced, single-touch controls

KOHLER Power Systems, a leader in energy solutions and part of the Kohler Co. Power Group, proudly announces a new line of electrically operated bypass-isolation transfer switches that are designed to interface with KOHLER generators and paralleling switchgear. The new line of electrically operated bypass-isolation transfer switches, available as standard (KAS) and programmed (KAP) transition configurations, features advanced, single-touch controls allowing users to transfer critical loads between power sources.

"This advanced line of electrically operated transfer switches offers touch button bypass control and fits seamlessly within our total system integration package," said Jennifer Schnelle, senior market analyst, KOHLER Power Systems. "Bypass-isolation transfer switches are commonly used in hospitals, data centers, and other critical applications where interruption of power for service or maintenance can't be tolerated."

On the main front panel of the transfer switch is a series of status indicators and controls. Bypass and isolation status features include high visibility alarm and operating mode indicators, as well as a simple one-line diagram indicating real-time switch and bypass status to minimize potential human errors. Single-touch bypass controls ensure smooth and easy transfer of loads, and LED lights indicate permitted and restricted operations.

Bypass isolation is used to transfer power to the manual switch to allow servicing of the ATS while maintaining power to the facility. When the primary automatic transfer switch is in test or isolate position, the manual transfer switch is powering the loads. The new line also features single-button bypass operation and manual engine start controls, and a handle to manually connect and isolate the transfer switch for inspection, testing or service. In addition, as a safeguard it provides emergency transfer capability if the primary switch mechanism is removed or disabled.

The electrically operated transfer switches are available with the KOHLER-designed Decision-Maker® MPAC 1500 controller that offers complete programming and viewing capability at the door using a keypad and LCD display. This controller offers a myriad of features, including communications, programmable inputs and outputs, load management and other advanced functions.

For information, visit kohlerpower.com

Universal Lighting Technologies Launches EVERLINE® LED Troffer Retrofit Kit for Faster Installation

Universal Lighting Technologies, a leading manufacturer of lighting fixtures and intelligent lighting control systems, has launched its EVERLINE® LED Troffer Retrofit Kit (TRK). The kit expands the EVERLINE family of LED retrofit solutions, providing a faster installation process for retrofit installers and contractors.

The LED Troffer Retrofit Kit (TRK) delivers a quick, cost-effective way for commercial environments to upgrade their fluorescent prismatic and parabolic troffers to LED. To provide superior flexibility, the TRK is available in two configuration options to fit a variety of needs, including a 2x2 with three lumen options, and a 2x4 with five lumen options. Options for the kit include Intelligent Fixture™ Sensor, Intelligent Fixture™ Controller, and Emergency Battery Backup Pack.

The TRK uses a unique suspension system with cable grips for quick installation, saving facility managers both time and money. Optimized for a variety of lighting environments, the product is designed to project an even illumination without pixilation.

"The Troffer Retrofit Kit is a great option for upgrading fluorescent troffers to LED. In addition to super-fast installation, facility managers can reap the cost savings benefits of high efficiency and the peace of mind that comes with industry-leading reliability," said Greg Bennorth, LED product director at Universal Lighting Technologies. "These kits are not only long-lasting but scalable -- working seamlessly to fit the current and future needs of our customers with controllable lighting options using our Intelligent Fixture Sensors and Controllers."

The TRK features universal input of 120-277VAC, 0-10V Dimming and excellent lumen maintenance (L85>60K hours). 3500, 4,000 and 5,000 CCT options are available. With "matched" EVERLINE LED Modules and Drivers to ensure current from driver matches output to the module, the kits are UL-Qualified and DesignLights Consortium® QPL listed with a five-year warranty.

For information, visit UNVLT.com

Milwaukee® Expands Electrical Hand Tool Solutions with the New 7in1 Conduit Reaming Screwdriver

Milwaukee Tool is changing the game once again with the introduction of the new 7in1 Conduit Reaming Screwdriver. The new screwdriver provides electricians with reaming capability for ½" – 1" conduit and features a Milwaukee® ECX™ bit for electrical fasteners.

The new 7in1 screwdriver comes with four bits and two nut drivers to deliver the most versatile conduit reamer on the market and can be used to fasten specialty screws commonly found in electrical applications. For added functionality, a swiveling lanyard hole provides a tether-ready connection point and a cushion grip with an anti-peel design delivers all-day comfort. Additionally, replacement conduit reamer blades and multi-driver bits are available.

Backed by a limited lifetime warranty, this new conduit reaming screwdriver confirms Milwaukee's commitment to delivering innovative solutions that will increase productivity for electricians.

Quick Reference

7in1 Conduit Reaming Screwdriver w/ECX™	48-22-2870 - $39.99
7in1 Conduit Reamer Replacement Blade Set	48-22-2876 - $9.99
4pc Replacement Bits	48-22-2111 - $9.99

For more information, visit www.milwaukeetool.com

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