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Electrical Business

THE AUTHORITATIVE VOICE OF CANADA'S ELECTRICAL INDUSTRY

EVOLUTION of a star

See page 5.

Also in this issue...

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Electrical Business

THE AUTHORITATIVE VOICE OF CANADA'S ELECTRICAL INDUSTRY

March 2009 • Volume 45 • Issue 3

ELECTRICAL BUSINESS is the magazine of the Canadian electrical industry. It reports on the news and publishes articles in a manner that is informative and constructive.

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CCAB BPA WORLDWIDE BUSINESS

Take time to evaluate your business

It's tough finding good things to say when things are looking pretty gloomy. Despite various world governments' efforts to provide assurances, we can't help but feel the world is in the toilet. Still, the latest news I heard was that some analysts are predicting the recession will be over this year, with recovery getting into full swing next year.

For those of you who have had to lay off some of your workforce, this should be encouraging, but if you're like me—mildly pessimistic—then you're taking a wait-and-see stance.

Meantime, until we do get back into the swing of things (and we will... we always do), what are you doing to improve your business? What efforts are you putting in toward reevaluating your current business model? What things continue to work well for your business, and what things do not or will not?

I ask these questions because now might be an excellent time for reflection and establishing goals.

It's something every business, no matter how large or small, should do regularly—both in anticipation of, and to fight through, times like these. Ideally, you come out stronger and better for it.

Take Electrical Business magazine, for example. In just a few years, it will be celebrating its 50th anniversary. Everyone continues consuming electricity, meaning there is always a need for electrical professionals, and EB remains committed to serving those professionals for another 50 years and beyond. But should we remain strictly a printed magazine in today's information age?

The answer, arrived at years ago, is "No". We need to expand our offering to be able to serve different reader styles and needs. The first thing was a website. Next came "E-Line: Your Industry News Broadcast", which is our free monthly e-newsletter. This was followed by The BlueBook, the buyers' guide for all things electrical in Canada. Then came L'industrie électrique, our French-language electrical publication for Quebec. This was followed by NETcomm Conferences (done through our sister property, NETcomm), which focus on low-voltage communications technologies.

And, debuting this summer at the S&D Conference, Distribution & Supply magazine: a new publication serving our professionals in the electrical channel. Add to that the fact that we've also branched into custom publishing and multimedia/video production, and you can see that—while we continue to deliver our core product (the magazine you hold in your hand)—we've added numerous other "services", if you will, to our product offering.

Now take this admittedly simple example and compare it to your own business. Besides focusing on your core, what else are you doing to ensure you're meeting the changing needs of your customers? Or, what are you doing to ensure you can do your core business better than your competitor? Are you attending conferences or classes to upgrade your skills? Are you pursuing additional certifications?

Take time to evaluate both your business and position in the market so that when we come out of this recession, your business is better for it and better able to weather the next one. EB

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Protecting mission-critical electronics in the industrial environment

Today's engineers are designing increasingly sophisticated control systems involving increasingly sensitive electronic equipment; when mixed with the inherently poor power environment of an industrial facility and aging power generation and distribution facilities, a variety of power- and electrical noise-based problems inevitably result. Understanding these problems, as well as some of their causes and solutions, can help ensure the design of reliable and cost-effective mission-critical electronic systems.

FEATURES

NOVA SCOTIA ELECTRICAL CONTRACTORS ASSOCIATION

DEPARTMENTS

Osram Sylvania 'The Next Icon LED' lighting challenge

Osram Sylvania has issued a challenge to Canadian manufacturers of lighting fixtures: the search is on for viable designs using Osram LED components and technology. "The Next Icon" Osram LED Design Challenge aims to further Canadian innovation and create awareness of the environmental and economic advantages of LED applications.

The company sees an opportunity to develop the presence of widely recognizable LED-based fixtures. "This challenge is a call for lighting designs we can celebrate and then help bring to market," says Steven Duff, Osram Sylvania's director, Special Lighting Markets. "We are actively seeking partners with innovative fixture designs that we can support and make a reality."

The entries will be highlighted at Lightpoint Canada, Osram's lighting educational facility. The fixtures will also be displayed, with winners being chosen by popular vote, at the Light Canada Expo at the IIDEX design show in September.

Osram Sylvania's commitment to all designs also includes promotion in trade journals and prominence in the company's Canadian LED Fixture Guide.

"We're serious about creating LED solutions and then working with manufacturers to help get them into the hands of end users," said Duff. Entries designed for illumination applications may be for direct or indirect, backlit or spot, ambient or task, indoor or outdoor applications.

The design challenge's moniker, "The Next Icon" points to the open opportunity to popularize LED lighting. "We are working to help create design icons using LEDs," said Duff. "So between rising energy costs, maintenance expenses, regulatory changes, designer chic and emerging LED technology, the time is right for stand-out designs that are imaginative and work well."

Seacliff completes Canem West acquisition

Seacliff Construction Corp. has completed its acquisition of Canem West Services Inc. and Canem West Operations Inc. (Canem West), an independently owned electrical and data communications contractor based in Vancouver, B.C. Seacliff says the $8-million acquisition strengthens the competitive position of Canem Systems (Canem), its existing electrical and data communications contracting arm.

"This acquisition is highly complementary to our existing business," said Bill Crarer, Seacliff's CEO. "Together, Canem and Canem West will be able to deliver a broader range of electrical and data communication services to more customers in more locations across B.C. and Alberta."

The successful completion of the acquisition more than doubles Canem's Vancouver team, with the addition of about 75 skilled field technicians and 11 office staff. As a result, Canem is now positioned to bid on much larger contracts, including public-private-partnerships (P3s). In the near term, Canem West will operate as a separate division of Canem, with full integration expected by late this year.

Canem West was incorporated as a fully independent business in 1997 following a strategic reorganization at Canem Systems. Since then, it has become a provider of next-generation electrical and data communication solutions to a blue-chip institutional and commercial client base. Long-term customers include BC Hydro, the Workers' Compensation Board of B.C. (WCB), the Insurance Corporation of British Columbia (ICBC) and Bentall LP.

Seacliff intends to continue growing its business through the strategic acquisition of other general and electrical contracting companies.

"With no debt and over $100 million cash on our balance sheet, Seacliff has significant resources to deploy," said Bill Crarer, adding the company is currently evaluating a number of acquisition prospects.

Seacliff's business is conducted through two business units: Dominion Construction, a general contractor, and Canem Systems, an electrical contractor.

Fluke Corporation acquires Hawk IR International

Fluke Corp., the global player in portable electronic test and measurement technology, has acquired Hawk IR International Ltd. of North Yorkshire, U.K. The latter will continue to operate as Hawk IR International as part of the Fluke Electronics Industrial Division.

The acquisition represents a significant global opportunity for Hawk IR International, says Fluke, adding that under Fluke ownership, Hawk IR will have access to resources, business systems and channels to market that will expand its ability to deliver products that improve the safety and efficiency of thermal imaging.

"We are extremely proud to be part of the Fluke family," said Tony Holliday, Hawk's managing director. "As the world leader in thermal imaging for industrial applications, Fluke Thermography gels perfectly with our arc-resistant infrared sightglass products. With a global network of electrical experts and distributors, the combination will bring safe and efficient electrical thermography to users worldwide."

"Bringing Hawk IR into the Fluke family provides benefits to both organizations, as well as to our channel partners and customers," said Fluke Industrial president Ken Konopa. "Customers of both Fluke and Hawk IR benefit from a coordinated offering of thermal imagers and peripheral equipment, as well as being able to tap a rich base of knowledge."

Caterpillar extends 0% APR financing program on compact gensets

Caterpillar Inc. is offering 0% APR financing on all North American compact generator sets 600ekW (equivalent kilowatt) and smaller to help customers meet their needs for standby and prime power applications while benefiting from below-market interest rates. The deal is available only through Caterpillar dealers.

Extended through its subsidiary, Caterpillar Financial, the financing program is offered over a 12-month

repayment period on any qualifying purchases made before December 31, 2009, and shipments scheduled prior to May 31, 2010. Promotional rates will apply on all new Caterpillar and Olympian diesel or gas gensets up through and including 600ekW, as well as rental XQ packages and Caterpillar-branded ATS, UPS and switchgear products (including PointGuard systems).

The program encompasses installment sale contracts and full payout finance leases. Caterpillar's 0% APR financing offer is based on price and applicable sales tax. An additional 10% of the total purchase can be used for customer installation and other soft costs. Low financing rates are also available to qualified customers purchasing equipment on longer terms.

All rates are subject to change on a quarterly basis and are based on approved customer credit. Cat Power Finance quotations will remain valid for 30 days beyond the date of the quote.

IEEE commemorates 125 years

IEEE
Celebrating 125 Years
of Engineering the Future

IEEE, the self-proclaimed largest technical professional society in the world, is commemorating its 125th anniversary this year with a variety of activities revolving around the theme of "Celebrating 125 Years of Engineering the Future".

Major anniversary events include the first IEEE Presidents' Change the World Competition for college and university students worldwide; a global media roundtable and webcast addressing emerging, world-changing technologies; a series of celebrations in major world cities throughout the year; and IEEE Engineering the Future Day on May 13 (the actual anniversary date).

IEEE traces its roots to the founding of the American Institute of Electrical Engineers by early industry giants such as Thomas Alva Edison and Alexander Graham Bell. Today's global IEEE has become a "trusted source for fostering technological innovation and excellence for the benefit of humanity as well as the profession".

To ensure that IEEE members, media, members of the technology industry and the general public have a one-stop resource for everything related to the anniversary, IEEE launched an anniversary website to provide up-to-date information on anniversary activities.

The latest information is available on the new anniversary website, www.ieee125.org.

Investment in non-residential building construction, Q4 2008

StatsCan reports non-residential construction reached $11 billion in current dollars in the fourth quarter of 2008, up 1.7% from Q3. In 2002 constant dollars, however, investment was down 1.2% from the third quarter. The increase in current dollars was mainly the result of rises in institutional and commercial building construction.

Investors spent $6.8 billion on commercial projects, up 1.5% from Q3, while investment rose 3.7% to $2.8 billion in the institutional component. Spending in the industrial component declined 1% to $1.4 billion.

All provinces and two territories recorded advances in the fourth quarter. The fastest increases occurred in Ontario, Quebec, Newfoundland & Labrador and Alberta—mainly the result of higher spending on institutional and commercial buildings.

Investment rose in 27 of 34 census metropolitan areas. The largest increase occurred in Edmonton, where significant increases in the institutional and commercial components resulted in a 7% advance to $614 million in the fourth quarter.

After rising for seven consecutive quarters, investment in Toronto recorded a decline, the result of decreases in the commercial and industrial components.

Commercial component

On a quarterly basis, investment in commercial buildings increased in the fourth quarter, mainly as a result of higher spending on the construction of office buildings in British Columbia and storage and recreational buildings in Quebec.

Overall, seven provinces and three territories recorded increases in commercial investment. The largest contributors (in dollars) were British Columbia (+2.8% to $928 million), Quebec (+2.0% to $1.1 billion), Manitoba (+16.5% to $137 million) and Newfoundland & Labrador (+54.1% to $49 million).

In contrast, Ontario, Nova Scotia and Saskatchewan recorded declines resulting from lower spending in several commercial building categories.

Institutional component

Spending in the institutional component advanced for a fourth consecutive quarter, mainly as a result of higher investment in educational and health care buildings.

Q4 investment increases were shared by six provinces and two territories. Ontario recorded the largest gain in dollars, followed by Alberta, as a result of significant spending on the construction of educational and health care buildings.

In contrast, Manitoba posted the largest reduction in dollars. This was the result of the completion of institutional construction projects started at the end of 2006 and 2007.

Industrial component

Investment in industrial building construction declined for the second consecutive quarter. Increases in spending on several industrial building categories in six provinces were more than offset by declines that occurred mainly in the construction of manufacturing plants in Ontario, Alberta and British Columbia.

Even so, the $1.4-billion Q4 total for industrial construction was 3% higher than the average quarterly level recorded in 2007. This increase was largely attributable to a rise in construction activity on utilities and primary industry buildings.

WAGO launches Innovation in Automation 2009 Tours

This year, WAGO Corp.'s Innovation in Automation Tour (IIAT) will spend 40 weeks touring Canada and the States presenting its automation, interconnect and electrical interface product lines.

Designed as mobile tradeshows, the IIAT vehicles are equipped with product panels and pick-up-and-play displays featuring the company's latest products. Visits are managed by WAGO product specialists to address specific application needs and offer interactive demos, free product samples and literature.

Visit EB's Calendar page online at www.ebmag.com to learn more.

NAED upgrades EPEC Program

The National Association of Electrical Distributors (NAED) announced a series of upgrades to its Electrical Products Education Course. EPEC integrates the full range of products a distributor sells with a unique systems approach. It not only provides information about individual products and their applications, but shows how each is interrelated with other products in electrical systems. Although EPEC is a self-study course, it provides the added benefit of ongoing personal feedback from industry experts as students proceed through the modules.

Upgrades to the Bronze level are complete, and Silver and Gold updates will follow in Spring and Summer. Improvements include:

- New products and technologies, such as LEDs, CFLs and personal protective equipment.
- Content updated to NEC 2008 and the addition of CE Code references.
- Increased emphasis on add-on sales in each chapter.
- Streamlined modules for faster completion.
- Capstone project added for each level.

New resources are also available, including updated EPEC Web pages (www.naed.org/EPEC) and an online student glossary. A bridge module is available for current students interested in transitioning to the new EPEC program. Members with previous unused EPEC Bronze modules may trade up and save 50% on new modules. The Bronze trade-up offer expires March 31. E-mail customerservice@naed.org for full details.

IEEE approves guide for specs of high-voltage circuit breakers

IEEE has approved a new power switchgear standard, IEEE C37.12, "Guide for Specifications of High-Voltage Circuit Breakers (over 1000 Volts)". The specs in this new standard apply to all indoor and outdoor types of AC high-voltage circuit breakers rated above 1000 volts.

IEEE has also approved IEEE C37.04b, "IEEE Standard for Rating Structure for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis - Amendment to Change the Description of Transient Recovery Voltage for Harmonization with IEC 62271-100".

It has also approved a revision of IEEE C37.13, "Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures", to modify all dimensional information to provide metric dimensions to gain global acceptance of this standard.

The group has revised IEEE C37.27, "Application Guide for Low-Voltage AC Power Circuit Breakers Applied with Separately Mounted Current-Limiting Fuses". Previously titled "Low-Voltage AC Non-integrally Fused Power Circuit Breakers (Using Separately Mounted Current-Limiting Fuses)", the new standard also slightly revises the scope of the document.

Finally, IEEE has approved work to begin on a new standard amendment, PC37.13.1a, "IEEE Standard for Definite Purpose Switching Devices for Use in Metal-Enclosed Low-Voltage Power Circuit Breaker Switchgear - Amendment: Revise Short-Circuit Rating and Test Requirement". This amendment will revise short-circuit rating clause 5.5 and add tests requirements to short-circuit tests clause 8.1.8.

IEEE launches standards projects for shipboard electrical installations

IEEE has begun work on developing six new recommended practice standards for shipboard electrical installations. They will build upon, and are intended to be used in conjunction with, IEEE 45, "IEEE Recommended Practice for Electrical Installations on Shipboard".

The standards projects will address new shipboard technologies and provide a consensus of recommended practices for design in marine electrical engineering as applied specifically to ships, shipboard systems and equipment.

The new standards projects are:

- IEEE P45.1, Recommended Practice for Electrical Installations on Shipboard - Design
- IEEE P45.2, Recommended Practice for Electrical Installations on Shipboard - Controls and Automation
- IEEE P45.3, Recommended Practice for Electrical Installations on Shipboard - Systems Integration
- IEEE P45.4, Recommended Practice for Electrical Installations on Shipboard - Marine Sectors and Mission Systems
- IEEE P45.5, Recommended Practice for Electrical Installations on Shipboard - Safety Considerations
- IEEE P45.6, Recommended Practice for Electrical Installations on Shipboard - Electrical Testing

The standards are being developed by the IEEE Working Group for Electrical Installations on Shipboards, and sponsored by the IEEE Industry Applications Society's Petroleum & Chemical Industry Committee.

Cooper hosts grand opening at Industrial Technology Center

Cooper Industries recently officially opened the doors to its new Houston, Texas-based technology and training facility for a customer grand opening celebration. Cooper CEO Kirk Hachigian and his staff greeted the more than 250 people in attendance for this half-day event, which featured comprehensive tours of the new facility and an opportunity to discuss training needs with the company's executives and representatives of each division. Attendees included a variety of end users, distributors and EPC professionals from the electrical, oil and gas and petrochemical market segments.

The 35,000-sf Cooper Technology Center features an auditorium, conference room and multiple training rooms. It also boasts a full-scale mock refinery, wastewater treatment facility and electrical distribution grid, which includes over 250 of Cooper's industrial offerings, installed as they would appear in an operational setting.

The industrial-focused training facility was designed to help facilitate industry-specific education and provide hands-on demonstration for an array of company products and solutions.

"During this time when budgets are stretched, this facility offers a unique venue for us to provide our customers with the education and training that is vital to their businesses," said Hachigian. "It also allows us to partner with distributors, EPC professionals and end users alike to discuss the various opportunities that exist with emerging technologies and products relating to global infrastructure, energy demands and energy efficiency, and facility safety."

NETA acceptance testing specs 2009 now ANSI standard

The American National Standards Institute (ANSI) approved the InterNational Electrical Testing Association's (NETA's) Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems, 2009 edition (ANSI/NETA ATS-2009).

Available for purchase as a bound manual, CD-ROM or electronic download, the ANSI/NETA ATS-2009 is used when specifying and performing necessary tests to ensure that electrical systems and apparatus, not only meet project specifications, but that the manufacturer of the equipment supplied a product that will perform safely and reliably for many years to come.

"Anyone involved in the energization of electrical equipment should consider this document a must-have," said Al Peterson, president of Utility Service Corp.

NETA is an accredited standards developer for ANSI, and defines the standards by which electrical equipment is deemed safe and reliable. NETA-certified technicians conduct the tests that ensure this equipment meets the association's stringent specifications. NETA is also a sponsor of the IEEE/NFPA Arc Flash Research Project.

Next Generation Power and Tomcar join forces

Next Generation Power has partnered with Tomcar to offer heavy-duty, safe, off-road service vehicles equipped with Next Gen diesel generators, compressors or combo generator/welder compressors.

"Many people who employ their Tomcars as service vehicles also require auxiliary power," said Next Gen president Gino Kennedy. "We simply outfit the vehicles to customers' specifications with our trusted generators and combination units. Then, they can fill tires, weld or power lights, tools and other equipment when they're out in hard-to-reach areas, repairing construction machinery or rescuing stranded outdoor enthusiasts."

Have seminar, won't travel

I would just like to initially comment that I thoroughly enjoy all aspects for your periodical, Electrical Business. I look forward to its arrival. I find most of the sections informative and helpful like the "Code File" at the end. I also enjoy the "hunt" for the answers. The contests are always fun as well. My biggest problem is finding the time to read them!

I just finished reading your article, "Awareness the key to staying alive" (EB January 2009). It was informative, and no doubt you had a ton of material to work through. The common idea that I got from the article was awareness... making all those involved in the industry aware. I just hope that the powers that be would make all the seminars more accessible for the entire country.

Most of the time they are in the larger Canadian cities. This often involves travelling, overnight stays, meals, etc. This eliminates the majority of small businesses. I am not suggesting that they travel to every community in the country, but I suggest that they cover more territory than they do now. Hopefully, this will allow more people to attend with smaller expense amounts and travel.

For instance, I would like to attend something on CSA Z462, but it would involve the cost of travel, accommodations, etc. The Electrical Safety Authority (ESA) offers some things in our community, but not to the extent of the larger centres. Generally, all the seminars that I have attended are received well, so I think that other seminars would also be received well... especially when the message is important and/or part of CSA or ESA.

Laurie John Hayton
Digital Engineering Inc.
Thunder Bay, Ont.

Must continue to get the word out

I recently received a copy of your January 2009 publication, and read the electrical safety round table article. Appreciate you leveraging this topic in your magazine, as we need to get the word out on Z462 and how it can help employers and employees to energized electrical safer.

I am the first past vice-chair of CSA Z462. With my current business partner, John Hodson, I created a voluntary Arc Flash Hazard Committee in Western Canada back in 2004-2005—before CSA revealed it had signed an MOU with NFPA and had selected 70E as the first standard to harmonize. I am still an Associate Member and Executive Committee member on Z462.

In 2007 I left my employer to form ESPS, an independent engineering company that consults in electrical safety. Please visit www.esps.ca, where we are trying to create a free resource for Canada; there are tools for employers and employees to better understand electrical safety and CSA Z462.

Terry Becker, P.Eng.
ESPS Electrical Safety Program Solutions Inc.
Calgary, Alta.

Building permits January 2009

Contractors took out $4.4 billion in building permits in January, StatsCan reports, down 4.6% from December. Increases in both institutional and commercial permits were not enough to offset the decreases in the value of residential intentions in five provinces.

In the residential sector, the value of permits fell 17.5% to $2.2 billion, with declines in both multi- and single-family permits.

The value of permits in the non-residential sector increased 12.2% to $2.3 billion, due mainly to higher construction intentions for institutional and commercial permits in Ontario. The total value of intentions fell in every province except Ontario, Saskatchewan and Prince Edward Island.

Intentions down in residential sector

Municipalities issued $696-million worth of permits for multi-family dwellings in January, down 36.2% from December. Ontario accounted for most of the decline at the national level, although seven provinces reported a decrease. Saskatchewan, Nova Scotia and British Columbia were the only provinces showing increases.

The value of single-family permits decreased 4.3% to $1.5 billion. Alberta, Ontario, Newfoundland & Labrador and Nova Scotia accounted for January's drop. Municipalities approved 11,065 new dwellings in January, down 19.4%. This was mainly due to a 33% decrease in multi-family units to 5180. The number of single-family units approved declined 1.9% to 5885 units.

Some increases in non-residential sector

Strong growth in the values of both institutional and commercial permits in Ontario was the main factor behind January's increase in the non-residential sector. Permits in the institutional component increased by 64.2% to $833 million, largely the result of higher construction intentions for medical buildings in Ontario.

In the commercial component, the value of permits increased 12.4% to $1.2 billion. The increase resulted mostly from higher construction intentions for storage and recreational buildings in Ontario.

The value of industrial permits remained volatile and fell 50.7% to $207 million, following a 30.7% increase in December. January's decline was due mostly to lower construction intentions for manufacturing buildings in Quebec and Ontario.

Permits down in most provinces

The value of building permits fell in seven provinces in January. The most significant declines occurred in Quebec and Alberta (-19.8% to $960 million and -22.4% to $585 million, respectively). In both, the decrease was due to lower construction intentions in the residential and non-residential sectors.

Ontario reported a 13.1% increase to $2 billion. This was a result of higher construction intentions in institutional and commercial buildings, which more than offset a decrease in the value of residential permits.

Saskatchewan and Prince Edward Island also reported an increase as a result of gains in both residential and non-residential sectors.

Large decreases in Toronto and Montreal

The total value of permits was down in 19 of the 34 census metropolitan areas. Permit values declined 12.9% in Toronto, as lower construction intentions in the multi-family component more than offset increases in the non-residential sector and single-family permits.

In Montreal, permit values fell 19.7% as a result of decreases in both residential and non-residential sectors. In contrast, Barrie and Oshawa posted the largest increases, mainly the result of higher construction intentions in the institutional component. EB

Judge finds violations of Pass & Seymour/ Legrand's GFCI patent rights

Pass & Seymour/Legrand (P&S) announced that the U.S. International Trade Commission (ITC) issued a final decision, finding that a number of China-based manufacturers of ground fault circuit interrupters (GFCIs) and their American distributors have violated P&S's patent rights.

The ITC affirmed an earlier decision by Administrative Law Judge Carl C. Charneski finding P&S's patents valid and enforceable. The ITC also found that GFCIs manufactured by General Protecht Group, Shanghai ELE Manufacturing, Shanghai Meihao Electric and Wenzhou Trimone Science and Technology Electric infringed P&S's patents.

In addition, the ITC issued exclusion orders precluding importation of infringing GFCIs made by General Protecht Group, Shanghai ELE Manufacturing, Shanghai Meihao Electric and Wenzhou Trimone Science and Technology Electric, and cease and desist orders precluding U.S. distributors Cheetah USA Corp. (Sandy, Utah), Colacino Electric Supply Inc. (Newark, N.Y.), The Designer's Edge Inc. (Bellevue, Wash.), Nicor Inc. (Albuquerque, N.M.) and Orbit Industries Inc. (Los Angeles, Calif.) from selling infringing GFCIs in the United States.

"Today's decision will enable P&S to fend off unfair competition, maintain market share and preserve high-end R&D jobs and the innovation those workers create, in a product category the company created almost 40 years ago," said Pat Davin, vice-president and general manager of Pass & Seymour/Legrand, adding, "These orders will ensure that our patents and quality products maintain their rightful presence in the marketplace."

P&S intends to work with U.S. Customs to enforce the exclusion orders to preclude the importation of infringing GFCIs. The company also intends to vigorously enforce the cease and desist orders against the distributors named in the investigation and contact other distributors to cease sales of infringing GFCIs. P&S has a related suit pending in U.S. District Court for the Northern District of New York, seeking damages. EB

Universal Lighting Technologies has expanded in Canada with new staff and a new office in Montreal, Que., to manage the company's nationwide sales efforts. **Stacy Chevrette** joins as national inside sales coordinator. He's a member of the Illuminating Engineering Society (IES) and an instructor at Sherbrooke University, and previously worked at Luxo Lighting as a sales manager. He was recently awarded first prize for technical and technological innovations by IES' Montreal Chapter. Chevrette will work alongside **Christiane de Cesare,** who joined Universal in May 2008. The Montreal office is located at 400 St. Martin Boulevard West, Suite 200, Office 11, Laval. Call (450) 668-7881 or e-mail schevrette@unvlt.com.

FLIR Systems Ltd. has added **JFC Solutions** (Burnaby, B.C.) as a manufacturing agent for FLIR infrared cameras and Extech Instruments (acquired in 2007) for electrical/MRO distribution from Ontario to British Columbia. FLIR acquired Extech in 2007. JFC Solutions has been added to support FLIR's national distribution partners: EECOL Electric, Acklands Grainger (T&M) and Wesco Distribution. Visit FLIR at www.flir.ca or e-mail sales@jfcsolutions.ca.

Clockwise from top: Shelley, Tai and Tony Wang.

WAC Lighting is celebrating its 25th anniversary this year. Its roots date back to 1984 when WAC Lighting was founded by Tony Wang and his wife, Tai, in Forest Hills, N.Y. Back then, the firm marketed portable lamps at a variety of trade shows across the States. As its line evolved, WAC began introducing track fixtures and recessed trims and housings, gradually shifting into the task lighting segment of the industry, too.

The **U.S. division of Zumtobel Lighting Inc.** welcomed **Tim O'Brien** as its new president. Before joining Zumtobel, O'Brien held several senior management positions with other lighting industry players, such as Osram Sylvania, GE and, most recently, Cooper Lighting. While at Cooper, Tim spent time as the vice-president of marketing and product development, and as vice-president and general manager of the Architectural Products and Controls Business Unit. **Wolfgang Egger** will focus his attention on sales and marketing in an effort to gain a much stronger U.S. market position. EB

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A low-cost passive filter bank beats

By Gary Gilbert, P.Eng.

Despite increasing demands on power systems, consumers expect clean, reliable power. In an ideal power system, energy is supplied at a single and constant frequency, and at a specified voltage level of constant magnitude. These conditions are rarely met, unfortunately, due to non-linear loads that affect the power quality (IEEE 519, "Recommended Practices and Requirements for Harmonic Control in Electric Power Systems"). Every power system with non-linear loads has the potential of producing harmonics, which can cause distortions in the power supply and, subsequently, produce harmful results for the power producer and consumer alike.

The long-term problems associated with harmonics can include:

- Electromagnetic effects: hysterisis and eddy current losses; skin effect; inductive interference; interference with the operation of control, protection, electronics and communications, and equipment.
- Premature dielectric degradation.
- High frequency effects.
- Increase in peak voltage.
- Insulation failure due to higher voltage.
- Increased copper losses and heating, reduced efficiency.

The instantaneous effects of harmonics can include:

- Contributes to voltage drops on weak systems.
- Results in false measurements.
- Resonance conditions can cause failures, malfunctions or force downgraded operation.
- SCR-controlled equipment can have notching and, when these result in a zero voltage crossing, control equipment can be affected.

Significant research conducted in the reduction and elimination of the harmonics produced by non-linear type loads, resulting in several different types of harmonic elimination methods, including the subject of this paper: a passive filter bank. Here, I'll look at how distribution systems can be affected by harmonics, discussing how they were identified and the mitigation techniques that will be implemented based on IEEE 519.

Problem formulation for harmonic analysis in industrial systems

Harmonic studies play an important role in the analysis of power distribution systems. They determine how the harmonics are created, and how to reduce or possibly eliminate them from the power signal. The two most common methods used in these studies employ time and frequency domain analyses. With *time domain,* Fourier analysis allows a distorted waveform to be broken down into a series of harmonic components. In the *frequency domain,* however, the use of frequency scans can determine the harmonic components. Once the harmonic components are established, it is necessary to determine whether they are within acceptable levels according to IEEE 519.

The following summarizes the necessary steps normally required for a harmonic study in the industrial environment:

1. Prepare system one-line diagram.
2. Gather equipment data and rating.
3. Obtain from the utility company the relevant data and requirements at the point of common coupling (PCC). These must include:
   - Minimum and maximum fault levels or, preferably, system impedances as a function of frequency for different system conditions.
   - Permissible limits on harmonics including distortion factors and IT factor. (The criteria and limits vary considerably from country to country. Typical values for different voltage levels are given in IEEE 519).
4. Carry out harmonic analysis for the base system configuration by calculating the system impedances at the harmonic source bus bars as well as all shunt capacitor locations.
5. Compute harmonic voltage distortion factors and IT value at the PCC by computer simulation with the information obtained in the previous steps.
6. Examine the results and, eventually, go back to Step 1 or 4, depending on whether the network data or only the parameters of the analysis need to be modified.
7. Compare the composite (fundamental plus harmonic) loading requirements of shunt capacitor banks with the maximum rating permitted.

To improve on the model obtained from the previous steps, it is necessary to obtain real-time harmonic values for the design model itself. Harmonic analysis is required when devices that generate harmonics (i.e. rectifiers, arc furnaces, AC/DC drives, etc.) are present or anticipated to be added to the power system. Frequent power system component failure may also justify the undertaking of harmonic studies. Another important reason may be to arrive at harmonic filter specs.

The response of an electric power system to harmonics can be studied by any of the following techniques:

a) **Hand calculations.** Manual calculations are restricted to small-sized networks, as they are not only tedious, but prone to error.

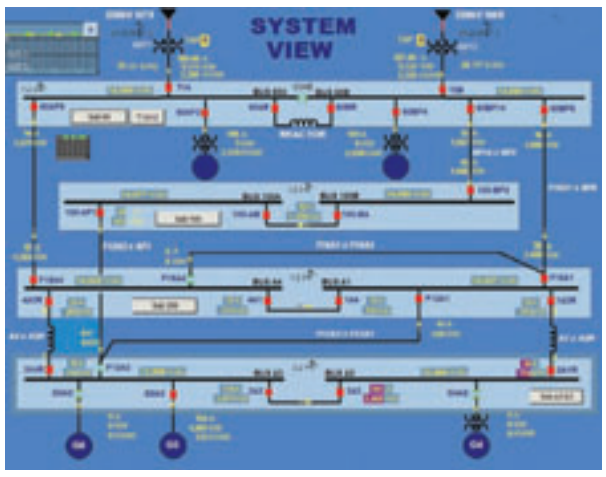
b) **Transient Network Analyzer (TNA).** TNA is also restricted to rather small network sizes because it is generally found to be expensive and time consuming.

c) **Field measurements.** Harmonic measurements are often used to determine the level of harmonic pollution in the power system. It is widely recognized, however, that undertaking harmonic measurements in a systematic fashion can be quite expensive and time consuming. Harmonic measurements, although quite useful in many cases, can be of limited validity because they reflect only the system topology at which they have been taken. Moreover, measurements can be incorrect due to inaccuracies in the measuring instruments, or poor use of those instruments. Field measurements are, however, used effectively to validate and refine system modelling for digital simulations.

d) **Digital simulation.** Digital computer simulation is the most convenient and, perhaps, more economical way of tackling the problem of harmonic analysis. Sophisticated computer programs feature an array of system component models. Computer simulations are centred on system-wide approaches utilizing the notions of system impedance and/or admittance matrices, backed by elegant and powerful numerical calculation techniques.

My study employs a computer software package capable of simulating the distribution systems and the characteristics of the harmonics associated with the harmonic-generating device discussed above (Figure 1).

FIGURE 1



The model produced requires real-time data from the distribution system to ensure the findings are as accurate as possible. This data can be obtained by utilizing meters that comply to IEC 61000-4-7 (harmonics) to determine the actual harmonics within the system. This meter should be able to capture and summarize the power quality of the system and communicate through SCADA-type systems to allow energy management remotely. This will allow for a detailed analysis of the power quality of the distribution system.

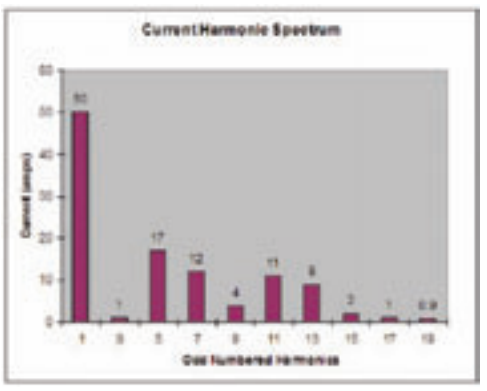
In addition, the harmonic impedance of a network must be uncovered. This is done by injecting a random noise and measuring the resultant voltage. The harmonic impedance is

back harmonics

the ratio of harmonic voltage to the injected current. This information is then transposed to the computer model of the distribution system for increased accuracy, allowing for more accurate mitigation technique selection.

The meters are typically connected to current transformers (CTs) that are typically a toroidally wound transformer with ferromagnetic core. The CT itself should measure up to the 50th harmonic without distortion. In addition to CTs, a voltage transformer (VT) is also required. VTs can be connected directly to low-voltage distribution circuits (up to 12 kV), otherwise cascaded transformers or voltage dividers are required at higher voltages. This information can then be collected by the SCADA system to produce an RMS and harmonic representation of the power within the distribution system (Figure 2).

FIGURE 2



Current harmonic spectrum from SCADA

In general, the Total RMS value of a waveform—based on its harmonic components—may be as follows:

$$I_{RMS} = \sqrt{50^2 + 3^2 + 17^2 + 12^2 + 4^2 + 11^2 + 9^2 + 2^2 + 1^2 + .9^2} = 56.3 amps$$

Employing a passive filter bank to fight harmonics

A passive filter bank was selected due its lower cost and relative size. Filter placement is an important issue in the reduction of harmonics because of the potential problems that can be created with the introduction of the filter itself, including parallel or series resonance. Therefore, it is important that the filter placement be thoroughly simulated before actually physically placing it within the distribution system.

Previously, filter placement had been restricted to the PCC, but I shift from this concept to an empirically determined method that allows the harmonic filter to be placed where the physical limitations of the system under study allow. In the case of the distribution system in Figure 1, the ideal PCC is at NS6 or NS7 in accordance with IEEE 519; however, this position was varied to simulate the effects of the passive filter.

The passive filter bank was tuned to the harmonic level that had been found to be problematic. The passive filter placement can be empirically determined through an exhaustive search pattern in the topology of the distribution system to determine the reduction in harmonic content throughout the entire system when the filter is placed at each node in the topology. By using every node in the topology, the results will show that there are several locations throughout the distribution where the filter can be physically placed and still reduce the harmonic distortion. However, the number of nodes in the search pattern can be reduced by only using nodes where the filter can be physically placed. It is to this end that this filter placement scheme was developed.

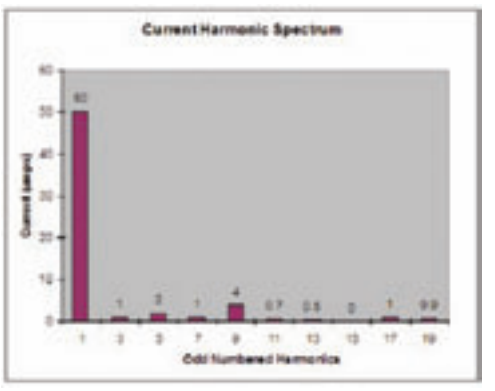
So the harmonic analysis determines which components need to be reduced to lower the THD (total harmonic distortion) and meet the limits of IEEE 519. Once a specific harmonic component has been identified as a potential problem, a passive filter or filter bank can be selected. After a configuration is selected, the filter is designed to meet the requirements of the system in question. Here, for example, the 5th, 7th ,11th and 13th components were identified as problems due to the type of drives used in this system—namely, 6 and 18 pulse drives.

The filter is tuned to a value of *slightly below* that of these harmonic components and, once the components of the filter have been calculated, it is placed at node number one and the harmonic analysis carried out. The analysis must be carried out at each new node location because the passive filter alters the overall system impedance at the new location, and this change in the system's impedance may cause resonance problems. Therefore, this step is repeated at each node until there are no major differences in the harmonic levels at nodes or sub-nodes, nor any new harmonic problems due to parallel or series resonance.

Passive filter results

With the passive filter bank placement method, it was necessary to determine where it could be placed within the distribution system. The next step is to run a harmonic analysis without any compensation to determine whether the harmonic content is excessively high according to IEEE 519. In this case, the filter bank could be placed at either Sub 200 or at the PCC. The passive filter could be placed throughout the vessel and still reduce the overall harmonic content to acceptable levels. This allows the flexibility to find the physical location that will allow the installation of the passive filter and still reduce the harmonic distortion. Figure 3 shows the effects of the filter bank at Sub 200, which was within 5% of the results from the PCC.

FIGURE 3



Current harmonic spectrum with passive filter bank

The results show how the passive filter bank reduces the unwanted harmonics. The RMS values of 6.04 amps are just over 10% of the fundamental current value. As any industrial site expands towards more non-linear loading, the harmonic current and voltage values grow to levels where system reliability is at risk.

The results of the filter placement method indicate the possibility of an alternate way of selecting a location for the filter. Filter placement has been traditionally restricted to the PCC which, while a valid location, does not take into account other factors, such as impedance. With the approach described above, other good filter placement locations were discovered. This allows the flexibility to empirically determine the location where the filter could be physically realized. EB

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- B.Thiem, W.Frankenburg, and M. Grotzbach, "Assessment of Line Current Harmonics Emitted by High Power AC/DC Converters", 5th Institute of Electrical and Electronics Engineers Conference Proceedings, Atlanta, Ga., 1992, pp 659-663.

Gary Gilbert, P.Eng, is a senior engineer with specialty chemicals player, Lanxess, where he is responsible for a high-voltage system comprising a distribution system of almost 60 transformers and an overall plant running capacity of over 100MVA at 230kV. Prior to Lanxess, he spent nearly nine years at the Electrical Safety Authority (ESA) as a code engineer, where he developed and interpreted the Ontario Electrical Safety Code. He completed his Masters in Electrical Engineering at the Royal Military College of Canada and is a member of IEEE, Professional Engineers Ontario (PEO) and the International Association of Electrical Inspectors (IAEI).

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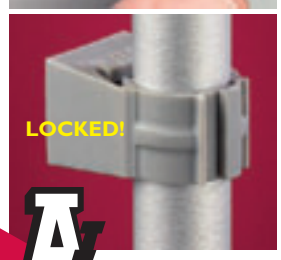

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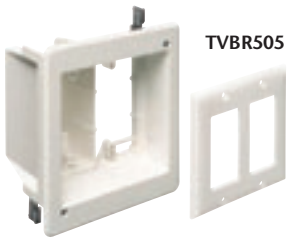

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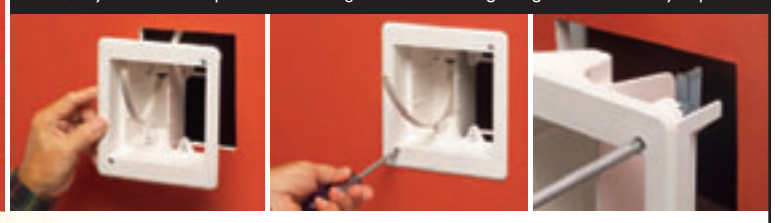

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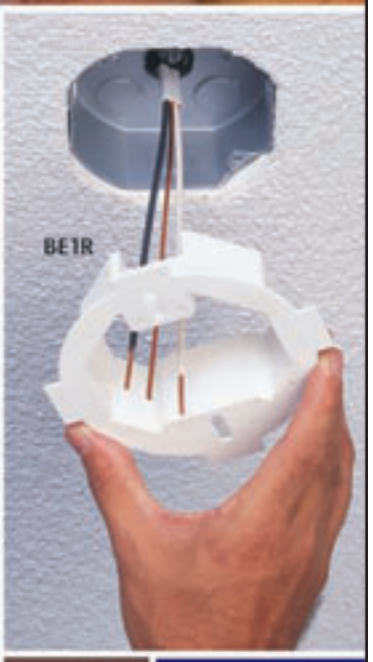

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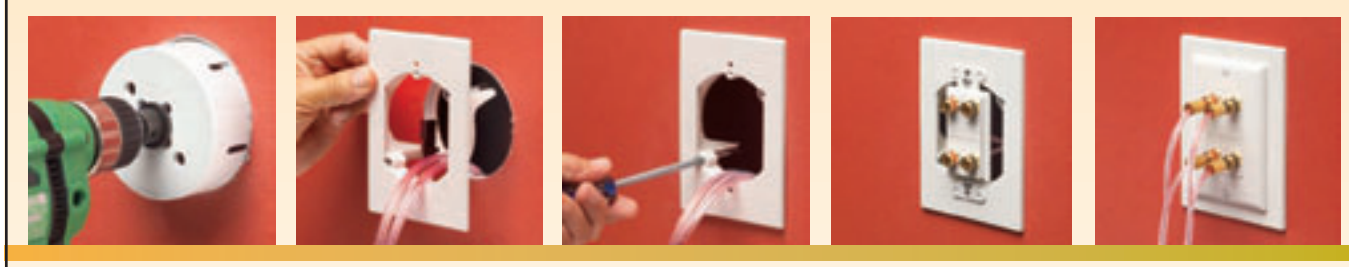

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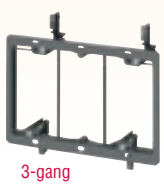

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Protecting mission-critical electronics in the industrial environment

By Paul Haake

Today's engineers are designing increasingly sophisticated control systems involving more electronic equipment—much of it adopted from non-industrial applications, and almost all of it more sensitive to electrical disturbances than the equipment being replaced. When mixed with the inherently poor power environment of an industrial facility and aging power generation and distribution facilities—both inside and outside of the plant—a variety of power- and electrical noise-based problems inevitably result.

Understanding these problems, as well as some of their causes and solutions, can help ensure the design of reliable and cost-effective mission-critical electronic systems.

Crash of mission-critical elements = lost profit

The first task in protecting mission-critical elements is identifying them. While each system is unique, they are usually easily recognized. Basically, they're all the items that, when they fail, cause customer displeasure, and/or increased labour/material costs.

Typically, PLCs (programmable logic controllers), industrial computers and electronic motor speed controls serving in the control loop of a manufacturing process are the first components put on the list. But this list is far from complete: sensors, datacom equipment, actuators and even production planning systems must be included. As you evaluate each item, remember: it is considered mission-critical when its downtime causes lost profit.

Once this list is complete, determine the necessary level of protection, of which there are three. The first level provides defence against the instantaneous destruction of critical equipment. The second provides additional protection against long-term equipment degradation (a condition often seen in semiconductor devices). The third and most important level for most industrial systems adds defence against disruption—those unexplained soft failures, system lock-ups and resets for which no specific cause can be identified.

As more devices containing volatile memory find their way onto the production floor, guarding against such disruptive events becomes critical for ensuring that costly interruptions do not occur.

When satisfied customers and controlled costs are of primary importance, there is little question that systems must be protected to the third and highest level. This requires examining and appropriately protecting each and every power and data I/O (input/output) lines against likely hazards. Achieving this level of protection usually requires the use of industrial-grade components, along with a combination of devices like surge protectors, power conditioners, power-conditioned UPSs (uninterruptible power supplies), as well as appropriate grounding techniques.

Powerline issues

'Outside' and 'inside' events

Powerline problems can originate both 'inside' and 'outside' the facility. Outside problems include inclement weather that produces lightning-induced transients or powerline outages due to high winds or ice. Problems may also come from routine utility operations, such as capacitor switching or clearing line faults.

While outside events are the most obvious and spectacular, it is estimated that up to 80% of power problems in industrial facilities originate on the customer's side of the meter. Inside problems are caused by a variety of factors, including motors stopping and starting, welding equipment, electronic motor speed controls, poor grounding, as well as some problems in common with the utility, like fault clearing and capacitor switching. The result of these events show themselves in many ways, including voltage interruptions, sags, and the less obvious—but more disruptive—voltage transients.

Power interruption

Among the most noticeable power quality problems is a power interruption. While relatively infrequent in most locations, the effect can be dramatic and obvious, as everything grinds to a halt.

Solutions to combat power interruptions include alternate power feeds to the facility, local backup generating capability (diesel- or gas-powered generators) and the addition of UPSs on selected equipment. While alternate power feeds and local power generation may not be practical for every facility, the addition of UPSs—particularly to software controlled devices—is an important component in a total protection strategy.

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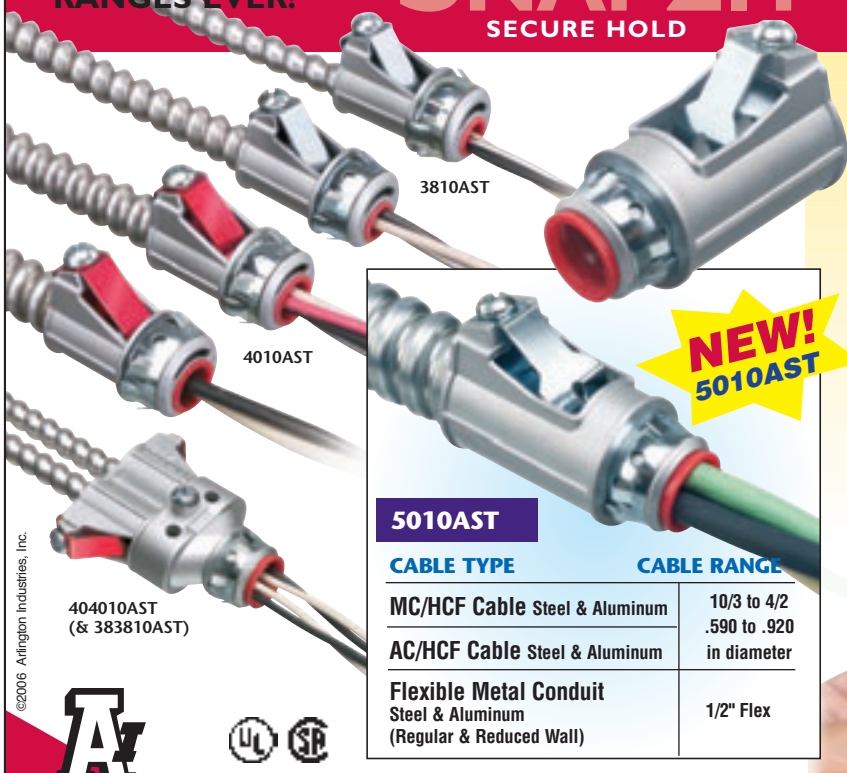

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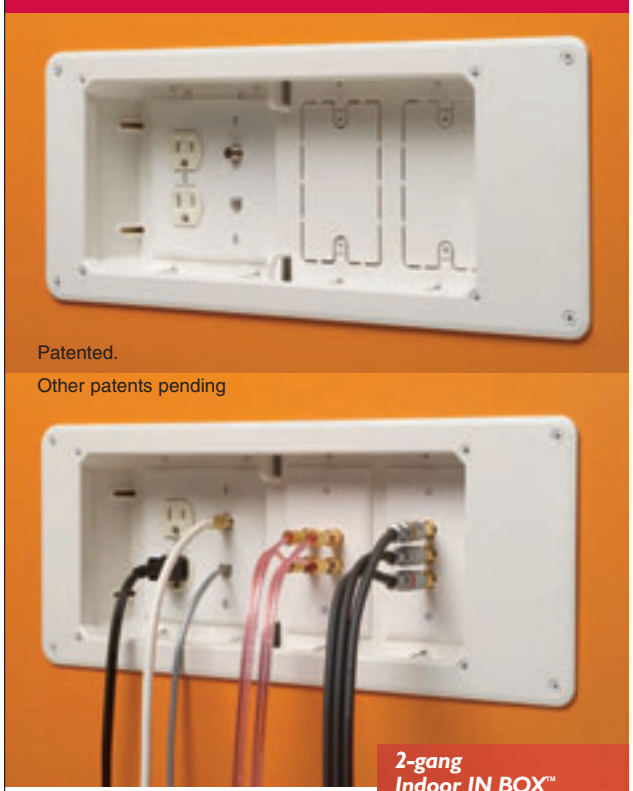

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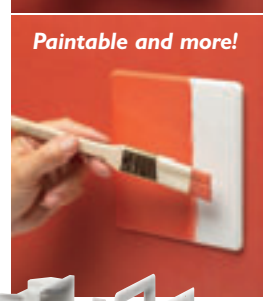

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Voltage sags

Voltage sags and, to a lesser extent, voltage swells are reported to be the most measured powerline problem. A study of one site estimated that up to 62 voltage sags down to a limit of 80% of nominal voltage, and an additional 17 sags down to a limit of 50% of nominal voltage, occurred yearly at that site. In another study of a large industrial facility, more than 500 sags of various levels were recorded at the input to key control equipment over a three and half-month period. In the same study, only about 100 such sags were recorded during that period on the input power line to the facility. Both of these studies also report that individual pieces of control equipment were affected quite differently by the recorded voltage sags.

As with power interruption, solutions can be applied both locally and plant wide. Plant-wide solutions include layout of power distribution to minimize the number of sags induced on critical equipment from internal causes, such as starting motors and fault clearing. Since studies show that up to 80% of sags are caused within the plant, such solutions—while expensive—can greatly aid in protecting critical control components.

Typically, however, a more practical approach for protecting controllers is the application of a voltage control device in the power path supplying the control system. Because these local devices can compensate for sags generated both inside and outside of the facility, using them is usually more reliable and less expensive than attempting a plant-wide solution.

At least three basic types of devices providing local sag protection are available. These include devices that: store energy in a transformer (constant voltage transformer [CVT]); use boost windings to raise voltages during sags (tap switching transformer); and supply energy from batteries during sags (UPSs). There are also devices that use some combination of these three technologies to combat sags.

While each of these solutions has its advantages and disadvantages, some are better suited than others to today's electronic control systems. In the past, the most common device applied to control sags was the CVT. This device, which also typically provided the step-down voltage function, was an excellent choice when most control devices used linear power supplies, most sags were not too severe, the attached control system 'crashed' well, and the CVT was presented with a relatively constant load.

Today, however, control systems have changed; loads are more typically switch mode power supplies (SMPS) and sags (particularly with aging infrastructure) are likely to become more severe. In addition, control systems are often no longer based on proprietary software that 'crashes' well but on commercially available operating systems that need to be properly shut down to start up again smoothly. Power system load requirements also change more often as control schemes are frequently updated with the latest technology to gain additional performance from existing tooling and equipment.

While changes have been made in many CVTs to adapt to this new technology, the best solution is one that was specifically designed to support SMPS and has more energy to ride through severe sags than a typical CVT. Such a device is a UPS with integral isolation transformer that provides highly robust regulation, isolation and backup. When an isolation transformer already exists in the power path near the load, a UPS with double conversion topology can also serve quite effectively.

Transients

By their very nature, transient voltages on power lines—below the level of those that cause massive destruction—are difficult to measure directly. Among the most difficult to measure are the high-speed ones that are the most likely to cause disruption of electronic equipment. To further complicate the situation, transients often occur randomly; and special power quality monitoring equipment is usually required to capture the high-speed impulse and oscillatory events that can cause sensitive electronic equipment to be disrupted. While often not discussed or considered, this 'least-measured' power quality event can be a major contributor to those random errors and lock-ups that occur in a control system.

As with many industrial power quality issues, most of the high-speed transients that cause system disruptions are not supplied through the power utility but are generated inside. This conclusion can be reached not only by observation, but through examination of the typical transient's high-frequency content and its interaction with the intrinsic impedance of power distribution lines. The one obvious exception is lightning, which is clearly a natural and external event. Typical inside causes of transient events include switching devices, such as contactors, motor starters, compressors, variable speed drives and the switching of capacitor banks for power factor correction.

It is important to note that while these transients are clearly a threat to a mission-critical system's overall reliability, not every transient will cause a system disruption. The transient's frequency, edge speed, mode in which it appears to the equipment, and location in the affected equipment's clock or processing cycle all determine its immediate effect.

Almost all transient events are ignored by electronic equipment; if they weren't, it would be almost impossible to keep a computer running. In mission-critical applications, however, the goal is to push disruptions as close to zero as is possible, and the reduction or elimination of these transients is critical in achieving this result. In these applications, reducing the amplitude and edge speed of all transients becomes paramount in achieving the desired system reliability.

To better understand the specific methods that may be used to control the amplitude and edge speed of transient voltages, it is useful to review how transient noise appears to electronic equipment.

Transients are said to be *Normal Mode (NM)* noise when they appear between the line (hot or phase) and neutral conductors supplying the equipment. While somewhat troublesome, noise appearing in this mode can often be controlled by a combination of transient voltage surge suppressor (TVSS) devices and filters. Typically, individual pieces of equipment often make some provision for controlling this noise mode within the control equipment itself.

The far more difficult noise mode to control is *Common Mode (CM)*. In this situation, there is noise between the neutral and ground lines connected to the equipment. While the neutral and common are bonded either at the service entrance or at an intermediate transformer, noise in this mode is quite common and very disruptive. CM noise typically occurs when current is "dumped" into the ground lead by other equipment;

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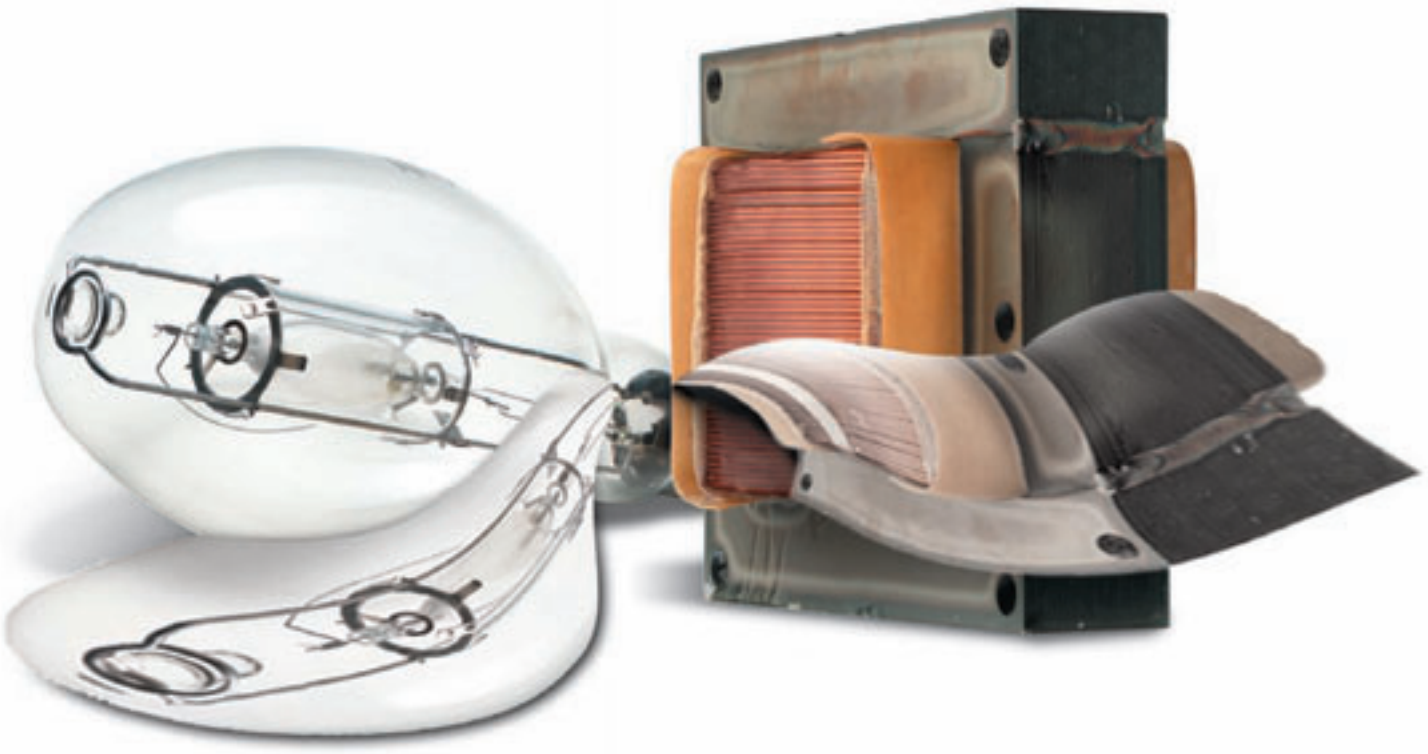

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input/output filters for suppressing high frequency line noise are a typical cause, as are protective devices such as TVSSs.

Power conditioning

Controlling CM noise usually requires a transformer-based power-conditioning device that provides a separately derived source of power in which the neutral and ground wire are locally rebonded.

Almost all such commercial power-conditioning devices also include appropriate components to control any present NM noise. These devices, which are typically available as traditional power conditioners or as power conditioners with battery backup, accomplish the necessary reduction in amplitude and edge speed of transient noise sources to help ensure that equipment in mission-critical systems is not unnecessarily affected by transient events.

In addition to installing an appropriate power-conditioning device, proper care must be taken in system layout and wiring. In particular, it is critical that the wiring to the power conditioner not be run with the power from the output of the power conditioner. Running these wires in the same conduit or wiring tray will significantly reduce the benefits provided by installing the power conditioner.

It is also important that, whenever possible, all critical devices (including sensors) be powered from the same power conditioner as the controller, and that sensor and peripheral equipment grounds be connected at a common point. Finally, datacom cables should be run in conduit or wiring trays that do not contain power or, at a minimum, do not contain unconditioned power.

Communication line issues

Today's typical control system uses communication lines for several purposes, such as: control busses (i.e. DeviceNet or Profibus); data lines to peripheral devices (such as human machine interfaces [HMIs]); and connections to plant-wide production information systems. While not subject to all of the problems of power lines, communication lines are often more likely to cause system disruption due to transients. In addition, grounded (non-isolated) communication schemes (such as RS232 and RS485) provide an opportunity for an additional path of disruption known as *ground skew.*

Communication line protectors

As in power lines, a user must be concerned about destruction, degradation and disruption when addressing communication line protection. In these lines, minimizing the chance of destruction or degradation is best addressed by the use of a communication line protector (CLP), as the semiconductor devices associated with these lines are not designed to withstand the high voltages or currents that can be induced from power lines or other noise sources.

CLP selection should be done with care to ensure that the clamping voltage is lower than the point at which damage will occur, but higher than the maximum voltage that can be applied to the line for normal communication. In addition, when using systems with the higher transmission speeds now available, care must be taken to ensure that the insertion loss due to the added capacitance and inductance of the CLP will not cause unacceptable signal level reductions.

The use of external CLPs is often suggested to improve system reliability, even when a communication port is internally protected by a TVSS against over-voltage. This approach can lead to improved reliability since a typical CLP will have a grounding lead that can be wired to direct transient noise away from the chassis ground of the control device. Redirecting this transient noise current will avoid introducing potentially disruptive common mode noise into the equipment, a situation that can occur when the internal TVSS is triggered.

For this scheme to have value, however, the external CLP will be required to activate at a lower voltage level than the internal protective devices. While properly selecting an external CLP provides this result, the selection requires investigation into the internal protection levels for each piece of equipment to ensure proper coordination.

While CLPs can provide protection against system destruction and degradation, they do little to assist in reducing disruptions from transient voltages that are below the level of component destruction yet above the disruptive level that interferes with routine communication. Protection against such disruption can be addressed in several ways.

First, it is critical that system grounding follows good practice and meets the equipment manufacturers' guidelines. With grounded communication schemes in particular, a small grounding problem can lead to very inconsistent communication. A second key factor is cable routing, which should be done in a manner to avoid inducing any noise into communication cables from other sources. To maximize system reliability, do not run communication cables with power cables; and when crossing power cables, try to do so at right angles.

Ground skew issues

Addressing ground skew is the next step in improving communication reliability. Ground skew problems occur when noise currents flow in a ground path between two pieces of equipment connected by more than one ground lead.

In grounded communication systems, the primary connection is the power ground, while the second ground lead is the shield and/or common lead in the communications cable. When ground currents flow in the power ground, they cause a voltage difference (ground voltage skew) between the two locations, thereby causing a voltage differential to be reflected in the cable. This voltage differential, and the resultant current flow in the cable, can seriously disrupt the communication path, and potentially destroy devices not protected by a CLP.

Two solutions can eliminate or reduce ground skew-related problems. The first and most expensive (and often most difficult to implement) is full isolation on the communication port. Such isolation typically requires separate power supplies be added at each end of the line, in addition to adding the appropriate isolation device. While commercially available, such devices are relatively expensive and take time to install.

A second solution is a ground skew protective device in the power path. Such a device is available from multiple sources, each with slightly different—and patented—implementations. The device works on the principle of creating a high impedance in the ground path at high frequencies while maintaining no or low impedance at powerline frequencies.

By increasing the high-frequency impedance in the ground line, the resulting voltage produced by high-frequency ground currents is substantially reduced, thereby reducing the opportunity for disruption or destruction of the communication line. To ensure proper protection, one ground skew device should be placed in the power path of each device containing a grounded communication port. Commercially, ground skew devices are typically sold as an internal option to power conditioners and power-conditioned UPSs.

Proper equipment and protection + vigilance

Two steps are required to provide the highest level of confidence in the reliability of a mission-critical industrial system. First, robust equipment designed to be used in an industrial environment must be selected. While this paper discussed techniques for minimizing the effects of electrical anomalies on the system, items such as working temperature range and mechanical ruggedness are also important for ensuring long-term system reliability. Secondly, once the proper equipment is selected, installing it with proper protection solutions on power and communication ports becomes of paramount importance to provide a system that is as failure free as possible.

When installing equipment with the goal of achieving total protection, it is important to protect each and every power and communication port in the system and provide a grounding scheme that is in accordance with prevailing codes and manufacturer guidelines. In a well-protected system, each power port should be protected with a low-impedance, transformer-based power conditioner to control both common and normal mode noise. On some power ports, a low-impedance, transformer-based power conditioner with batteries (UPS) may be the proper choice for providing protection against extended sags and outages when sensitive controllers need to be shut down in an orderly fashion.

In addition, each communication line should have a CLP installed that has the appropriate voltage breakdown level and controlled insertion loss for the type of communication port being protected. When grounded communication lines are involved, either ground skew protection devices, or full port isolation, should be considered.

Finally, remember that once a system is properly installed and protected, vigilance is required to maintain the level of integrity that was originally designed. One single 'on-the-fly' addition or change can leave a system with an unprotected path and subject to the disruptive effects of power and communication line anomalies. EB

Paul Haake is vice-president of engineering for Chloride North America with responsibilities for all aspects of the design and engineering of UPSs, power conditioning and communication line protection devices. He has over 25 years of experience in design and design management for power conditioning products, and equipment and instrumentation used in the process, utility, nuclear, HVAC, safety and assembly industries. Visit www.chloridepower.com.

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By Ron Coleman, B. Comm., FCCA CMC

Winning in tough times

Small changes make big differences!

There is no easy answer as to how you should react in tough times. Your business is unique—just like everyone else's! There are, however, a number of decisions you should be considering (and we'll touch on some of them here), but one of the areas on which you really need to focus is your costs.

Reducing costs helps increase profit, but take care that your cost reductions don't negatively impact your efficiency, otherwise you might end up losing more money than you save.

Does quality control cost—or save—you money?

Every dollar of sales has a direct cost and an impact on variable overhead. Many contractors ignore variable overhead and treat all overhead as fixed. Because variable overhead is such a small portion of the equation, you shouldn't have a problem if you take that route

TABLE 1

	Before		After	
	$	$	$	$
Revenue		100		100
Labour	55		52	
Materials	25		24	
Direct cost		80		76
Gross profit		20		24
Variable overhead		5		4
Contribution to fixed overhead		15		20

Direct cost covers all the material and labour used in actually completing the project. When you install a light fixture, the labour and material used are your direct costs. The variable overhead is the overhead you incur because you are doing the work. It could include the fuel you use to drive to the jobsite.

When you succeed in reducing your direct cost (i.e. labour, material, subs) or variable overhead, you make a greater contribution to your fixed overhead. In the example in Table 1, I have improved my labour efficiency, got a better deal from my suppliers and reduced my variable overhead. Each $100 of sales contributes $20 toward my fixed overhead instead of $15. If my fixed overhead is, say, $20,000 per month, then my break-even sales are:

TABLE 2A

	Before		After	
Overhead	20,000		20,000	
Contribution to fixed overhead	15%		20%	
Amount of sales to break-even	$133,333		$100,000	
Proof				
Sales		$133,333		$100,000
Labour	55%	$73,333	52%	$52,000
Materials	25%	$33,333	24%	$24,000
Variable overhead	5%	$6667	4%	$4000
Contribution to fixed overhead		$20,000		$20,000

** Divide overhead by the % contribution*
$20,000 divided by 15% = $133,333

The amount of sales needed to break-even has dropped from $133,333 to $100,000. This means you could reduce your sales by 25% without impacting your bottom line. You might even be able to reduce your overhead and come out ahead. If, through efficiencies and a lower workload, you could reduce your $20,000 overhead by $2000, how would that impact your numbers?

The numbers on Table 1 don't change; only the numbers in Table 2, and here is what it would look like:

TABLE 2B

	Before		After	
Overhead	$18,000		$18,000	
Contribution to fixed overhead	15%		20%	
Amount of sales to break-even	$120,000		$90,000	
Proof				
Sales		$120,000		$90,000
Labour	55%	$66,000	52%	$46,800
Materials	25%	$30,000	24%	$21,600
Variable overhead	5%	$6000	4%	$3600
Contribution to fixed overhead		$18,000		$18,000

The amount of sales needed to break-even has reduced from the original $133,333 to $90,000. This means you could experience a drop of 32.5% in sales without impacting your bottom line, and if you reduce your sales by 32.5%, you should certainly be able to reduce your overhead.

Lower that overhead

Now that we can calculate our *what-if* scenarios, we need to work on gaining the efficiencies that will help us reduce overhead.

Consult your technicians about what can be done to improve productivity. It might be better scheduling or new tools; maybe more/better training, or taking on helpers and apprentices. Talk to your suppliers. Can you get volume discounts? Can you use generic parts? Can they afford to give you rebates? Can they give you better prices? Identify your variable overhead and brainstorm ideas with your team for reducing it. There's no telling how many solutions you and your team can come up with.

When it comes to fixed overhead, go over each item and ask questions like: What value is this expense bringing to the organization? What would happen if we reduced or eliminated this expense? By what other means could we get the same outcomes for less money? Also examine your overhead salaries; they likely make up 50% of your fixed overhead. Can you take any of those salaries and turn them into direct cost? For example, an estimator might be able to run jobs part-time, thereby moving some of his cost out of overhead and into direct cost.

Construction versus service work

A typical electrical contractor might have a gross profit (marginal contribution) of around 15%, whereas a service contractor is more likely to be in the 45% to 50% range. The fixed overhead for the electrical contractor (doing construction) might be 8% to 10% of sales, while the electrical service contractor might be at 35% fixed overhead. Because of these differences, you'll get a variety of outcomes from the exercises above for different elements of work—the outcome is much more dramatic for the construction contractor than the service contractor.

Because they are price sensitive not volume sensitive, I encourage trade contractors doing construction work to cut back on volume but maintain their prices.

Service work is normally less price sensitive than construction work (you usually don't have to bid the work), so there's less of a need to reduce your prices. (Whereas a 5% price reduction would have a small impact on the activity level in service work (and unlikely to generate sales), it would have a devastating impact on construction work—you would get more work and have less profit. To maintain your service margins, you need good marketing strategies.

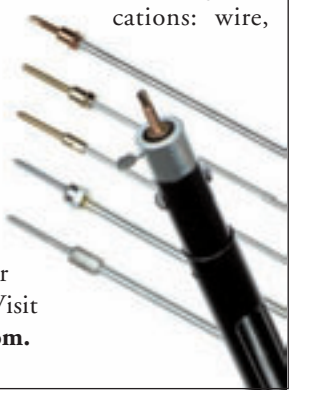
The other main area on which you should be focusing on is revenue, and we'll look at that in my next column. Final thought: Canada's Work-Sharing Program can really help reduce your overhead. Find out more at tinyurl.com/dksfzu. EB

Ron Coleman is a member of the Institute of Certified Management Consultants of British Columbia. A noted speaker, he has completed many interfirm financial comparisons of groups of construction companies in Canada and the United States. Ron's numerous published education programs include a 36-hour business management course specifically designed for ECABC. He is also author of the book, "Your Million Dollar System: How to Increase the Value of Your Construction Business by One Million Dollars in Three Years". Visit www.ronaldcoleman.ca.

In this installment of Vehicles and Accessories, we present several neat products/ technologies that we feel will take efficiency to the next level.

With the **Color-Keyed Battpac LT 6-to**n compression tool and die sets, you won't have to worry about downtime on the jobsite due to lacking the proper size crimp die. That's because this compression tool comes with a full complement of 16 TBM series dies for crimping lugs and splices from 8 AWG to 500 kcmil copper and 10 AWG to 350 kcmil aluminum. For even greater versatility, says Thomas & Betts Canada, this same tool also accepts Color-Keyed 6-ton series and Blackburn O and D series crimp dies (adapter required for the latter). The open-yoke design provides maximum crimping flexibility, while the double-speed feature maximizes efficiency by doubling jaw speed until it reaches load capacity. The Ni-MH battery yields about 200 crimps (based on 3/0 AWG) per charge, and the tool is compatible with compatible with Burndy W dies. **Visit www.tnb-canada.com**.

Developed for electricians, the **LagMaster-Plus telescoping pole tool** boasts it is the fastest and simplest way to hang threaded rod, wire or chain in ceilings up to 30-ft high from the floor. The tool hangs threaded rod, ceiling chain and wire while you work safely from the ground and, if you're quick, you can install up to 100 ceiling wires in an hour. The thin profile of the pole allows it to reach into tight places where you would otherwise have difficulty. The LagMaster-Plus comes with interchangeable heads for specific applications: wire, jack chain, purlin clips, threaded rod, smooth rod and screws. A 1/4-in. female hex head turns the pole into a long screw driver. There's also a special head that works with Ramset's Viper powder-actuated tool. Visit **www.hookandhanger.com.**



Overhead fastening is quick, easy and never out of reach, says Hilti, with its DX 351-CT ceiling fastening system. The DX 351-CT features a slim, compact design to provide accessibility to tight areas, and a coaxial trigger design that makes it easy for you to keep working on the move. Pre-mounted Hilti fasteners provide high-quality setting in a range of materials. A sturdy, integrated, modular pole allows you to easily and accurately make fastenings into ceilings of various heights from a comfortable standing position. The system is backed by Hilti's Lifetime Service, which includes two years of no-cost coverage. **Visit www.ca.hilti.com**.

The **Bullet Mole** promises to be the fastest, easiest and cost-effective **way to install electrical conduit under sidewalks,** driveways and other hardscapes. It is engineered and designed to break apart rocks, roots, gravel or other common buried debris hiding under pavement. A shovel and sledge hammer is all you need! The 'Quick Unit' design installs pipe as it penetrates the ground under sidewalks up to 6-ft wide. For longer runs, you simply add extension shafts and glue together sections of pipe as you go. By the time the tool emerges on the other side, the conduit is installed. The Bullet Mole will make holes that receive 1-in. to 2-in. pipe. Visit **www.bulletmole.com.**

By Dave Smith

CSA Z462 puts the squeeze on small electrical contractors

CSA Z462, the new Canadian Workplace Electrical Safety standard that supersedes NFPA 70E, is going to be a struggle to implement for small electrical contractors. It's a huge change for all electrical workers, but not all companies are the same. Most electrical contractors start out as a one-person shop or, perhaps, as several friends or relatives. With luck, good business sense and a good market, they thrive and grow.

It is well known that 80% of new businesses close their doors within the first five years of operation. Some time ago, a Royal Bank study confirmed this before revealing that, of the survivors, 80% close *their* doors within the next five years.

This is a 96% attrition rate for small businesses in the first 10 years of operation. Granted, numerous factor play a hand in this conclusion, but a lousy marketplace is a killer—even for established companies—and we are at the beginning of a royal mess. Someone is going to disappear. And now the ante is huge on the health and safety table.

Bill C-45 amended the Criminal Code of Canada several years ago to put health and safety in the crosshairs of the local police. Should they determine that an accident warrants it, they will press charges with no discussion with the Ministry. Once the Ministry becomes engaged, you'll be fighting two parallel investigations. Just watch your bank account drain now!

CSA Z462 is not legally written in stone but every province has a General Duty Clause: "You shall protect your workers against recognized hazards". After 28 years of trying to convince people that electricity *really is* dangerous, I can tell you that electrocution, arc flash and blast—and all the ancillary nasties—have never enjoyed such a high profile.

A small contractor with an irregular work force has a real chore ahead of him, trying to change the human behaviour of a gypsy; even a contractor with a seasoned crew will be challenged when trying to change the habits ingrained after a century of no PPE (personal protective equipment). The complaints will be constant; the gloves are hot, sticky and clammy within minutes of putting them on; a face shield has lots of annoyances; hot, claustrophobic, hard to see through, they fog up, etc.

When you have a recalcitrant workforce that grudgingly wears PPE when they are being observed, but go back to old habits when they are alone, your business and, by extension, all of your hard-earned assets are seriously at risk.

Surviving tough times calls for pork and beans and corn flakes all around, and battening down the financial hatches: if it's an expense, forgo it; if it's risk, get it under control.

Uncontrollable electrical workers that do not adopt and follow the safe work practices of CSA Z462 are a risk that you cannot afford. You don't allow open fires in your shops, do you? Well, not following Z462 is like a bonfire waiting to burst.

Should one of your workers get electrocuted, you will have no defence for not fulfilling your responsibility under the law. Legal retainers run about $10,000, and you won't get change back. Going to court will cost you another ten grand, and you still won't be finished. You'll also quickly discover that—outside of your family and close friends—no one really cares.

I have had some terrible times in running my own business. This will be the fourth ugly downturn I have experienced, but I have my survival planned. Whether this is your first or fourth downturn, you don't want to go under because of an injury *that could have been prevented* with safe work practices and PPE.

You don't want to go under because of an injury that could have been prevented with safe work practices and PPE.

Z462 is a great shield for defending yourself against accidents and stupidity. To get it moving, you need to get yourself and your crews trained, develop a safety program and hold safety meetings that engage your workers. You cannot avoid spending money on equipment and PPE, so there's no point in griping about it. You're already the leader, so become a safety leader, too, and become a champion for the standard.

When someone crosses the line, make sure they understand where that line is and the consequences. If they do it again and again, fire them; they're lighting matches in your living room, and they just don't care.

Until next time, be ready, be careful and be safe. EB

Dave Smith is president of Canada Training Group and has been providing consulting services to industry since 1980. At www.canada-training-group.ca, you'll find stories like this one; feel free to use this information to support your own safety program.

You can meet **Dave Smith** at the Ontario Electrical League's (OEL's) Electrical Industry Conference, which runs April 15-18 in Kingston, Ont. Dave's presentation is proudly sponsored by

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TRANSFORMER OIL
essential for ensuring optimal

By Laurie Brescacin

Transformer oil coolers play a critical role in keeping electrical generation systems reliable. They're a small investment that protect the power industry's huge capital investment in the massive transformers that make up the backbone of a nation's energy supply.

Power plant generators produce electricity that has to be converted to high voltage for more efficient transportation across wires to substations near businesses, factories and homes. The transformers that convert the electricity to high voltage do so extremely efficiently with only something in the order of 0.5% of the electrical load being lost in the form of heat. However, even though the loss percentage is small, the actual quantity of heat can be quite large. The heat that is produced must be carried away from the transformer and dissipated. If not, the transformer will overheat and be damaged... maybe even destroyed.

The windings of the transformer are immersed in an enhanced mineral oil that is circulated to cool the transformer. This oil also remains stable at high temperatures and has excellent insulating properties that protect against stray current path. The oil circulates through both the transformer windings and the cooler, and the heat lost is transferred either to the ambient air around the transformer or to water. The oil-filled tank often has radiators through which the oil circulates by natural convection. Large transformers use forced oil circulation by electric pumps, aided by external fans or water-cooled heat exchangers.

The transformer oil cooler has to be sized to transfer the amount of heat that needs to be dissipated from the transformer, depending on its size, design and configuration. Some transformer oil coolers are designed to take into account the kinds of adverse conditions around the transformer that could potentially cause a shortfall in performance.

Design considerations to ensure performance

Air-cooled systems most prevalent

Most fossil fuel plants use air-cooled systems because air is always readily available, and its use in transformer oil cooling systems usually involves fewer environmental concerns.

There are several design considerations that must be taken into account with air-cooled systems. The temperature difference between the oil and the air determines the amount of surface needed for cooling. The greater the temperature difference between the oil and air, the less surface needed. So when the air temperature has been elevated but the oil temperature is fixed (because the application cannot allow it to increase), the size of the cooler's surface area must also be increased.

Air-cooled transformer coolers are typically mounted on the side of the transformer, usually vertically about 3 ft away from the transformer wall. The coolers take air from around the transformer, and fans then draw or push the air through the transformer coolers. The air is then discharged to the environment around it. To get the level of cooling required, designers must be able to accurately predict the amount of air that will actually flow across the heat exchanger, as well as the temperature of that air.

Depending on how many coolers are required and the amount of heat to be dissipated, one to six coolers might be placed along each side of the transformer. The more coolers mounted along the side of the transformer, the more likely there will be adverse air recirculation from the discharge of that air. This is because the discharged air is warmer than before, and when blended with the air that is being drawn in to cool the transformer, the discharged air will raise the temperature of the air that's coming through.

Several other site-specific factors must be taken into account to avoid detrimental effects on cooler performance:

- Wind speed and direction. For example, when fans are blowing air away from the transformer but the prevailing wind is blowing toward the transformer, warm air will be pushed back.
- Buildings around the transformer, firewalls or other fire protection components can trap air and impede exhaust.
- Existing transformer cooler applications elsewhere on the site could blow heated air toward the new installation.

For example, a designer may be asked to design a system based on a 30°C ambient situation. However, due to one or more of the factors described above, the air adjacent to the transformer might not be 30°C, but could possibly be as high as 35°C to 50°C. Experienced designers know to design a system that reflects these actual ambient conditions.

Water-cooled systems

Water-cooled transformer oil coolers are considered more efficient and are used where water is plentiful, as in hydroelectric power applications. After the heat from the transformer is dissipated to the water, it is necessary to either discharge the water back to its source (which has potential environmental issues) or lower the water temperature before recirculating it through the transformer cooler (which requires an auxiliary system).

COOLERS:
operations

Also, water-cooled systems require a leak detector system to make sure water doesn't get into transformer oil and then into the transformer, which could have disastrous consequences.

Fans and motors are key

Another factor that makes a big difference in the operation of the transformer oil cooler is the selection of the fans and motors for the unit. Designers must size the motor correctly to drive the air without overheating the motor. Motor cost, cost for required circuitry and/or need to use existing circuitry, and noise levels are all factors that must be considered.

Experience shows that when fans and motors are selected based solely on the manufacturer's specs, they may not perform as required. Fan and motor performance specs are usually based on optimum conditions, inconsistent with the extreme environment of most power applications. In these conditions, fans frequently require more energy than specified, requiring larger motors that, in turn, use more power. Do your homework.

Manufacturing process must be strictly controlled

Manufacturing processes must be strictly controlled to ensure that the oil cooler meets specifications. Maintaining cleanliness of the internal surfaces of the cooler during manufacturing is extremely important, especially surfaces that would come into contact with the circulating oil. It is essential that no metal particles are introduced that could contaminate the oil. Particles that could get into the transformer windings with the oil would be extremely detrimental to the life of the transformer.

In addition to a clean manufacturing process, cleaning processes—like a flushing system and electronic monitoring or particle counting systems—can be insurance that the system will perform as required and protect the transformer.

Oil coolers protect transformer investment

Power facilities must perform continuously, often in extreme environments. Properly sized and configured, high-quality transformer oil coolers play a vital role in maintaining safe, efficient, and reliable electricity production. Overheating can shorten the transformer's life and, in severe cases, lead to serious and costly damage—even transformer destruction. Special care is needed to design cooling systems that accurately reflect the existing onsite ambient conditions. EB

Laurie Brescacin is a senior consultant with London, Ont.-based Unifin International LP. For more information on air- or water-cooled transformer oil coolers, visit www.unifin.com.

REGIONAL FOCUS

NOVA SCOTIA ELECTRICAL CONTRACTORS ASSOCIATION

Nova Scotia incorporates new electrical contractor association

The word is out: on August 1, 2008, the Province of Nova Scotia incorporated the Nova Scotia Electrical Contractors Association (NSECA), a new group that aims to act as the voice of both non-union and union electrical contractors in the province.

"With all the issues facing electrical contracting professionals—including contractor licensing—there's never been a greater need for an association of electrical contractors for electrical contractors to stand up for our interests and concerns," said Colin Campbell, president of NSECA, and owner of the electrical contracting firm CM Campbell Electric Ltd.

To get the association up and running, NSECA has called a General Meeting at noon, March 26, at Eddy Supply, Bayers Lake Industrial Park (31 Oland Crescent in Halifax), where common interests and goals will be discussed, followed by work on a strategic plan.

"Many of our peers in other provinces—British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec and New Brunswick—already belong to established electrical contractor associations," notes Campbell, adding, "It's time Nova Scotia's electrical contractors also made their voices heard and, to do that, we need to speak with a united voice! I invite and encourage every electrical contractor in Nova Scotia—regardless of size—to attend and become members."

Affiliated industry professionals, such as distributors, suppliers, inspectors, etc., are also encouraged to participate in NSECA's activities.

For more information, e-mail campbellc@eastlink.ca.

Energy strategy identifies The Yukon's vision and priorities

Minister of energy, mines and resources for The Yukon, Brad Cathers, has released "Energy Strategy for Yukon"—a long-term vision for responsibly developing and managing energy resources to meet the territory's needs.

The energy strategy addresses priority energy issues, including:

- conserving energy and using it more efficiently;
- increasing the supply and use of renewable energy;
- meeting The Yukon's current and future electricity needs; and
- managing responsible oil and gas development.

Development of the strategy included energy sector research, a public workshop and extensive consultation involving First Nations, stakeholders and the public.

To get a copy of "Energy Strategy for Yukon", visit www.gov.yk.ca.

Nova Scotia building code changes postponed

Implementation of Nova Scotia's new building code regulations is being rescheduled for late 2009 to help the construction sector make the changes more smoothly.

Consultation with industry revealed that builders and their customers would benefit from having more time to fulfil building agreements made under the current building code. This would minimize additional costs and allow time for businesses to use up existing materials inventories.

The consultation also showed that industry wished to have more education and time for training to implement significant changes to the code that address—for the first time—energy and water conservation measures. The proposed changes will mean more energy- and water-efficient homes and offices for Nova Scotians, and maintain consistency with national standards.

"This is exactly why ongoing consultation is an important part of government's work," said Mark Parent, minister of labour and workforce development. "We are responding to the interests of industry stakeholders affected by changes to the building code, while making sure the new code will work for them as well as it will to protect Nova Scotians."

During a consultation period that ended December 3, 2008, most respondents strongly endorsed the new goals for energy and water conservation measures but felt more time and information would be required to implement them well.

"Extending the proposed implementation period will increase and speed up compliance with the new code," said Peter Greer, chair of the Nova Scotia Building Advisory Committee. "It will also foster positive relations between building officials and the industry into the future because it shows that government is listening to our recommendations."

The proposed changes are available on the Labour and Workforce Development website at www.gov.ns.ca/lwd/buildingcode.

Record spending in New Brunswick's post-secondary education infrastructure

New Brunswick is investing $105 million in the Edmundston, Saint John, Moncton and Bathurst community college campuses over the next two years, said Donald Arseneault, post-secondary education, training and labour minister.

"This is an important step in increasing community college student capacity and making the connection between our post-secondary education system and our province's changing labour market needs as we move to be self-sufficient by 2026," said Arseneault. "When you combine the additions to these four campuses, the network will see an additional 1200 seats allowing more students to enter the province's community colleges."

Edmundston will get $35 million for a new 116,208-sf campus adjacent to the current high school and Université de Moncton-

REGIONAL FOCUS

Edmundston campus (100 total new seats). Saint John will see $44.3 million for a new 24,210-sf building on the UNBSJ campus and a new 96,840-sf building on the main campus at Grandview Avenue (600 total new seats). $20 million has been earmarked for Moncton for overhauling the existing facility and reassigning training spaces to maximize shop and classroom availability. This will include an additional 29,052 sf of training space behind the current facility (400 total new seats). $3.6 million is headed to Bathurst, where a multi-purpose, 12,600-sf shop is being added to the trades site (100 total new seats).

Another $2 million will be available this year for regular campus maintenance.

New independent electricity efficiency administrator in Nova Scotia

A new, independent administrator for programs to help cut electricity consumption and reduce peak demand will be created in Nova Scotia, as recommended in a Dalhousie University report.

The report recommends creating an independent entity for electricity demand-side management, reporting to a board of directors, and overseen by the Utility and Review Board (UARB). The new administrator is expected to be in place before the end of next year. Required legislation changes are scheduled for the spring.

David Wheeler, dean of Dalhousie University's faculty of management, led a consultation this past spring to determine who should administer programs to help cut electricity consumption and reduce peak demand.

"Energy experts agree that energy efficiency and conservation are key to keeping electricity affordable for Nova Scotians," said Richard Hurlburt, minister responsible for Conserve Nova Scotia. "Demand-side management programs will help consumers manage their electricity costs and protect them from higher electricity rates."

UARB approved Nova Scotia Power as the interim administrator. Conserve Nova Scotia will continue to deliver energy efficiency and conservation programs, refocusing its efforts on fuels rather than electricity.

Four electricity demand-side management programs started in Summer 2008, including direct-install lighting for small business, housing efficiency upgrades for low-income families, a commercial and industrial custom program and an efficient lighting products awareness campaign. A copy of the report is available online at www.conservens.ca/publicconsultations.

PEI electrical inspectors say aluminum is okay

Electrical inspectors in P.E.I. are advising Islanders that aluminum wiring can be safe but must be properly maintained.

Inspectors have received a number of enquiries recently about the safety of aluminum wiring—many calls coming from homeowners considering alternate heat sources, such as portable heaters, electric fireplaces and electric baseboard heating.

Although not commonly used anymore in residential dwellings, aluminum wiring was often installed in homes from the mid 1960s until the late 1970s. Officials in the Electrical Inspection Section of the Department of Communities, Cultural Affairs and Labour say aluminum wiring is both safe and permitted under the Canadian Electrical Code. However, inspectors stress the importance of maintaining proper connections and terminations in older wiring installations.

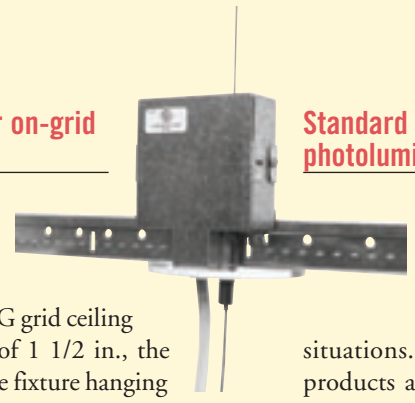
There have been some reported problems with aluminum wiring related to overheating and failure of the terminations. This can happen as the wiring ages because aluminum has a tendency to oxidize and may not be compatible with devices designed for use with copper wire. As well, inspectors caution that, throughout the years, rodents may have used insulation around the wiring for nests, leaving the wires dangerously exposed.

Some homes may contain both aluminum and copper. Inspectors say that anyone with concerns about the wiring in their home should contact a qualified electrical contractor who is knowledgeable in working with and repairing aluminum wiring.

Questions about aluminum wiring in residential dwellings can be directed to a senior electrical inspector at (902) 368-5280.

EB LIGHTING PRODUCTS

Litecontrol canopy box T-bar on-grid mounting solution



Litecontrol's canopy box is designed for on-grid lighting fixture mounting in T-bar ceiling installations. Intended for installation in a NEMA Type G grid ceiling with a maximum T-bar height of 1 1/2 in., the canopy box can be installed where fixture hanging cables are located on a Main T. The canopy box is cUL approved; the feed cord enters the electrical box directly below the ceiling plane; and is intended for use with 9/16-in. T-bar, 15/16-in. T-bar and screw-slot T-bar.

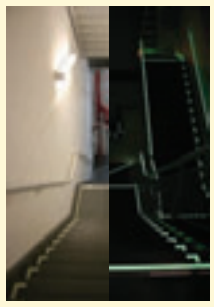
LITECONTROL
www.litecontrol.com

Vista LTC recessed LED commercial nightlights

Vista's LTC nightlights provide compact, recessed LED wall-mounted units, with light-directing integral louvers that may be specified for vertical interior installations in long-term care and other facilities. The nightlights are characterized by non-glare light that consumes just 5 watts per unit, whether Amber, Blue or White LEDs are selected. Each of three models have the same dimensions, with a choice of an open faceplate, and vertical die-cast louvers, including an optional photocell. The lights have a low-profile appearance with no sharp edges, and are easily cleaned. They're coated with AgION slow-release antimicrobial that inhibits bacterial colonization on painted interior and exterior surfaces.

VISTA LIGHTING
www.vistalighting.com

Standard Safety Glow photoluminescent products



Standard's Safety Glow products provide continuous supplementary lighting to help guide people in emergency situations. The photoluminescent products absorb and store ambient light that becomes immediately visible in a sudden blackout or smoky conditions. In addition to photoluminescent way-finding strips, consider installing a non-slip system on the edges of steps and landings to help prevent slips and falls. The Safety Glow line offers a variety of exit signs, egress systems for both high- and low-traffic areas, as well as photoluminescent tape and directional signs.

STANDARD PRODUCTS
www.standardpro.com

Ushio Ultraline Titan MR-16 lamps

Ushio introduced an MR-16 that can last, it says, up to 18,000 hours. Ultraline Titan lamps promise to last three times longer than standard MR-16s, and are available in spot, narrow flood, flood and wide flood beam spreads. Titan employs an axial filament that is computer-aligned to attain precise 12°, 24°, 36° and 60° beam angles.

USHIO
www.ushio.com

EB PRODUCTS

Petro-Canada Luminol TR and TRi electrical insulating fluids

Petro-Canada says Luminol TR and TRi electrical insulating fluids are the only fluids in the Canadian market meeting the new Type III and Type IV special requirements introduced by CSA, which were created to ensure electrical insulating fluids perform under the demand put on by today's HVDC and shell-type power transformers, free-breathing transformers operating under overload conditions, and reactors. Referred to as CSA C50-08 (formerly CSA C50-97), the new spec includes four revisions: upgraded ASTM D1275B corrosive sulphur testing; addition of a reclaimed oil category; limits for 2-furaldehyde; and the two new fluid categories (Type III and Type IV). The fluids are suitable for use in large power and distribution transformers operating at peak capacity.

PETRO-CANADA
lubricants.petro-canada.com

Ty-Rap pneumatic cable tie installation tool

Thomas & Betts Canada suggests you try out its Ty-Rap pneumatic cable tie installation tool for fast, consistent cable tie installation in high-volume applications. Pneumatic power combined with ergonomic design lets you tension and trim large quantities of Ty-Rap cable ties in rapid succession with accuracy and one-button ease. Rotate the narrow nose 360° to get into tight spaces. Set the tension with a quick twist of the tension-adjustment wheel, which is located near the nose for easy access. For repetitive work requiring a constant tension, use the tension lock to prevent accidental setting changes. A storage slot in the handle keeps a spare cutting blade at hand. You can use the tool to install Ty-Rap cable ties from 18 lb to 50 lb in tensile strength.

THOMAS & BETTS CANADA
www.tnb-canada.com

Siemens expands smart MCC product line

Siemens is expanding its Tiastar Smart motor control centre (MCC) product offering to provide seamless integration of this line into customer sites with competitive control systems. The company's new offering includes a series of gateway solutions that transition the Profibus-DP network inside the Smart MCC to the customer-desired control network. The gateway solutions are factory-installed and programmed in a 12-in. MCC bucket. Additionally, Siemens has developed a series of PLC card solutions, which enable easy integration of the Smart MCC to run Profibus-DP through Rockwell or Modicon PLCs. Both solutions have been tested on the full suite of Smart Components in the Tiastar Smart MCC.

SIEMENS ENERGY & AUTOMATION
www.sea.siemens.com

Littelfuse Up-LINK fuseholder

Littelfuse's new remote-indication fuseholder employing Up-LINK technology integrates into a facility's existing monitoring network or PLC; when a fuse opens, a control signal is generated that can be relayed via the control network to maintenance personnel, indicating precisely where the fuse is located. In conjunction with a user-programmed PLC, users have the option to transmit additional information that can further reduce downtime, including fuse type and the tools needed to replace it, and required PPE. Each fuseholder is also equipped with a built-in indicating LED that further identifies the open fuse inside a panel. The DIN-Rail mountable, dead-front fuseholders house Class CC and Midget style fuses, are UL-approved, and meet all applicable IEC requirements.

LITTELFUSE
www.littelfuse.com

Cooper Bussmann Quik-Spec distribution products

Cooper Bussmann's Quik-Spec family of electrical distribution equipment promises a simple and cost-effective way to selectively coordinate a fused electrical distribution system. The Quik-Spec family includes a coordination panelboard, power module switch and panel, and safety switch. With this system, there's no need to do a short-circuit current study or plot time-current curves to engineer fuse selective coordination. The fusible panelboard is UL listed, while the switch and panel both meet prevailing ANSI/ASME, NEC and NFPA 72 requirements for shunt-trip elevator disconnect applications. The safety switch meets UL and NEC requirements, features an enhanced finger-safe design and an easy interface with viewing window. Plus, its Class J performance Low-Peak CUBEFuse offers arc flash protection.

COOPER BUSSMANN
www.cooperbussmann.com

GE AKD-20 low-voltage switchgear with EntelliGuard

Employing EntelliGuard G low-voltage circuit breakers (available from 800A to 5000A with fault ratings up to 150kAIC) and the TU Trip Unit, the AKD-20 low-voltage switchgear promises to enhance system reliability and arc flash protection. The AKD-20 involves a footprint that uses smaller section sizes when possible: 22-in., 30-in. or 38-in. widths. Since the breaker compartment doors have no ventilation openings, operators are protected from hot ionized gases vented by the breaker should an arc flash incident occur. The switchgear integrates a bus system that offers different levels of protection, while insulated and isolated bus makes maintenance procedures touch-friendly to reduce the risk of arc flash. To learn about the AKD-20's many other features, visit the website.

GE CONSUMER & INDUSTRIAL
www.ge.com

APC 800kVA to 1100kVA MGE Galaxy EPS 8000 UPS

APC's three-phase MGE Galaxy EPS 8000 1000/1100kVA uninterruptible power supply (UPS) offers scalable power protection. Relying on 12 pulse rectifier and inverter technologies to restrict total harmonic distortion to less than 5%, and boasts an integrated galvanic copper isolation transformer. A 100% step-load capability promises a quick response to load changes with accurate voltage regulation. In addition, the 8000 incorporates fault tolerant circuitry that protects it from accidental short circuits (usually caused by load side failures or overloads) and a 100% rated output static switch with a stable, predetermined response time. The UPS interfaces with common communication protocols and incorporates four communication slots in a rackmount multi-slot case to support SNMP, J-Bus/ModBus and RS232-RS485 protocols.

APC (by Schneider Electric)
www.apc.com

Leviton expands Powerswitch safety disconnect switch line

Leviton expanded the PowerSwitch safety disconnect switch line to include the enclosed disconnect switch with receptacle (EDSR-23). It combines a 30A, 600vac safety disconnect switch and NEMA locking receptacle in one enclosure, resulting in faster installation, easier maintenance and, says Leviton, longer device life. At 6.25-in. wide, the EDSR-23 fits between an I-beam's flanges and provides enough wiring space for both switch and receptacle. EDSR-23 accepts standard 20A or 30A NEMA locking flush receptacles rated up to 600V and is shipped complete with grounding plate and wires for connecting receptacle to switch.

LEVITON
www.leviton.com

Ideal Term-A-Nut grounding connectors

The Term-a-Nut grounding connector allows for quick, hassle-free grounding of steel outlet boxes, enclosures and electrical devices. Requiring no crimping or specialized tools, Term-a-Nut connectors can be easily removed for either fast changes or repeat usage. Professional-grade features include: heavy-duty, solid brass terminal; thread-forming ground screw with combination hex, Phillips and slotted heads; and flexible lead wire. You can choose from connectors that have a pigtail with either a fork terminal or with a ring and ground screw, or the grounding combo that has a pigtail with a ring and ground screw, combined with a jumper and a fork terminal. The connectors are available in bags of 10, 25, 100 and 250 pieces.

IDEAL INDUSTRIES
www.idealindustries.com

P&S Plugtail Power PreFab wiring assemblies

Pass & Seymour/Legrand's PlugTail Power pre-fabricated wiring assemblies will help commercial electrical contractors realize greater efficiencies with repetitive installations in, for example, hotels, office buildings and condominiums. The assemblies install simply, with no vertical measuring necessary for the floor brackets, which slide under the sill plate. The wall brackets screw directly to the studs. The assembly system includes floor or wall brackets with one- or two-gang openings, pre-installed boxes and pre-installed mud rings available in 5/8-in. or 3/4-in. rise. The assembly also includes support arms in the back, to brace the unit and ensure rigidity. P&S PlugTail Connectors are pre-wired to the ground screw and allow contractors to make device choices at finish.

PASS & SEYMOUR/LEGRAND
www.passandseymour.com

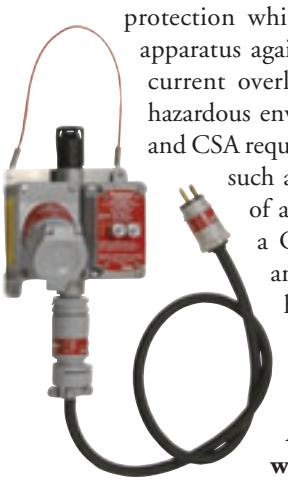
Cooper Crouse-Hinds wireless monitoring solutions

Cooper Crouse-Hinds has added a product line of industrial-focused wireless monitoring solutions that are designed specifically for monitoring and controlling processes in challenging or difficult industrial and hazardous applications. Through a system of transmitters, receivers, transceivers and interface gateways, the Industrial Wireless Solutions offer both one- and two-way wireless monitoring capabilities for a host of industrial applications, including tank level monitoring, pump performance metrics, conveyor belt alignments, heat trace monitoring and more. The line is complemented by a list of accessories, including high-powered antennas and explosion-proof enclosures.

COOPER CROUSE-HINDS
www.crouse-hinds.com/wirelessIO

Appleton U-Line portable receptacle/GFCI

Appleton has expanded its U-Line series of electrical receptacles to include a Class I, Division 1 and 2 portable receptacle/GFCI combination. The 125vac receptacle delivers open neutral protection while also safeguarding the connected apparatus against damage from short circuits and current overload. Engineered to safely work in hazardous environments, the combo meets all UL and CSA requirements for non-hazardous locations, such as marinas. The device is constructed of aluminum and weighs 7.5 lb, features a GFCI designed for 20A receptacles, and has a built-in carrying handle and heavy-duty, three-foot SO power cord. A visible pilot light indicates the GFCI is engaged and the receptacle ready for use.



APPLETON
www.appletonelec.com

Eaton's Blackout Tracker keeps tabs on nation's power outages

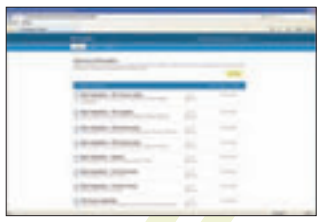
Eaton Corp.'s Blackout Tracker provides a snapshot of reported power outages across the country. With information compiled by Eaton Power Quality Co. since April 2008, the tracker serves as an interactive and educational resource showcasing the causes and impact of power outages. Blackout Tracker divides Canada into four regions, and categorizes blackouts by cause (i.e. animals, weather/falling trees, theft/vandalism, vehicle accidents, etc.). Visitors are invited to submit their own outage reports online and request an annual Blackout Tracker report that provides a statistical analysis of power outages reported across the nation and in their home state.

To check it out, visit www.powerware.com/canada (you may be asked to register, though registration is free).

Guide for installing photoluminescent exit stairway markings

The NRC-IRC has published a guide providing information about the installation of photoluminescent (PL) markings in buildings, and the requirements for satisfactory performance. In blackout situations, PL safety markings in the form of paint, plastic strips and signs can aid evacuation by guiding and directing people to safer locations. While the guide was developed primarily for federal office buildings, it can be used to aid in the design and installation of PL markings in other types of buildings with enclosed exit stairways as means of egress.

Visit irc.nrc-cnrc.gc.ca/pubs/fulltext/nrcc50818.



Hammond HPS Academy transformer training centre

Hammond Power Solutions (HPS) has launched an online resource centre to educate visitors on transformer technologies, helping them better evaluate performance characteristics and improve system efficiency. The online resource features interactive presentations focused on HPS products, electrical standards and regulations, installation procedures, theory and more. HPS plans on adding at least 40 training modules to the resources centre this year.

Visit the HPS Academy at www.hammondpowersolutions.com (click the announcement).

WAGO's eBooks tool offers access to catalogues

WAGO Corp. has moved its five full-line product catalogues online to create the eBooks tool. The move gives you online access to the nearly 17,000 products from WAGO's interconnect, electrical interface and automation product lines. The eBooks have a search and indexing system to help you locate and print catalogue pages.

Access WAGO's free eBooks online tool at www.wago.us/ebooks.htm.

Controlled Power "Electrical Power Solutions" brochure

Controlled Power Co. , a manufacturer of electrical power quality solutions, has published an "Electrical Power Solutions" brochure. Available in both PDF hardcopy formats, the six-page, colour document highlights key products in the company's major product families, as well as the typical market applications for each product.

Visit www.controlledpwr.com.

Fluke multimeter application note for under-utilized functions

Fluke Corp. has published a series of application notes to help you perform advanced testing with its digital multimeters (DMMs). For example, one under-utilized function is Fast Min/Max or Peak Min/Max recording, available on the Fluke 287-289 and 187-189 DMMs. When set up to monitor a signal or system, these DMMs can capture intermittent or transient events as short as 250µs, and can record the time and duration of the event. With this information, you gain insight into the stability of the signal or system you're evaluating.

For more information, visit www.flukecanada.ca.

Columbia Lighting launches new website

In addition to a new look, Columbia's website offers a variety of product search options, including Quick Search, Products Menu, Search by Type and Search by Feature. The product pages contain four tabs offering you an overview, product and application images, technical drawings, spec data and literature. Ordering information and availability tables are available as a pop-up reference. Columbia's createchange energy-efficient luminaires and energy analysis software tools are also there under Resources, making it easier to research, specify and choose energy-saving lighting solutions.

Visit www.columbialighting.com and check it out.

Stahlin SolarGuard animated 3D video

An animated 3D video available online demonstrates how SolarGuard from Stahlin Non-Metallic Enclosures protects composite enclosures from UV degradation. SolarGuard is a non-haloginated system, meaning it contains no bromine or antimony, thereby reducing the risk of smoke-borne toxicity. The proprietary formulation technology enhances the molecular bond strength and crosslinking that occur during the curing process, making it more difficult for UV energy to attack the molecular bonds of both primary chains and crosslinks.

Follow the front page SolarGuard navigational button at www.stahlin.com.

IEC launches new Webstore

IEC has launched a new version of its IEC Webstore, coinciding with the store's 10th anniversary. On a functional level, you can place orders faster, while an advanced search tool provides further refinement with the possibility to select publications on the basis of header references such as IEC or CISPR, TC (Technical Committee) numbers or their titles, and ICS number references or their code titles. A further possibility lets you enter publication date ranges to obtain the publication you're looking for. New functionalities are expected to be added in the coming months.

Visit webstore.iec.ch.

NAED Green Commercial and Industrial Guides

The National Association of Electrical Distributors introduced two planning guides that underscore green electrical products and solutions proved to reduce electrical consumption and commercial building operating costs. "Industrial Upgrades: Green Electrical Cost Savings" and "Commercial Upgrades: Green Electrical Cost Savings" are available to NAED members, associates and allied partners.

For more information, e-mail Customer Service at customerservice@naed.org or visit www.naed.org.

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For complete details, call **1-877-259-0941, ext. 2912** or e-mail us at **marketingcdn@ge.com**.

www.ge-ed.ca www.geindustrial.com

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BY LES STOCH, P.ENG.

Rule 36-110, Tables 33 and 34

Rule 36-110 in the Canadian Electrical Code (CEC 2009) refers us to Table 33–Horizontal Clearances from Adjacent Structures and Table 34–Vertical Clearances for Overhead Lines, to provide minimum safety clearances for installations operating in excess of 750 volts. Table 33 provides minimum horizontal clearances between high-voltage conductors and buildings. Table 34 provides minimum ground clearances for overhead lines.

I will review Tables 33 and 34 and their reference to CAN/CSA-C22.3 No. 1-01, Overhead Systems. Tables 33 and 34 both apply to voltages up to 69 kV. For applicable clearances above 69 kV, Rule 36-110(2)(a) refers us to the aforementioned CSA overhead lines standard.

Based on their operating voltages, both the CEC and the CSA standard provide a range of minimum horizontal and vertical clearances for overhead conductors, but their minimum specified clearances *are different.* The tables found in the CSA standard usually result in smaller clearances than those found in Tables 33 and 34. So why are these minimum requirements different?

Tables 33 and 34 both contain the note "See Appendix B"; when we turn to Appendix B, we find the following statement: "The spacings and clearances shown in these tables differ intentionally from those found in CAN/CSA-C22.3 No. 1, as explained in Clause 4.2.1 of that standard". But what's that all about?

If we are fortunate enough to have a CSA overhead lines standard on our bookshelf, we can easily find Clause 4.2.1 which explains that the clearances shown in the CSA overhead standard apply to "design limits rather than clearances for construction or day-to-day operation". The standard further specifies that "clearances under day-to-day conditions will be greater than the minimum specified clearances...".

A footnote under Clause 4.2.1 provides a further clarification: "Clearances specified in the Canadian Electrical Code-Part I apply at the time of installation rather than under specified maximum conditions and are therefore larger than those specified in the Canadian Electrical Code-Part III for the reasons previously explained in this Clause".

Confused? In other words, Table 33 and 34's minimum installation clearances are considered sufficiently large so as to allow for all expected operating and environmental conditions, such as prevailing winds, icing and ambient temperature variations. The minimum clearances specified in the CSA Part III overhead standard, on the other hand, must be increased by a sufficient amount so as to allow for actual environmental and operating conditions. This dissimilarity in approach accounts for their differences.

If we look even further, we find that CSA C22.3 No. 1 also contains Clause 3.1.1, which states the following for situations where more than a single requirement may apply: "Wherever two or more requirements apply to any situation, the requirement for the greater clearance, separation, spacing or strength shall govern". Obviously, Clause 3.1.1 requires greater clearances for compliance with other requirements, such as health and safety regulations for people working in the vicinity of overhead lines.

For example, let's assume that the horizontal distance between an overhead line and a building has met the applicable minimum clearance specified in Table 33 or Table 9 of the CSA overhead standard. Let's say that someone puts up a ladder to maintain or repair the building. As I interpret Clause 3.1.1, extra clearance is required to ensure that a person working on the ladder will not violate the applicable limits of approach specified in the health and safety regulations.

Clearly, on their own, the minimum clearances between overhead lines and buildings as specified in the tables of the CEC and the CSA standard do not at all times ensure that a worker on a ladder placed between an overhead line and a building is able to work safely, without violating other safety rules. As we all know, working on ladders in the vicinity of overhead lines is often the cause of many serious electrical accidents.

In my view, Clause 3.1.1 clearly states that other requirements, such as limits of approach, need to be considered when the CSA overhead standard is applied to minimal horizontal clearances from buildings. We also know that other requirements are not always considered.

One thing that does remain unclear is whether this rule also applies to Table 33? If not, does the CEC need a rule similar to Clause 3.1.1? What do you think? EB

Les Stoch is president of L. Stoch & Associates, specialists in quality management/engineering services. He is a member of PEO, OEL and IAEI, and develops and delivers electrical code and technical workshops for Dalhousie University. He also developed the Master Electrician training program and exam (Ontario) for the Electrical Contractor Registration Agency. Visit L. Stoch & Associates online at www.lstoch.com.

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Tackle The Code Conundrum... if you dare

So, you think you know the electrical code, eh? Well, we'll soon find out if you're an electrical code junkie or downright code-clueless. Take a look at the following questions and check your answers in April's Electrical Business.

How did you do?

3 of 3 – Not only are you smart, you love to show off.
2 of 3 – You're pretty smart, but you still missed one.
1 of 3 – Your understanding of these questions is not up to code.
0 of 3 – Did you come up with your answers by playing Eenie, Meenie, Minie, Moe?

Question 1

Luminaires, lampholders and lighting track in dwelling units shall not be connected to a branch circuit protected by overcurrent devices rated or set at more than ___ .

a) 15 amps **c)** 30 amps
b) 20 amps **d)** 40 amps

Question 2

Rink areas that are provided with positive mechanical ventilation capable of changing the air at least ___ times per hour shall be permitted to be regarded as dry locations.

a) 1 **c)** 3
b) 2 **d)** 4

Question 3

TW75 conductors in raceway are permitted for the wiring of ceiling outlet boxes on which a luminaire is mounted.

a) True
b) False

Answers to Code Conundrum

Electrical Business February 2009

Q-1: The bonding conductor for the metal parts of pools shall be permitted to be of aluminum

b) False. Subrules 68-058(1) and (7) require the bonding conductor for metal parts of a pool—and non-electrical equipment associated with the pool—to be of copper.

Q-2: Where conductors No. 8 AWG or larger issue from a raceway, they shall be protected from abrasion by an equipment hub with a smoothly rounded throat, an insulated type bushing, or insulating material that separates the conductors from the raceway fitting and affords adequate protection from mechanical injury.

a) True. Rule 12-906(2).

Q-3: Armoured cable shall be permitted to be fished into wall cavities containing concealed knob-and-tube wiring or non-metallic sheathed cable.

b) False. Rule 12-612.

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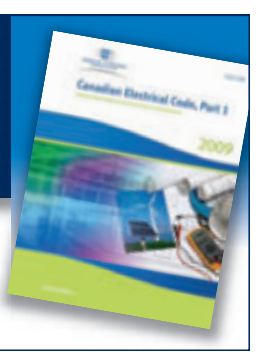

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