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The Utility Source™ is published twelve times a year on a monthly basis by H&F Media Group, Inc., 951 1st Ave. W. Alabaster, AL 35007 USA. The Utility Source™ is distributed free to qualified subscribers. Non-qualified subscription rates are $57.00 per year in the U.S. and Canada and $84.00 per year for foreign subscribers (surface mail). U.S. Postage paid at Birmingham, Alabama and additional mailing offices.

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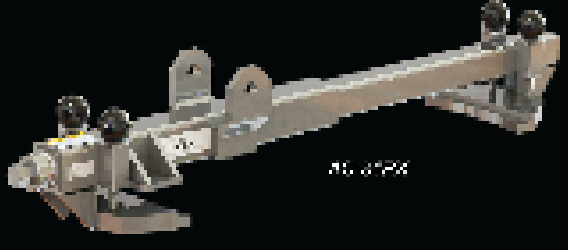

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The Evolution of the Smart Grid Ecosystem

Fasten Your Seat Belts

By James Brancheau

There is a lot of money pouring into development of the smart grid. The federal stimulus package set aside $4.5 billion for starters. That's not bad for seed money. Private money is also pouring in because investors believe this is the "next big thing." However the architecture develops, the smart grid will be tied together using a digital network running open standards. These standards will overlap heavily with those running the internet. All the tech giants are jumping into the smart grid at some level or another. It makes perfect sense. They have the capital and the digital pedigree. The scale and scope of this problem-set is so large that each one has a variety of partners. Partners range from big utilities, to tiny start-ups, to legacy grid suppliers. There are direct competitors in opposing camps (e.g. Microsoft vs. Google), as well as companies placing bets across competing technologies to increase their chances of winning market share (e.g. Cisco and IBM). It's reminiscent of the early days of the commercial internet when new giants were born and others consolidated their power.

The world is moving from a fossil-fuel economy to an electricity economy based on nuclear and renewables. There are major obstacles to overcome including rapid technology change, a fragmented regulatory landscape, and the conservative nature of utilities. The grid will collect information about energy use and display it for the consumer and their utilities. Consumers win if they use the information to save money. Utilities win by providing opt-in incentives for shaving peak loads and avoiding the cost of new power plants at $500M to $1B each, with nuclear at $10B. The home energy management system (EMS) might appear to take center stage, but it's just one element in the digital home.

If the smart grid represents the future of electricity, then it also represents the future of home technology. Consider that the digital home already includes a combination of broadband, PCs and Macs, iPods, smart cell phones, digital televisions, media centers, game players, music controllers, and more. Consider that these devices are becoming more interoperable year-by-year. Smart phones are becoming as capable as PCs, iPods run home stereo systems, digital televisions record and playback TV on demand with recordings controlled from PCs or smart phones, media controllers connect to computer downloads, etc. Yet the potential of all these devices has not been realized. Synergies have not been achieved.

Both the digital home and smart grid will be based on open standards which embrace and extend those that power the web today. In a mere 15 years, the web has completely redefined the global landscape of communication and business technology. In the next 15 years, the smart grid (in concert with the digital home) will again redefine our technology experience. This won't be restricted to residential digital homes, it will grow even faster in commercial buildings. Together they use almost 70% of US electricity. The focus in commercial buildings will center on building automation and energy management.

With the emphasis on digital networking and standardized technologies, tech giants are being sucked in like steel to a magnet. The grid is pulling in top companies from information technology, consumer electronics, telecoms, and the web. Not to mention the industrial giants such as GE and Seimens. In upcoming articles we will profile the giants and work our way down to the focused players who are making the needed technological breakthroughs. I don't believe this is hype. Capital is pouring in, standards are being set, and infrastructure is being deployed. Projects are cropping up all over the world. Sure, it's going to take longer than everyone wants. But look at what happened in 15 years of commercial internet development. Tech change builds on itself and accelerates over time. Therefore the 15 years of internet-time could easily shrink to 10 years. And these next 5 years will set the stage for the next 50. Fasten your tech seat-belts. We live in interesting times.

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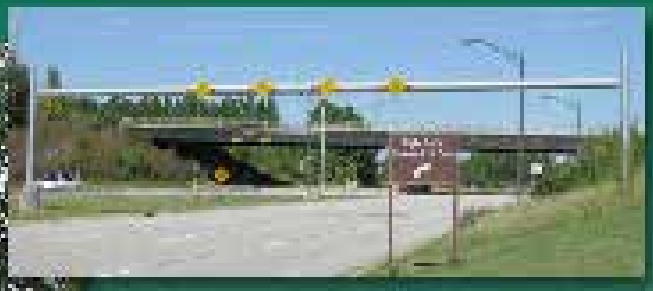

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Smart Grid Ecosystem - Here Come the Tech Giants

The smart grid has been called the "energy Internet" so it makes sense that giant tech companies are rolling out products and services. The enterprise IT companies, in particular, are ramping up their investments.

IBM has been focused on utilities consulting and software for several years. They offer enterprise software with extensive systems integration and IT support. Some of IBM's solutions are purpose-built for the grid, but many are just reconfigured from its extensive portfolio of enterprise applications. You can count on Cisco to get involved in every application of IP networks. The smart grid is no exception. Cisco will work with utilities on home area networking (HAN), backhaul services, network security, and network operations. Microsoft is naturally focused on software. A late mover, it recently jumped in with a software suite now in field trials. Coming out of the web, Google is experimenting with a web-based solution which it offers free to partner utilities (and their customers). Google sees a major play in all the data that will be generated. As in their primary market, they will go head-to-head with Microsoft, courting utilities and their customers. Oracle is focused on utility data management and operations integration around their database, middleware, applications and back-end technology infrastructure. Most of the majors are also making investments in the smaller players. And last to mention here, Intel is developing microprocessors for embedding into transmission and distribution equipment.

The other tech giants are not (yet) as deeply involved but they won't sit on the sidelines and let this market develop for long. Consumer electronics (CE) competencies revolve around the digital home and creating stylish, easy to use products. The growth of the smart grid will depend heavily on consumer acceptance and the CE companies know the consumer better than anyone. With the smart grid's requirement for digital networks spanning the continent, telecoms giants such as Verizon and AT&T are offering 3G wireless networking services to the utilities so they don't have to build their own networks from the ground up. They will also offer consumer solutions based on their cell-phone platforms. In Boulder's smart city, Xcel built out it's own fiber optic network, but that won't be the norm.

Each one of these companies brings its core competencies into the utility industry. Each one is building large partner networks. This opportunity wide and deep, no single company can provide all the solutions. The utilities industry is America's largest, almost double the size of the telecoms industry. Electric utilities control more than $600B in assets with $260B in annual revenue. There are more than a billion meters worldwide with more than 100M in the US. Upgrading so many meters, homes, and network assets is an opportunity on the scale of the internet. In another article, we'll discuss some of the smaller, innovative players in this space.

Dr. Brancheau has 30 years of experience in business, technology, and education. He is founder and CEO of Carbon-Pros, a B2B consultancy focused on business sustainability.

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Accident Prevention 101

By Christopher M. Hunter

The Crane Truck!

Crane accidents are one issue that construction industries are faced with on a daily basis. The incident rate of crane-related accidents has been rising over the past few years. In 2006, there were 72 fatalities recorded and that figure accelerated the following year to approximately 90 deaths. These accidents were due to mechanical failure, negligence on the part of the operator, and inadequate safety inspections.

Crane safety has been addressed by the Occupational Safety and Health Administration (OSHA) as well as the manufacturers. Protection from harm should always take precedence any time this machinery is in operation. OSHA calls for all employers to participate in precautionary measures to stop crane-related deaths.

OSHA'S Crane Safety Practices

To avoid preventable deaths and severe injuries, OSHA has designed the following guidelines:

- **Operator** - Only qualified and certified personnel should operate a crane truck.
- **Inspection** - A thorough inspection should be performed by qualified mechanics with importance placed on the control system.
- **Ground Position** - Hoisting equipment should be positioned on compact and even ground.
- **Work-site Safety** - The work zone should be marked using flags and outriggers should be fully extended per the recommendation of the manufacturer.

- **Overhead Clearance** - Operators should be aware of overhead power lines in the area. A ten-foot clearance should be observed from the swinging radius to the electrical lines.
- **Equipment Safety** - Hoist lines should not be wrapped around the cargo and all rigging should be inspected before operation.
- **Equipment Capability** - Operators should be updated with current crane configurations and absolutely know the maximum lifting capacity.
- **No Overloading** - Under no circumstances should overloading be permitted while hoisting.
- **Work-site Observation** - Material should not be moved if workers are in the vicinity.
- **Follow the Guidelines** - Universal crane signals and safety instructions must be followed while using the lifting equipment.

General Crane Safety Practices

Truck-mounted hydraulic cranes are the cause of the most incidents and fatalities among the various types of lifting equipment. Operators must be aware of general safety standards necessary to avoid deadly accidents.

- **Identify All Hazards** -

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Operators should identify the number of hazards present in the area: electrical, ground condition, and fall hazards.

- **Operator Training** - Training regarding cargo preparation, hydraulic truck operation, and load securing should be taken by operators before using hoisting equipment.
- **PPE Must be Worn** - Personal protective equipment should always be worn, i.e. hard hats, vests with retro-reflective stripes, and safety boots.
- **No Overloading** - Avoid exceeding the rated lifting capacity. This causes a high risk for accidental tip-over.
- **Secure the Cargo** - Always secure the cargo before lifting. Ensure that hooks and chains are properly fastened around the materials to be hoisted.
- **No Sudden Movements** - Avoid jarring of the equipment. Rotating, lifting and lowering of the hydraulic arm should be done gradually.
- **Avoid Lifting over Things or People** - Do not lift cargo over the cab of the crane or over workers.
- **Stabilize Crane** - Outriggers and stabilizers should be used extensively.
- **Use Signals** - Use a signal person if operators have limited views.
- **No Extra Riders** - Operators should not allow anyone to ride on a load while hoisting.

Accidents impact the business and the lives of the workers involved. They may affect the production level of the company or the ability of the company to generate revenue and cause financial hardship for the company because of such incidents. To address these issues, both the government and private business sectors have begun to encourage operators of hoisting equipment to join the safety campaign related to the usage of the crane truck. These safety guidelines should be a lifeline to operators to help them prevent irresponsible accidents that cause severe injuries or death from ever happening - it is a basic Accident Prevention 101!

Christopher M. Hunter is an expert in commercial specialty trucks. To find out more about National Crane Trucks, go to the main website at:http://www.centraltrucksales.net/home.

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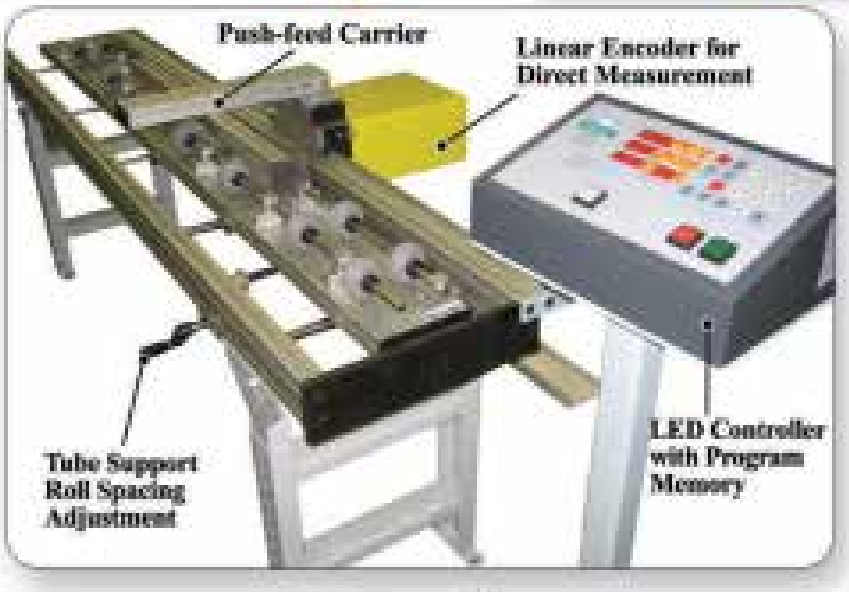

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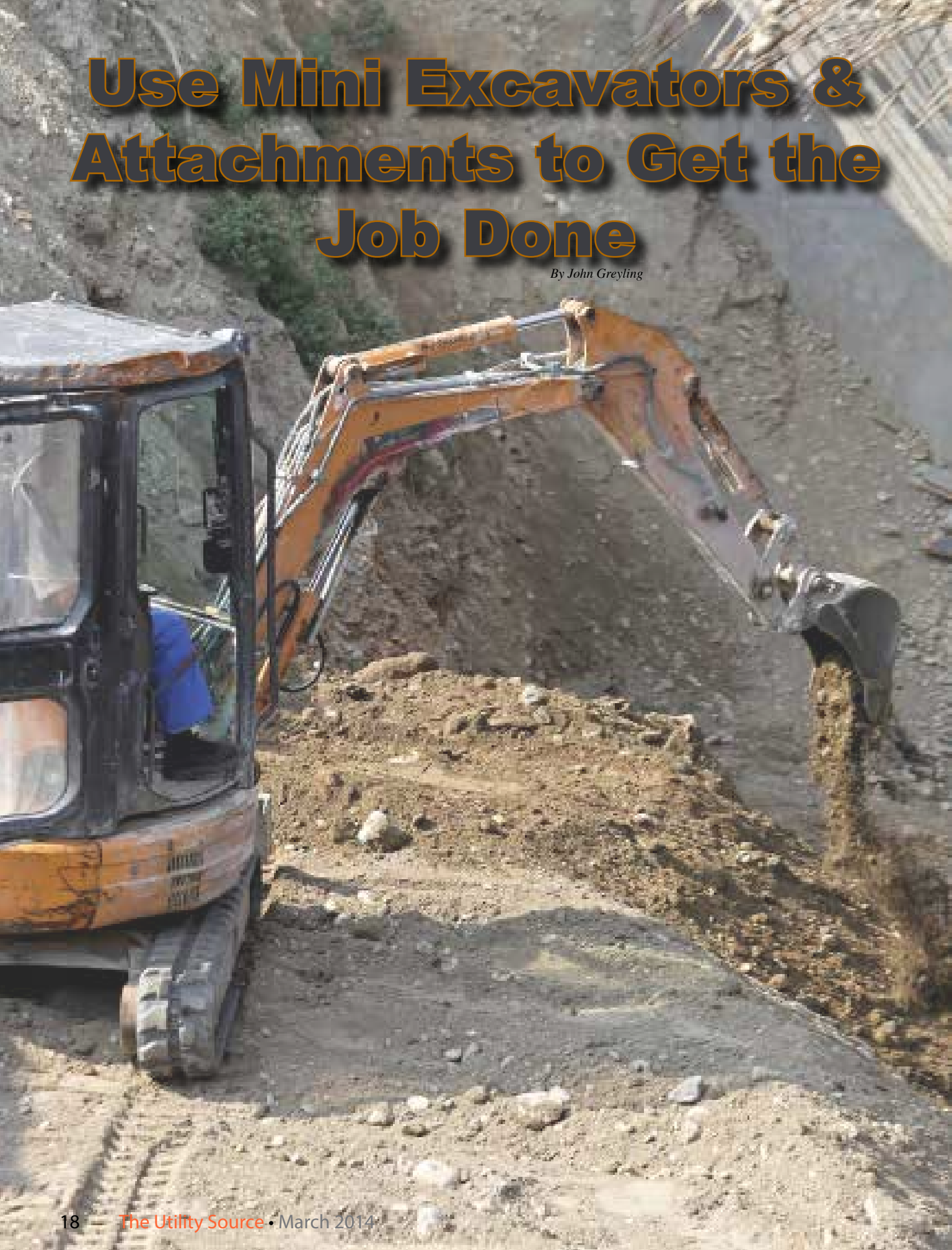
Use Mini Excavators & Attachments to Get the Job Done

By John Greyling



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Everyone is looking for a better and faster way to get jobs done, especially in the construction world of Oregon. Used mini excavators are not only extremely versatile they can do almost any job around the construction site. They are also suitable for the homeowner who is looking to perform improvement around the home. In Oregon, used mini excavators for sale are perfect for the rugged terrain and sloping land that is common.

Some tasks a mini excavator is able to perform with ease include:

• Breaking up rock or digging holes for pipe by attaching a hammer.
• Used mini excavators are also great for not disturbing traffic when digging up sidewalks or doing work near the street.
• You can also use these excavators for digging up a septic tank or doing some landscaping in your yard.
• You can use them for digging up the spot that you would like to put a pool in.

Some advantages to utilizing used mini excavators include:

• They can fit into small tight spaces. Some mini's can even fit through small yard gates.
• Almost anyone can get into an excavator and learn to operate them with ease.
• They can rotate in a 360 degree circle so you don't have to move around a lot when operating.
• These excavators are small enough to be loaded on some pull behind truck trailers, so hauling is made very easy.
• These excavators are light enough and come equipped with rubber treads so you don't have to worry about tearing up your lawn when doing home improvements.

In Oregon used mini excavators for sale come with so many attachments for different jobs that you can find exactly what you need to get the job done. If you're looking to dig footers for a new home or just adding a garage to your home, you can use the bucket attachment. If you need to bust up rocks or concrete you can get the hydraulic hammer attachment, to help jack hammer through hard surfaces.

Some of the (mini) excavator attachments available are as follows:

• Tilt buckets which are used for digging large holes or scooping up rocks and dirt to be moved out of the way.
• Grapples are used for picking up rocks and trees and other large objects that buckets can't scoop up.
• Clearing rakes are utilized for filtering through dirt to remove unwanted objects or smoothing out a surface.
• Metal shears for cutting metal and other very hard materials that you need cut into different sections.
• Wood splitters which are used for cutting trees into different sections for easier hauling.

There are so many mini excavator attachments it would be difficult not to find the one you need. These attachments for sale are not expensive and increase the versatility of the compact excavator tremendously. If you are looking into renting a one of these you can probably order the mini excavator attachment that you need for the job at no extra cost. For regular use investing in a used mini excavator might be a good idea.

John Greyling is a retired entrepreneur and businessman. During his career he acquired extensive experience if many business sectors. He now spends his time travelling the world with his family and writing. For more information on mini excavators visithttp://www.excavatorreviews.com/used-mini-excavators.html.

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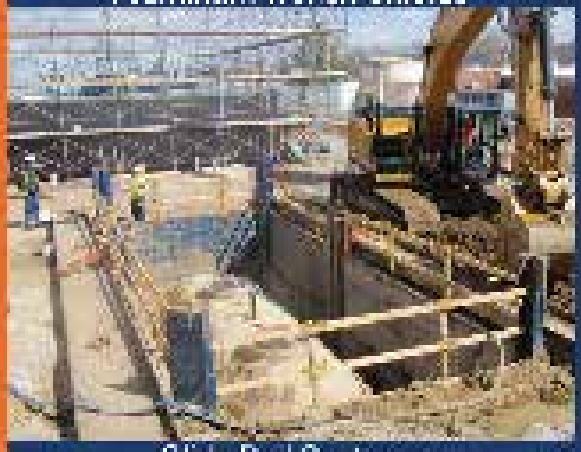

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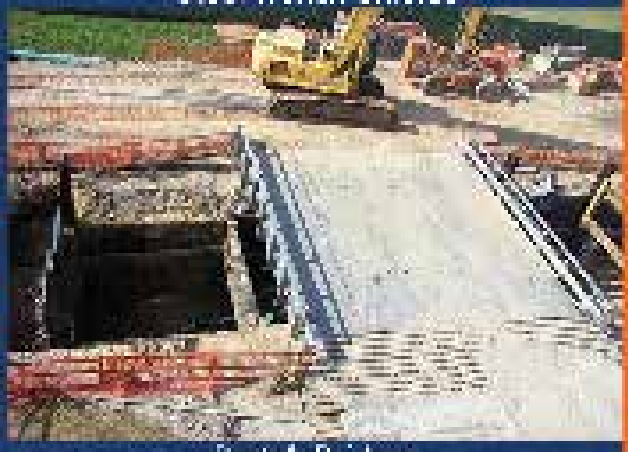

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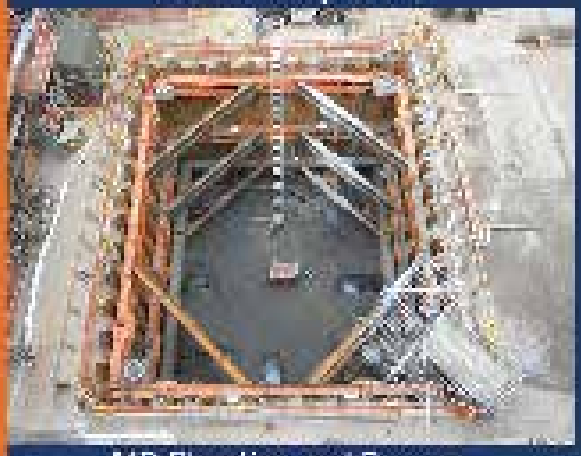

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Monitoring of Transformers

By Mike Dickinson

As a vital part of transmission and distribution systems, transformers are built and expected to be unfailingly reliable. Nevertheless, internal faults like partial discharges can occur, and the problem with such faults is that if left un-corrected, they can eventually morph into catastrophic faults that can result in power outages and even end-user property damage.

Transformer Monitoring: What's Involved

* Data acquisition
* Sensor development
* Data analysis
* Development of links between measurements and failures

Easily Prevented

Preventing disasters of this nature is actually quite simple, and involves transformer monitoring. Monitoring transformers and spotting problems before they turn into unmanageable incidents can prevent faults that are costly to fix and may result in a loss of service. Transformer monitoring mainly involves data acquisition, sensor development, data analysis, and the development of causal links between measured values and failures of transformers.

Installing monitoring equipment on transformers is usually done for two reasons:

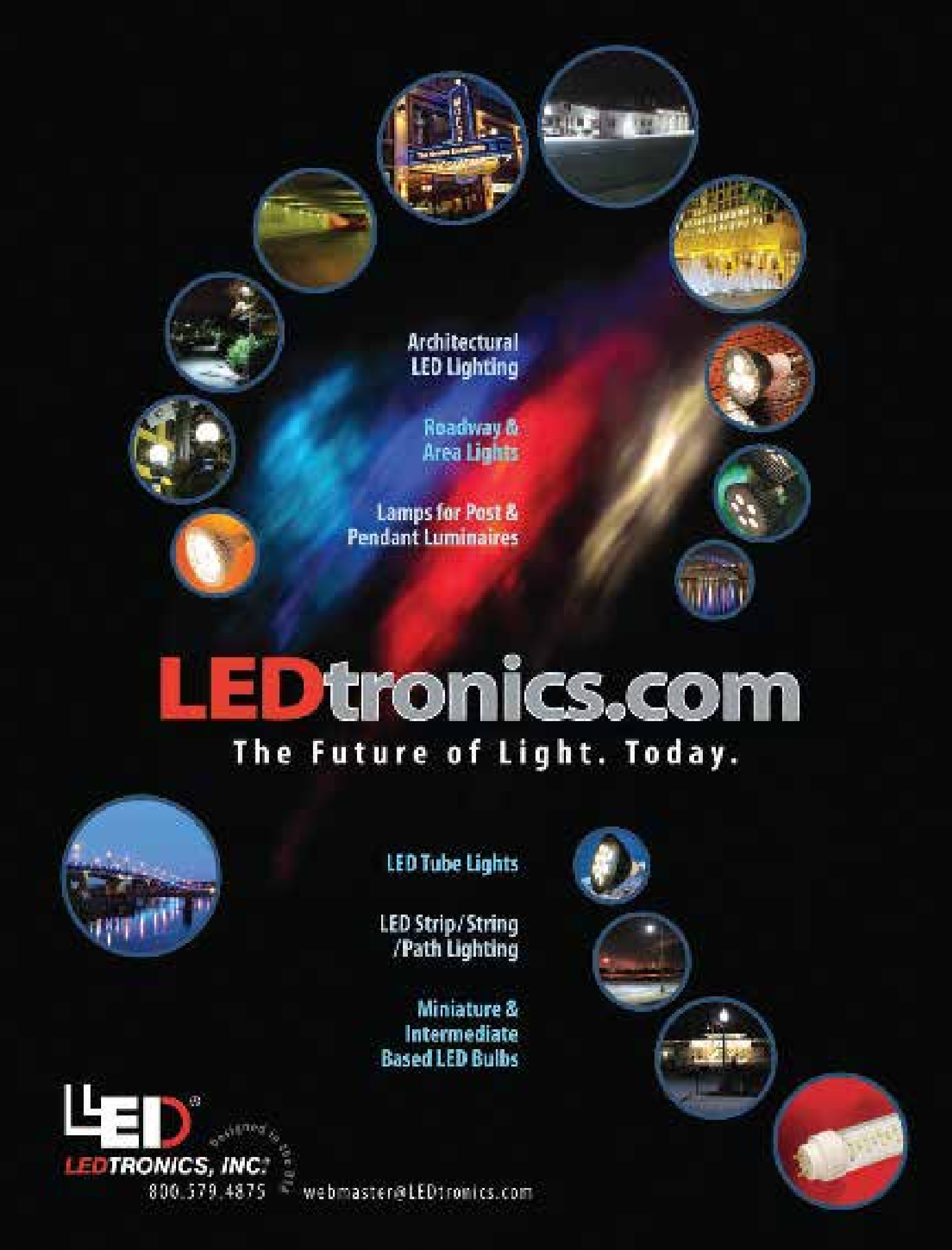
1. Monitoring important transformer functions can help detect developing faults before they lead to a catastrophic failure
2. Monitoring transformer functions can allow for a change from periodic to condition-based maintenance

Monitoring Equipment

Monitoring equipment is permanently mounted on the transformer and is online 24/7. Reliable, low-cost monitoring is thus a necessary condition. Failure rates of transformers are usually low (0.2 - 2% per transformer/year), and high-cost failure prevention systems cannot thus be justified, especially when redundancy is available and the consequential costs are thus limited. To keep within this cost barrier, some compromise on the functionality of the monitoring equipment is necessary.

Transformer Monitoring: Parameters

* Oil temperature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In a majority of cases, it is enough to supply a reliable warning signal without online analysis and diagnosis, provided that manual or automatic diagnostic methods are available to follow up the alarm. Specifically with regard to power distribution networks in the US, a majority of the transformer population is aging, and most emerging faults can be expected from these units. Monitoring equipment should thus be designed for field installation on operational transformers that might date back a few decades.

Detection of Developing Faults

The main transformer parts that need monitoring are insulation quality, winding temperatures, oil quality, and mechanical moving parts such as on-load tap changers (OLTC). Monitoring the windings and insulation systems for gas-in-oil and partial discharge are crucial; temperature and load monitoring on the other hand, is regarded as base information and should be included in any type of transformer monitoring.

OLTC failures are typically caused by mechanical faults with bearings, springs, shafts and drive mechanisms, closely followed by electrical faults such as burnt transition resistors, choked contacts, and insulation problems.

Some parameters of transformer monitoring, and the sensors best applicable are discussed below:

* **Dissolved Gas Analysis (DGA)**

An established diagnostic method, gas-in-oil analysis involves analyzing the types, concentration and production rates of generated gases. Different types of gases are produced based on the types of faults; for example, overheated cellulose leads to the formation of carbon oxides, but arcing leads to the generation of acetylene.

Depending on the criticality of each unit, oil samples are taken manually at regular intervals (between 12 and 24 months) and the gasses are extracted from these samples. On-line gas sensors are typically the first choice in designing full time monitoring systems for DGA; simply because the technique of analysis is well established and accepted, and the sensor is truly capable of detecting a wide range of failure types.

Partial Discharges (PD)

Partial discharge testing of de-energized transformers is a valuable tool for evaluation of overall transformer integrity, however, on-line, real

time, partial discharge monitoring is, in general, more expensive and complicated. For example, glass fiber rods acting as wave-guides inside the main tank have been applied to large transformers, but the cost and complexity of installation has made such a system unsuitable for online monitoring.

There are several advantages associated with electrical PD monitoring, but it has been difficult to design field applications thanks to the difficulties in separating internal and external PD sources. Sensors that are being tested and developed currently include externally fitted acoustical sensors, which are more cost-effective but are susceptible to disturbances from rough outdoor substation environments.

* **Temperature**

The load capability of a transformer is limited by the hot spot of the windings. The hot spot is typically calculated indirectly from measurements of oil temperatures and load current. An alternative method involves fiber-optic temperature sensors that are installed in the winding during the manufacturing process. These sensors come in two varieties - fibers which measure the temperature at a single point, and distributed fibers that measure the temperature along their length. All of these systems involve high costs; in particular, the distributed fiber sensor is the most expensive to install and can only be applied to new transformers.

New Techniques

The condition of the insulation can be judged from other parameters as well, such as moisture levels and particulate content. Data interpretation with these parameters is not straightforward, but new techniques are being developed using software to analyze the large body of historical data available and identify patterns of progression towards failure. If similar deterioration is detected for a transformer in service, remedial action can be taken.

Other types of online sensors have also been investigated. Examples of such systems are online measurements of the moisture content of the oil, static charge in oil, optical sensors and pump monitoring.

Also on-line measurements of the moisture in the cellulose by optical fiber techniques are being studied. In general, these systems do not have a strong coupling to important and frequent failure modes.

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Reel Innovation Improves Industrial Safety & Performance

Advances in hose, cord, and cable reel design make handling vital resources safer and more productive for operators

In industry, hoses, cords, and cables are used to direct vital fuel, fluid, air, water, and electric resources where needed. This occurs not only in manufacturing and maintenance facilities, but also in mobile field service applications. But while hoses, cables, and electric cords are a key part of operations and power tools, they can pose a considerable trip and fall hazard if not properly managed.

"Slips, trips, and falls constitute the majority of general industry accidents," states OSHA's website. "They cause 15% of all accidental deaths, and are second only to motor vehicles as a cause of fatalities. An OSHA Pocket Guide safety checklist warns operators to keep "floors and aisles…clear of clutter, electrical cords, hoses, spills and other hazards that could cause employees to slip, trip or fall."

To keep hose, cords, and cables safely up off the floor, conveniently stored where needed, reels have been developed. The reels allow hose and the like to unwind from the reel as needed, and then retract after use. This prevents tangling and a potential trip hazard while minimizing required storage space. The reels are typically spring-driven, hand cranked or motor driven.

But typical reels can present hazards as well. For instance, when an operator lets go of the hose, cord or cable, some spring-driven reels recoil them so quickly that they can act like whips. In such cases, they can retract as fast as 25-feet per second. This can produce a whipping action of 5 to 15 feet of length that can lash people or machinery with up to 500 ft. lbs. of force. The danger is greater when the hose, cord or cable ends with an attached metal nozzle or tool that intensify the impact.

Other reels may lack needed structural strength, stability, or alignment, and may prematurely wear the hose, cord or cable. This could jeopardize operator safety and production.

Fortunately, ongoing reel innovation has improved industrial safety and performance. Advances in hose, cord, and cable reel design have, in fact, made handling vital resources safer and more productive for operators.

Enhancing Industrial Safety and Performance

"Whether reels are mounted on ceilings, walls, or floors, they can help industrial users get the job done safer and more efficiently," says Buddy James, Purchasing Manager in Fort Worth, Tex. for Stuart Hose and Pipe Company, a hose and pipe stocking distributor in the Southwest. "But it's important to know what to look for."

For industrial users considering a spring-driven reel, James recommends using a reel with controlled retraction. Controlled retraction is a safety innovation that slows reel retraction to a safe rate, such as that on EZ-Coil equipped models by Coxreels, a Tempe, Ariz.-based manufacturer and innovator of industrial-grade hose, cord, and cable reels. Established in 1923, the company recently celebrated its 90th anniversary.

Unlike spring-driven reels which can retract hose, cord, or cable as fast as 25-feet per second, with whipping of 5 to 15 feet of length, and up to 500 ft. lbs. of force, EZ-Coil reels retract up to 80 percent slower. By retracting at a safer 5-feet per second, this eliminates the whipping hazard. It reduces whipping to 0 to 1 foot of length, with just 0 to 1 ft. lbs. of impact.

"Reels with controlled retraction like EZ-Coil act like a safety net that reduces trip, fall, and whip hazard on busy production floors," says James. "The reel retracts unneeded hose after use to prevent trip and fall risk. If an employee drops the hose, or if it gets pulled out of his hands, it will not fly across the workplace hitting people, machinery, and objects. It will retract back slowly just as if it were being walked back."

In addition to the shop floor, LDJ Manufacturing uses reels for a variety of hoses, cords and cables on their Thunder Creek Equipment brand of fuel and service trailers. Photo Courtesy of Thunder Creek Equipment.

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PROVIDING COMPLETE ELECTRICAL SAFETY SOLUTIONS

On hand-cranked reels, one safety innovation has been to improve structural integrity by eliminating the possibility of bolts loosening and falling out. One way this is being accomplished by manufacturers such as Coxreels is by robotically CNC welding the reel's entire steel frame as a single piece that will not loosen or require maintenance over time.

A related safety innovation is to enhance hand-cranked reel stability with a steel "A" frame. Typical reels require other parts of the reel such as the barrel, discs, or plumbing for support. But these elements of the reel can get out of alignment, particularly in high use work settings, jeopardizing safety and stability. Reels that use a steel "A" frame are safer and more stable because need no other support; they are their own support system.

To enhance safety and productivity, LDJ Manufacturing, a Pella, Iowa-based manufacturer of diesel fuel and service trailers, uses a variety of reels in production and on its service trailers. In production, reels are used for electrical cords and for air, oil, and lubricant hoses.

"A simple trip or fall can turn into a tragedy," says Loren Van Wyk, Founder and President of LDJ Manufacturing. "In production, we use reels to keep cords and hoses safely out of the way until they're needed, then retract them as soon as the job is done. The reels help us stay safe."

Most of the reels used in production are wall mounted, so the production floor is clear for other uses. "Because the hoses and cords are out of the way until we need them, it's safer and we're able to put every square foot of our production floor to good use," says Van Wyk.

Van Wyk appreciates that the Coxreels reels he uses have CNC spun discs, with all steel rolled edges for added safety. "The reel edges are rolled, not stamped," says Van Wyk. "They're safer to touch and safer on hoses and cords than sharper stamped edges."

The company also uses reels for a variety of hoses, cords and cables on their Thunder Creek Equipment brand of fuel and service trailers. Reels are used with hoses for air, glycols, engine oils, hydraulic oils, electric cords, transmission fluid, and diesel exhaust fluid (DEF). On sophisticated service trailers, reels are even used with welder cables, jumper cables, and acetylene torch hoses.

Because the service trailers are intended for demanding, off-road use, the company uses reels with a dual axle support system from Coxreels. Compared to single axle systems, the dual axle support system increases safety and stability during operation, reduces vibration, and strengthens the structural integrity of the reel.

"Our customers appreciate how the reels improve their safety and productivity as much as we do," concludes Van Wyk.

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