

FEATURES:

- Control systems + automation
- Electrical protection + safety
- Flow measurement
- Transformers + substations
- Energy + enviroFiciency: Focus on lighting

04/2016

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The future is 80 GHz



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The remarkable and ongoing developments that define this moment in history make one reflect on leadership ... and the importance of leadership that is in all ways above reproach. It is not my style, nor the style of this magazine, to dive into a political discourse, but it would be remiss of me not to acknowledge that the machinations of politicians have an impact on the lives of many and the opportunities that may come their way. My contention is that, in the context of this country, and even this part of the world, we tend to think about the impact of political decisions on those who most need support – and dare I say, leadership?

It is certain that the most vulnerable need leadership, but the policy environment also needs to be geared towards a sustainable future, and a future in which we can guarantee that those most vulnerable amongst us never need to face being vulnerable again.

A dream? Of course not. But leadership transcends the short-term and the self – or so it should. Leadership must be about setting the trend for how we behave; how we choose our national priorities; and how we collectively hold accountable those who lead us.

Leaders are human. We make mistakes. My deepest concern, and a concern that relates not only to our current national leadership, but equally to many of our youth, is that there is a growing sense of rights that seem to be assumed to come without the associated responsibility. This is a grave concern – particularly when looking to the youth as the future leaders of the nation. We are increasingly seeing the role models, whom we look to for guidance, showing similar traits. How can we develop strong youth if we do not set the example? How can we educate and encourage our children to be fine, upstanding and honourable contributors to society if we, and those we employ to teach, set a poor example?

All around us we see examples of outstanding human beings, but increasingly I get the sense that it is not the gentle and upstanding that determine the way we run our lives – the examples currently being set appear to be too similar to the icons of the past we now so vehemently revile.

Recently I spent some time walking around the campus of one of our brand new universities – the Sol Plaatje University in Kimberley. Naturally, you cannot breathe in Kimberley without thinking back to the days of diamond mining, consolidations of the mining industry, the beginning of the School of Mines (now Wits University), and the good and bad

associated with this significant era in our history. The scoundrels who were revered at the time are largely vilified when judged in the context of the present day.

Context, as they say, is critical. One has only to think about today, and the suggestion that powerful industrialists may be controlling some politicians and some of the deals of the day. Outrageous! But, frankly, old hat.

That is the story of this country. Were there ever any really honest politicians? Were there ever powerful industrialists who genuinely put others before them (before, of course, they lay on their death beds)?

It does make one think ... and it does make the point that perception is the truth. No matter what you do: Perception is the truth. It is the perception that we need to change and perceptions change only with action.

I'd be fascinated to hear your views, as our industry, without doubt, is impacted, significantly, by the action – or inaction – of the day!



Ian Jandrell

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Ian





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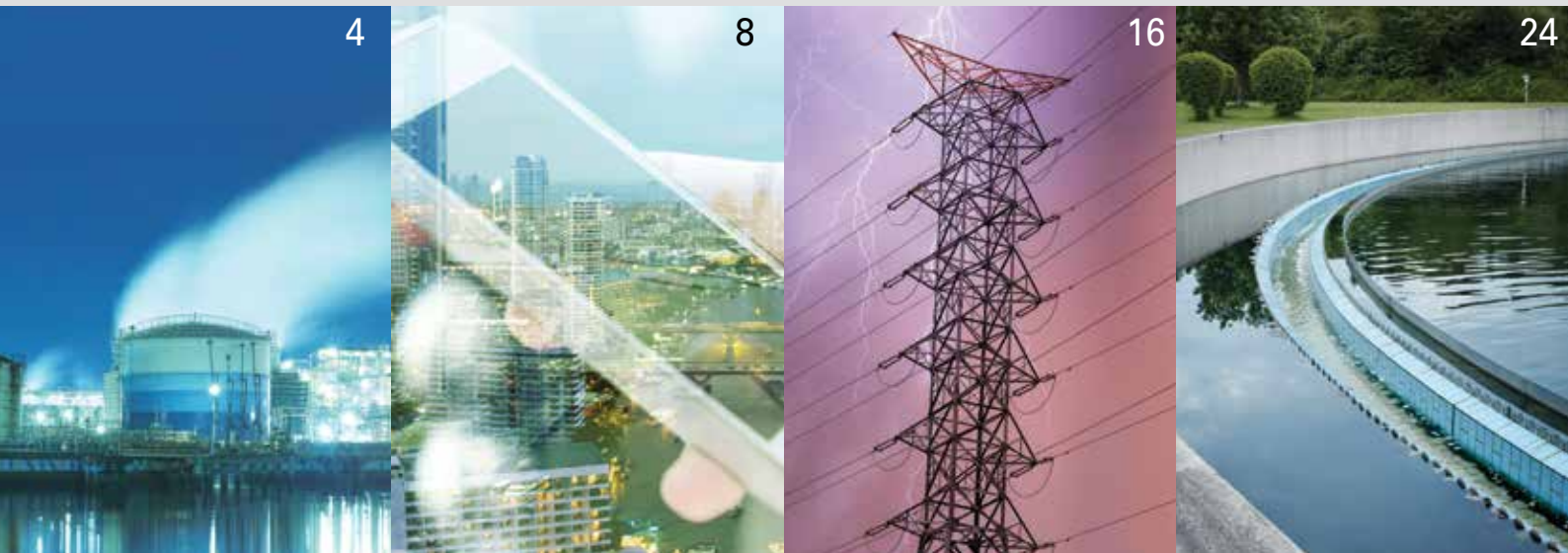
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Cover

VEGAPULS 64, the first radar level sensor for liquids on the market that measures with a frequency of 80 GHz, will be launched by **VEGA** in May 2016. *Read more on page 27.*

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Transparent energy data saves money from the building to the machine

Dipl.-Ing. Javier Manchado, Beckhoff



Current

Heat, Gas

Water

Air pressure
consumption

Temperature

Condition
Monitoring

Managing energy consumption in buildings, production facilities and machines is critical to the success of a company.

Making correct cost reduction decisions requires the ability to collect and process all energy-related data. Scalable energy data management systems integrated into PC-based control equipment cover everything from the building to the machine and even each individual motor. The only way to uncover all potential energy savings is by taking a comprehensive view of the entire busi-

ness – the administrative level with its offices, conference rooms, and cafeterias; the production facility level; and the individual machine and equipment levels. To secure meaningful results, one must be able to identify all 'energy hogs' and make appropriate improvements in some cases, while coordinating the operation of all energy consumers, based on comprehensive and reliable energy data.

DIN	– Deutsche Industrial Norms (German standards agency)
EMAS	– Eco Management and Audit Scheme
EN	– European Standard
EnMS	– Energy Management System
HMI	– Human Machine Interface
I/O	– Input/Output
OPC	– Open Platform Communication
PC	– Personal Computer
RTD	– Resistance Temperature Detector
UA	– Unified Architecture

Abbreviations/Acronyms

Energy-efficient Smart Factory saves costs

With such an energy measurement system, the forward-thinking company supports the creation of a 'Smart Factory', from the aspects that it meets the requirements of the DIN EN ISO 50001 [1] standards as well as from an energy perspective, all with minimal effort. In addition, the integrated and, therefore, low cost energy data management system does not require large investments. Since the necessary sensors and meters can be integrated into existing buildings and machine automation systems and expanded when necessary, developing a comprehensive energy data management system step-by-step becomes relatively easy, and any investment costs quickly pay for themselves. The end user can analyse and potentially smooth out peak loads based on collected data. In addition, companies can reap clear and long-term cost benefits by consistently optimising energy usage, which is particularly important against the backdrop of almost certain future price increases.

Also, being 'green' is becoming more important to society in general, with businesses facing increasing governmental and political pressure to reduce energy consumption and CO₂ emissions. For example, the repayment of the so called 'renewable energy surcharge' in certain countries depends on the introduction of an Energy Management System (EnMS) or EMAS certification. The EnMS model of the DIN EN ISO 50001 standard [1], defines detailed energy monitoring, metering and analysis requirements which can be easily implemented with a Beckhoff solution consisting of modular I/O terminals, TwinCAT and open communication standards such as EtherCAT and OPC UA.

In addition, continuous improvement of an energy data management system is just as important as its initial implementation because receiving a refund of the renewable energy surcharge as well as the power and pollution tax requires continuously improved compliance with DIN EN ISO 50001 [1] or EMAS certification. Beyond that, the new Energy Services Act (EDL-G) in several countries requires that all companies not falling under the definition of 'small enterprises' implement an energy audit as well as an energy or environmental management system. Such improvements are only possible with a continuous stream of accurate energy consumption data.

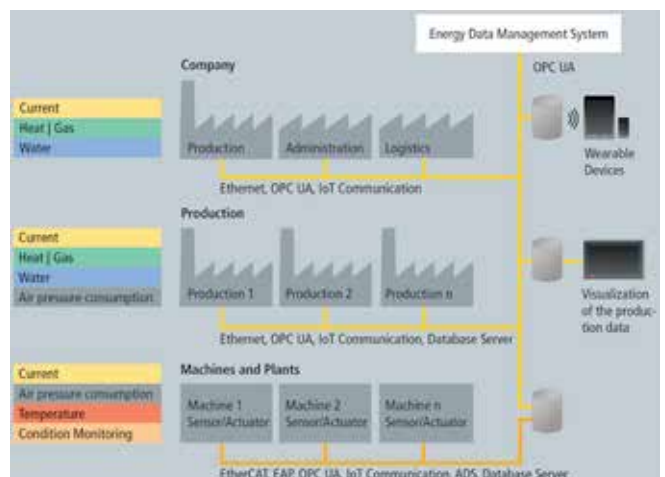
“
Identify all 'energy hogs'
and make appropriate
improvements based on
reliable energy data.”

Detailed data analysis with standard control software

With the open PC-based control system, energy data is available for analysis and further processing on all software levels, not just in a higher-level energy management system. Since the TwinCAT automation software operates directly on the control level, the consumption data can be analysed directly in the control algorithms to improve plant energy efficiency. TwinCAT also supplies a wide range of advanced monitoring and analysis tools. The TwinCAT Condition Monitoring Library, as an example, features a modular toolbox of mathematical algorithms for analysing the energy status of machines and systems, with functions that cover the areas of analysis, statistics and classification. The energy data can be monitored with

Comprehensive and integrated energy data collection

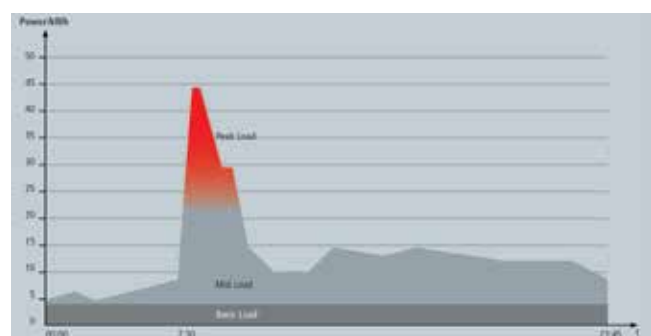
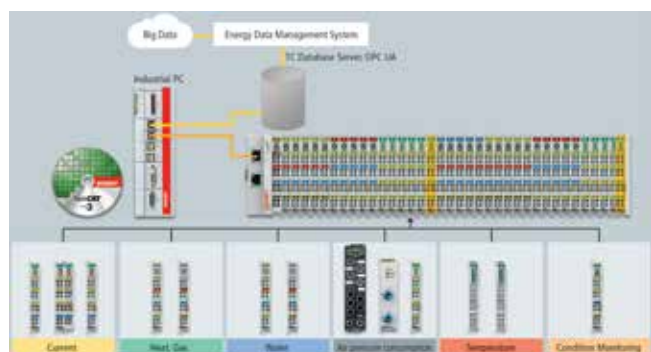
The company's PC-based control technology makes the programming of advanced measurement systems more efficient. The modular and highly scalable PC Control technology works not only for machines, but also for building automation applications with a single, universal software system that can handle all control and energy data. This makes it easy to process, combine, and correlate all relevant data, forwarding it to the energy management software. The user also benefits greatly from the flexibility and openness of PC-based control. On the one hand, all signals can be easily integrated into the control system via the modular and extremely broad I/O spectrum. On the other hand, all popular fieldbus systems and transmission standards, such as OPC UA as well as telecontrol protocols, and the EtherCAT protocol are all supported and seamlessly integrated into



the TwinCAT software oscilloscope, which combines fast data logging with a powerful visualisation tool. The logger can process long series in addition to very fast cycles in the millisecond range, for example, from EtherCAT monitoring I/O terminals such as the EL3773 with oversampling functionality. The results are displayed via the Scope View component, which provides an almost unlimited number of curves in high resolution over time. This enables the viewer to see, for example, whether sinusoidal voltage profiles or harmonics are present. Because of the high resolution, even short peaks become visible, which are very hard to analyse with conventional systems.

Application scenarios for better management of energy costs

Realising all potential improvements requires a comprehensive energy data management system. This enables users to integrate the collection and analysis of energy consumption data into the building automation system on the administrative level in order to optimise the consumption of power, water, gas and heat with an Embedded PC, TwinCAT and I/O terminals. In industrial environments, an Industrial PC with TwinCAT in connection with EtherCAT Terminals provides the ideal data management solution for evaluating cost centres such as the usage of power and compressed air. Installed within the machine, PC-based control produces and manages accurate data down to the sensor and actuator. It also provides comprehensive condition monitoring as the basis for cost-optimised preventive maintenance. This helps users generate load curves and identify peak usage periods for future load balancing. PC-based control also enables determination of each single load share, as well as the basic and average loads. Companies can also use the



- 'Smart Factory' meets the requirements of ISO 50001.
- An integrated energy data management system does not require large investments.
- The benefits of a fully integrated energy management system are apparent in highly complex solutions.



information to analyse the machines' power requirements relative to each other and use the results as the basis for further improvements. Identifying 'energy hogs' can reduce electricity costs and make it easier to accurately allocate them to the appropriate cost centre. Detailed energy data can also be used for control purposes, for example, to make the entire production process more stable and to prevent failures.

Module-based integration of all energy data types

The PC-based control technology with its scalability and modularity provides the ideal basis for integrated and detailed energy management solutions. It also features a broad I/O system that enables data collection for all forms of energy usage within the enterprise. For example, one can collect data directly via the KL/EL3403 power measurement terminals. In addition, the EL3413 and EL3433 power measurement terminals and the EL3773 power monitoring oversampling terminal provide extended analytical functions. Consumption data for gas, water and heat, on the other hand, can be integrated indirectly into the energy data management system. The KL6781 and KL6401 Bus Terminals with M-bus and LON interface, respectively, make it easy to link popular gas, water and heat meters to the system. The typical counter pulse output can be integrated with digital input terminals.

Conclusion

Temperatures can be controlled directly via thermocouples or RTD resistance sensors via KL3xxx Bus Terminals and EL3xxx EtherCAT Terminals. The compressed air usage can be measured with KM37xx differential pressure measuring terminals and the locally installed EP3744 IP 67 differential pressure metering EtherCAT Box, making it easy to identify energy-wasting leaks. Compressed air sensors can be indirectly integrated into the system via KL/EL3xxx analogue input terminals. Sensors with IO-Link interface can also be used. Further, the EL3632 analogue input terminal is suitable for condition monitoring applications in which fluctuations are recorded by means of acceleration sensors or microphones. With condition monitoring, impending failures can be recognised early on so that countermeasures can be taken before developing problems bring the application to a halt.

Reference

- [1] DIN EN ISO 50001. 2011. Energy management systems – requirements with guidance for use.



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Steam to digital, the industrial revolution continues

An Omron perspective

As interest builds in the concept of Industry 4.0, Omron looks at the practicalities behind its implementation, and what this means for machine builders.

There's a new buzzword on the block, with any conversation on the future of manufacturing or production inevitably turning to the topic of Industry 4.0. Introduced as a concept at the Hannover Messe in 2011 to describe and connect trends across different industries, the term has evolved to herald a new paradigm in manufacturing. Why '4.0' you might ask? The concept indicates that this is the fourth industrial revolution, and a change in approach to manufacturing as radical as the transition of the late 1700s from hand production methods to machines and industrial processes. If we look at the intervening years, we could define a second industrial revolution, extending from the latter half of the 19th Century until the early 1900s, and culminating in early factory electrification, mass production and the production line. The third industrial revolution is generally thought of as the transition from analogue to digital technology, and specifically in industrial terms to the move to digital computing and digital communications through the last years of the 20th Century.

This brings us to Industry 4.0, defined loosely as the computerisation of manufacturing. Related to other buzz phrases such as the 'lights out' factory or the 'connected factory' or even the 'cyber factory', it refers more specifically to a shift towards self-organising manufacturing operations, with a greater distribution of intelligence towards individual machines and components. Under Industry 4.0, production lines will reconfigure themselves automatically in order to optimise productivity. Some of that will be driven from above, with production lines responding dynamically to new or amended production orders, tying in seamlessly with logistics and the wider business. Some will be driven from the product itself, communicating with the line to determine the optimal route through the production process.

For example, if there is a bottleneck at some point in the production line, the product will recognise this and look to see if there are other processes that might be accomplished first, and instruct the line to reroute its progress. Industry 4.0 also brings a higher degree of flexibility to the manufacturing process. This again is the logical next step to a process that has already taken us from mechanical line changeovers from one product type to another to push-button line

reconfiguration. Under Industry 4.0, a single line will accommodate any type of product without the need for a changeover from one batch to another, for example through parts or products modifying robot profiles as they move along the line. If all of this sounds highly futuristic and well beyond the realms of what is achievable today, then it shouldn't, because actually it is simply an extension of the communications discussion that has dominated control systems design for the last two decades or more. And in particular, while it might seem to imply the need for a green-field manufacturing site with a ground-up design that implements the ideals of Industry 4.0 from the outset, it actually impacts on machine builders in a much more practical way.

The two key aspects to consider are the handling of data around the machine – and in particular the transformations on that data to turn it into useful information – and the flow of information between the machine, the wider production environment and the higher level enterprise. There is greater intelligence, now, in all automation components, and a greater emphasis on networking means that information is accessible anywhere. The latest control platforms, such as the company's Sysmac controllers, can create, integrate and act on that information at high speed, making best use of the data made visible by the machine and the information transferred to and from higher-level systems. Because this all happens at the hardware level in the company's Sysmac controllers, rather than in software or middleware where the functions have traditionally resided, the control system is able to deliver the real-time interaction required for truly dynamic production lines.

Conclusion

The fact that the intelligence, speed, power and communications capabilities to enable Industry 4.0 concepts to be implemented today is a powerful reason in its own right to push forward with the latest automation offerings. But these same characteristics are also important aspects of the drive towards improved OEE (overall equipment effectiveness) scores, improved preventative maintenance capabilities and reduced total cost of ownership. So don't think of Industry 4.0 simply as a concept with only theoretical appeal. Dig a little deeper and there is much practical substance, with control paradigms that can be implemented today to deliver real benefits in all areas of production.

“
Don't think of Industry 4.0 simply as a concept with only theoretical appeal. You'll find practical substance... if you dig a little deeper!

- Industry 4.0 is loosely defined as the 'computerisation of manufacturing'.
- It refers more specifically to a shift towards self-organising manufacturing operations with a greater distribution of intelligence towards individual machines and components.
- Under Industry 4.0, production lines reconfigure themselves automatically to optimise productivity.

take note

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Laetitia.de.jager@eu.omron.com



Smart city fundamentals

Tapleigh Niethamer, Schneider Electric

Cities are facing urban challenges of unprecedented scale, and will continue to do so into the foreseeable future. As populations grow, so too does pollution, resource scarcity, crime, traffic, emissions, and more. It is thus becoming a necessity that communities preemptively respond and preserve the integrity, attractiveness, and competitiveness of their cities by becoming smarter.

Setting a smart city vision and effectively moving towards it with a bottom-up, systems-based approach is critical to ensuring resource efficiency and security, as well as maintaining socially inclusive growth. Many cities have already started this process. By the end of 2020, analysts from Pike Research anticipate that annual spending on smart city infrastructure will reach \$16 billion.

'The Smart City Cornerstone: Urban Efficiency'

Schneider Electric's Smart Cities business foundational approach is found in its white paper 'The Smart City Cornerstone: Urban Efficiency'. By continually revisiting this text, the company anchors each customer project to well-proven principles that help it to work collaboratively to achieve successful outcomes. In over 250 completed smart city projects around the globe, this company has sought to apply these same bottom-up building blocks:

- Set the vision and roadmap for an efficient, livable and sustainable city
- Combine best-in-class hardware and software to improve operating systems
- Harness big data integration for wider city operational and informational efficiency
- Add innovation to make a holistic and sustainable future a reality
- Drive collaboration between the most well-suited global and local players, as well as across the entire smart city value chain.

Regardless of which aspect of its infrastructure a city chooses to start with, these principles can help ensure that the journey towards a smart future is mindful and holistic at each step. This company has applied this data-driven approach to help various cities of different sizes across a range of key municipal departments. Often, a city will choose the most pressing infrastructure issue to begin with, subsequently widening the scope of projects over time to incorporate more aspects of citizen priorities. The decision-making herein can

be shaped by many factors such as staffing, resource constraints, infrastructural issues or funding challenges.

Carson City, Nevada, USA

A remarkable case in point of a city choosing to make big changes over a large cross-section of infrastructure is that of Carson City Nevada's Public Works Department, which worked with Schneider Electric's Invensys subsidiary and Ecosystem partner, Wonderware PacWest, to deliver a major solution encompassing water, waste water, transportation, landfill, fleet and renewable power. With a population of less than 60 000, Carson City's challenges of doing more with less are exactly the same as those of much larger cities; such as increasing efficiency, reducing waste, and improving the utilisation and distribution of resources.

Like some of the world's most progressive cities, Carson City is blessed with administrators and public servants who are committed to ensuring their city is providing the best possible service for its citizens. The city's Public Works department delivered an end result that reduced operational staff hours by 15% while integrating cross-functional management capabilities; a huge success for any city in the world.

“
What a difference the philosophy of doing 'more with less' would make if applied in the cities and towns of South Africa.

Conclusion

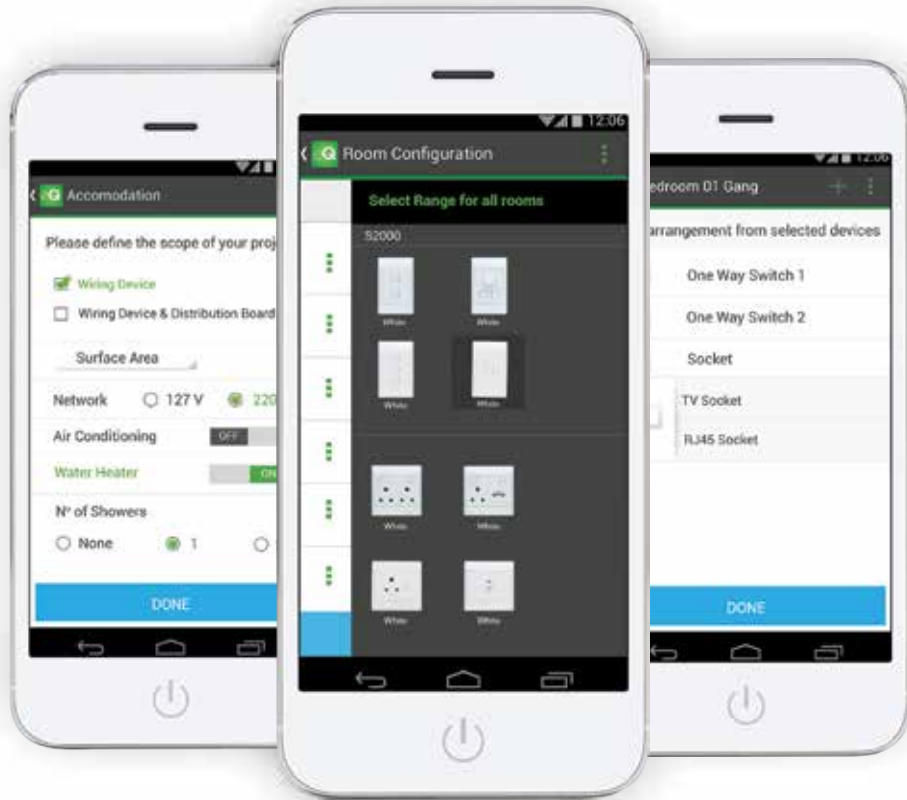
Whether your city is ready for a city-wide project or simply one preliminary department at a time, focusing on the fundamental principles when beginning a smart city journey will dramatically increase your chances of a successful and transformational outcome. The time to act is now. Our urban populations are growing rapidly and the pressure on infrastructure increases. The need to reduce the impact of cities on our environment will therefore only become more urgent.

- Every city can become smarter.
- Successful smart cities improve their critical systems by combining the bottom-up systems-centric approach with the top-down data-centric approach.
- If the fundamental principles are adhered to, the journey to achieving 'smart city' status will be successful.



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Schneider Electric launches an innovative app for electricians: EasyQuote



Schneider Electric, the global specialist in energy management, has identified that quotations and bill of materials are time consuming tasks for electricians, based on the knowledge of its partners. In parallel, the capability to quickly answer the end-consumer and send quick quotes are important components of satisfaction, loyalty and word-of-mouth.

Schneider Electric has developed an easy-to-use mobile application for iOS and Android smartphones to help electricians better manage this pain point, generating bill of materials and quickly share quotations with their clients.

The bill of materials and quotations include distribution board and wiring devices for all the residential projects of the electrician.

EasyQuote is a free application available on the Apple App Store and Google Play, that will help electricians to create and send quotations faster.

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Life Is On

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Strengthening Kenyan telecoms

In order to ensure uninterrupted mobile telecommunication coverage during power outages in Kenya, the country's largest service provider Safaricom entered into a multi-million dollar contract with Car & General Cummins distributor in East Africa. To date Car & General has supplied many diesel generator sets (gensets) that provide back-up power to the Safaricom tower network, data centres and office buildings in the event of a blackout.

According to Communications Authority of Kenya (CA) June 2015 Sector Statistics reports, Safaricom owns 67% of the mobile data transfer segment in Kenya with over 25 000 000 subscribers. Nakul Virat Cummins Telecom Segment Leader in Africa points out that total cost of ownership is one of the advantages that Safaricom have valued from Cummins generator sets. "The supply to Safaricom includes the gensets and the maintenance and servicing of parts. Our local Kenyan distributor, Car & General, has a long history and is recognised for value-added services in Kenya, which has played a major role in our success."

According to Balaji Power Generation Sales Manager for Car & General the Safaricom contract is a major platform for growth for Cummins in East Africa and overall in Africa. "This has given us substantial recognition in the region, as Safaricom has established itself as one of the most efficient and well-respected telecommunications companies in Africa. Thanks to mutual respect and understanding of each other's capabilities, the project continues to run smoothly without any major obstacles"

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The robust housing incorporates an easy-to-read display with large digits (48 mm x 48 mm in size) as well as four large buttons to facilitate adjustment of all configurations.

The counter is easy to programme and has three presets. This simplification of handling also extends to the installation of the unit which is via pluggable terminals. The Hengstler



Tico 772 is suitable for use in ambient temperatures up to 50°C and is ingress protected to IP 65 and is both shock and vibration resistant. Input frequency is up to 60 kHz and signal times are programmable for up to 10 minutes.

The Hengstler Tico 772 is available from leading southern African supplier of sensing, measurement, counting, switching, monitoring and positioning instrumentation, **Countapulse Controls**.

Enquiries: Gerry Bryant. Tel. 27 (0) 11 615 7556 or email bryant@countapulse.co.za

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Many outdoor identification solutions fade, shrink, crack or fall-off after a couple of years making them unreadable and therefore irrelevant. **Brady's** new, halogen free and ultra durable outdoor identification label remains attached and clearly legible for more than 10 years in tough outdoors conditions. The label is uniquely weather resistant and doesn't even need an overlamine to protect its print. Clear and durable identification increases the efficient use of equipment, components, vehicles, tools and facilities, and it doesn't need frequent replacement. Available in black print on a white surface, the toughest outdoor identification label is ideal to barcode and to identify solar panels, vehicles, equipment and facilities or exposed cables. Potential applications also include identification on signposts, on vending machines, rooftop air conditioning units, doors or outside stairwells. In sectors with outdoor activities or products, like data/telecom, construction or electrical, the toughest outdoor label will increase efficiency through clear identification and communication on the spot.

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Mobile mini controller – high current relay outputs

The compact, flexible and inexpensive mini controller, available from **ifm electronic**, replaces the conventional relay logic and demanding and complex process controllers. The control electronics integrated in a compact plastic housing provides all the necessary connections for the inputs and outputs, communication and programming. The coded connectors for mobile use are easy to handle and available all over the world. The connection of sensors and actuators is carried out without further external wiring. Due to an increase of the protection rating through a cover and a pluggable cable seal the BasicController can also be used in areas that are exposed to splashing water.

The integrated 32-bit processor and the electronics are optimally tailored to the application. Inputs and outputs can be configured to the application via the user program. The powerful plug-in relay outputs ensure the connection of high-current consumers. All relay outputs are with diagnostic capability and individually protected. Each output has a freely programmable status LED. Thanks to the additional multi-functional inputs a flexible control module for mobile machines is available.

The CODESYS software enables a clear and easy creation of the application software for the user. The control module BasicController supports all common CODESYS

programming languages. Simple and clearly structured function libraries are available for communication and special device functions.

Enquiries: Alwyn Skelton. Tel. +27 (0) 12 450 0400 or email info.za@ifm.com



Long range fibre amplifier with analogue output

Banner Engineering, represented locally by **RET Automation Controls**, has introduced its long-range DF-G3 fibre amplifier with analogue output. With world-class long range sensing capability, the DF-G3 can sense more than three metres with opposed mode fibres or more than one metre with diffuse mode fibres. The extra power, combined with its new analogue output, enables the DF-G3 to provide increased detection reliability for contrast matching, intensity monitoring, web guiding, process monitoring of signal intensity and dense sensing point environments.

"We enhanced the DF-G3 fibre amplifier to include both an analogue and digital output to solve more of our customer's applications," said Dennis Smith, Senior Technical Marketing Manager, Banner Engineering. "With unmatched sensing power, convenient combination of both output types in one amplifier, and an easy-to-use interface, the DF-G3 is optimal for difficult detection challenges in assembly error-proofing, consumer packaging, and electronic assembly markets around the world."

The DF-G3 offers a simple interface to ensure easy setup and programming via displays and switches. The easy-to-read dual digital displays show both signal level and threshold simultaneously. Users can also setup the sensor remotely via a multi-function input wire which can be configured to control the LED, gate the amplifier's output, remote teach the amplifier, or set up a robust cross-talk avoidance ring with up to seven amplifiers to solve dense sensing point applications.

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Email brandon.topham@retautomation.com



Ease your vacuum generation

In response to increasing demand for integrated vacuum generation systems, **SMC** has launched its new Series ZHP vacuum pad with ejector. An energy efficient single compact unit, the ZHP can be easily mounted in confined spaces due to its innovative design that removes the need for further components, making it simple to order and maintain.

The vacuum unit features an innovative lock-plate structure that allows easy one-touch replacement of the pad. This means that pads can be easily attached and detached for disposal, minimising maintenance. The use of an enhanced two-stage ejector improves vacuum generation efficiency, delivering an increase in suction flow rate of 50% and a reduction of air consumption of 30%.

Brain Abbott, Product Manager at SMC Pneumatics South Africa, elaborates that: "The ZHP Series has been designed to make life as simple as possible for our customers. Thanks to its innovative design and ease of use, we have achieved that and more and initial feedback from our customers has been very positive." According to Abbott, the ZHP offers a trio of vacuum port locations which provide a variety of connections for other equipment,

like pressure sensors, and creates the opportunity for daisy-chain piping, allowing for multiple devices to be connected in sequence, reducing piping requirements. The ZHP has further design qualities, including a through-hole silencer that significantly reduces noise levels and the risk of clogging.

Enquiries:
Email sales@smcpneumatics.co.za



Brian Abbott –
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1963-2013
50
YEARS



- Large factory capacity.
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- Various standard products: enclosures, cabinets, locks and hinges.
- Stock available on all standard products.
- Versatile applications across all industries.
- Guaranteed quality workmanship (ISO 9001-2008).
- Short lead times on special orders.
- Highly competitive pricing.

Asset protection system

Booyco Electronics has extended its electronic safety equipment offering having recently launched its Asset Protection System (APS) which is specifically aimed at enhancing vehicle and operator safety in surface mining operations. In combination with its underground Pedestrian Detection System (PDS) technology, the company now offers the mining industry a turnkey, fully integrated surface and underground safety solution for machinery and personnel.

Having secured its forefront position in the PDS field years ago, Booyco Electronics is determined to replicate this success in surface applications. "Our current surface solutions were developed using our underground VLF systems but work optimally for pedestrian speeds and movements, rather than fast-moving vehicles," Martin Vermaak, chief operating officer at Booyco Electronics, says.

Designed for easy and effective communication between vehicles, the APS transfers information between users via a new, in-house designed and developed human machine interface. It incorporates a high definition LED screen and high-level controller with 'massive computational power' to operate quickly at high speed.

"Because our system can process a large amount of data really quickly, it meets the requirements necessary for vehicle-to-vehicle safety protection," Vermaak continues.

All forms of system communication are exchanged with the operators using icons, making it easy to use and understand; a significant advantage for users who are illiterate. Additionally, messages can be provided via a pre-recorded voice programme and can be customised to any language, which "encourages adoption and prevents alienation of the system as well".

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New patch cords

After their successful premiere at SPS IPC Drives 2015, as of now, new RJ45 patch cords from ESCHA are available through



RET Automation Controls. They are adapted for industrial applications (e.g. switch-cabinet wiring) as well as a structured building wiring.

To meet various customer needs, ESCHA has launched two new product lines: one with PVC-cable quality for CAT5e-applications and another with FRNC-cable quality for CAT6A-Applications respectively including four-pair AWG26-cables available in grey, black, yellow, red, blue, and green. On request, ESCHA supplies your individual

lengths of 0,3 m to 50 m. A characteristic feature of the new product series lies in the fact that its industrially proven and over-moulded RJ45 connectors can be combined with a fully shielded Ethernet cable. Despite this unique feature, ESCHA has managed to bring out the patch cords at attractive prices. They are adapted to applications in protection class IP 20 areas – predominantly in patch fields and switch cabinets.

Enquiries: Brandon Topham. Email brandon.topham@retautomation.com

New communication module for Simatic Ident devices

Up to two Simatic Ident systems can be connected to the Simatic ET 200pro distributed I/O system using the Simatic RF170C communication module. The read/write devices of all RFID (Radio Frequency Identification) systems, Simatic MV400 optical read devices and Simatic MV320 and MV340 hand-held readers can now be connected to RF170C as well as third party systems using a universal RS232/RS422 interface and the Freeprotocol.

The new **Siemens** communication module is particularly suited for applications in machine building, conveying technology, assembly lines in the automotive and supply industries and also for small-scale assembly lines. Simatic RF170C comes with two reader interfaces. The new mod-

ule can be integrated into the TIA Portal engineering framework where an Ident Library provides functions with facility for easy parameterisation.

Optional serial devices are linked via an RS232/RS422 interface to the Simatic RF170C communication module and integrated with the Freeprotocol using available function modules. The hand-held readers MV320 and MV340 are connected to the new Simatic RF170C communication module by high protection rated IP 67 spiral cables, enabling their use in harsh environments.

The spiral cable is designed to permit operation over a wide working range.

Enquiries: Jennifer Naidoo. Email jennifer.naidoo@siemens.com



Cables for CC-Link networks

Lapp Group, which is headquartered in Stuttgart and has operations around the globe, has in recent years developed a range of cables for CC-Link networks. Sales of these have been significant, particularly in Asia, as Ralf Moebus, the company's Head of Product Management, explains: "We started our CC-Link development with a fieldbus cable and now also make optical and copper cables for CC-Link IE, the gigabit industrial Ethernet option. In fact, our cables will support 10-gigabit data rates. We are seeing strong demand in Asia for these cables and they will be key to our future growth."

CC-Link IE and CC-Link are the leading open automation network technologies throughout Asia. They were originally developed in Japan by Mitsubishi Electric, and then passed over to the CC-Link Partner Association (CLPA) as open technologies. Today, the CLPA is responsible for their development and promotion worldwide. It has offices and conformance testing centres around the world and Lapp is among about 300 manufacturers globally who offer CC-Link IE and CC-Link compatible products. CC-Link IE and CC-Link are seen as de facto

industry standards throughout the manufacturing industries of Asia and are also gaining popularity in Europe and America. There are approaching 15 million compatible devices in use around the world, a figure that is continuing to grow at double digit rates.

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French Ministry of Education contributes towards training

At a function at the Schneider Electric Midrand Campus on 3 March 2016, Schneider Electric signed partnership agreements with the Cape Peninsula University of Technology, College of Cape Town, University of Johannesburg and Sedibeng College for the establishment of four additional training centres. This comes at the back of the success of the earlier collaboration between Schneider Electric and the French Education Ministry, which was piloted through the Vaal University of Technology.

Eric Leger, the country president of Schneider Electric Southern Africa, said that these agreements formed part of the company's vision to accelerate vocational training in the field of energy across the country for previously disadvantaged students. State-of-the-art Schneider Electric equipment will be deployed at the centres to enable the skills facilitation and exposure essential to the energy industry. Through intensive vocational training, junior and senior technicians in the relevant disciplines will be taught innovative technologies and internationally recognised competitive learning programmes.

These centres are being conceptualised around a four party agreement involving the Schneider Electric Foundation, the French Ministry of Education, Schneider Electric South Africa and the higher learning institutions mentioned earlier.

"We identified the need to have more students trained in the field of energy in line with our sustainable development strategy, and we are pleased to sign these new partnership agreements," said Leger.

As part of the new partnerships, the parties have agreed to set up training centres, called French South African Schneider Electric Education Centre (FSASEC), whose primary focus is the training of future artisans, electricians and technicians in the field of energy.

It is anticipated that the doors to the new training centres will open during the second quarter of 2016, hosted at the respective institutions.

"All parties have entered into the agreements on the basis of their common interest- to promote education and to create development opportunities that offer training to deserving individuals from previously disadvantaged backgrounds. These partnerships could not have succeeded without the support of the French Embassy in South Africa, as well as Schneider Electric Foundation's relationship with The French Ministry of Education.

The South African Deputy Minister of Higher Education, Mduzizi Manana, the French Ambassador to South Africa, Her Excellency Elizabeth Barbier, and Marianne de Brunhoff from the French Ministry of Education, Philippe Lagayette from the Schneider Electric Foundation, Thierry Ruard from Schneider Electric France and representatives from the Business French Trade Commission were among the guests who observed the signing ceremony. (See Social Engineers, page 51).

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Corrosion of earthing and lightning protection systems

Trevor Manas, Pontins

Generally, earthing and lightning protection systems are designed and installed to last between 20 to 30 years... which can be achieved, given the right conditions.

In order to achieve a life span of 20 to 30 years, the correct appraisal of the site conditions, environmental factors, soil resistivity values, types of conductors and components must be carefully assessed. The correct site evaluations and subsequent design and installation should prevent premature corrosion of the earthing and lightning protection conductors, connectors and components and thereby increase the life expectancy of these protection systems. There are various factors that could cause corrosion of the earthing and Lightning Protection System (LPS), they are as follows:

- Electrochemical corrosion (most cases)
- Galvanic corrosion
- Corrosion at buried connection points
- Air-borne corrosive particles
- Incorrect combination of materials



Figure 1: Corrosion of 10 mm solid galvanised conductor – after eight years.

Electrochemical corrosion

Corrosive soils: Conductors in direct contact with the soil or water (electrolytes) can corrode owing to stray currents, corrosive soils and cell formation. It is not possible to protect earth electrodes from

corrosion by completely enclosing them, this is because the use of protective sheaths have high electrical resistance and therefore eliminate the effectiveness of the earth electrodes. Earthing systems made of the same material are prone to corrosion as a result of corrosive soil conditions and the formation of concentration cells. The risk of corrosion depends on the earthing materials and the type and composition of the soil.

Soil resistivity: The relationship between soil resistivity and corrosiveness can be appraised, as a general guide *Table 1* can be used:

Soil resistivity - $\Omega.m$	Corrosiveness
0 - 10	Very severe
10 - 100	Moderate to severe
100 - 1 000	Mild (if aerated)
> 1 000	Probably not corrosive

Table 1: Relationship between soil resistivity and corrosiveness. Source: SANS 10199: 2010 [1].

The results are sometimes difficult to interpret where dry soil is underlain with moist soils and where the soil types vary with depth. In these cases, the soil resistivity should be determined at the planned depth of the earth electrodes.

If the soil conditions are deemed to be corrosive due to low soil resistivity values, then the appropriate measures should be employed to mitigate the corrosiveness of the soil. These would include the

choice of conductor type and the sealing of connection points to prevent corrosion.

Heterogeneous soils: It is vitally important to carry out numerous soil resistivity soil surveys when conducting a site evaluation. The soil resistivity values give a good indication on whether the soil conditions are Homogeneous or Heterogeneous. When the soil resistivity values differ substantially across the site, this indicates that the soil conditions are Heterogeneous. The variance in the soil conditions can lead to corrosion of the earth termination conductors if the incorrect type of conductors and connection points are installed.

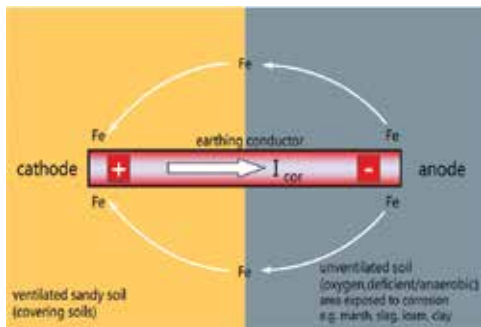


Figure 2: Formation of concentration cell in heterogeneous soil.

Cell formation

Corrosion damage due to cell formation is on the increase. A cell is formed between different types of metals with very different electrolyte potentials are immersed into an electrolyte (soil). With this in mind, it is not commonly known that the reinforcing of concrete foundations can become the cathode of a cell and hence cause corrosion to other buried services. Owing to changing construction methods, larger reinforced concrete structures in the ground result in the surface ratio of anode / cathode becoming more and more unfavourable with the risk of corrosion of non-precious metals being increased.

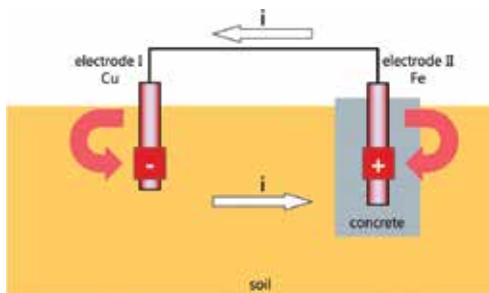


Figure 3: Formation of cell electrode in soil/iron in concrete.

Today, the aim is to interconnect all earth electrodes and other buried metal installations to establish equipotential bonding and thus ensure maximum safety against excessive step and touch voltages in the event of a fault current or lightning strike. The only way of preventing or reducing the risk of corrosion of the earth termination systems and the other metallic installation connected to them is to choose suitable earth electrode materials.

Selection of earthing materials

Hot dipped galvanised steel: Galvanised steel may be embedded in concrete. Foundation earth electrodes, earthing and equipotential bonding made of galvanised steel may be connected to concrete steel reinforcing.

Copper clad steel: Various anti-theft conductors are made of copper sheathed steel. The properties for copper apply to the sheath material but damage to copper sheath presents a high risk of corrosion of the steel core. Therefore care must be taken not to damage the copper layer.

Bare copper: Bare copper is very resistant to corrosion due to its position in the electrochemical series. Moreover, when copper conductors are connected to other buried metallic installations made of more 'non-precious' materials (e.g. steel), bare copper provides additional cathodic protection of the earth termination system, this however is at the expense of the 'non-precious' metals.

Stainless steel: High-alloy stainless steels are inert and corrosion-resistant in the ground. Since the surface of stainless steel earth electrode materials passivate within a few weeks of installation into the ground, they are neutral to other precious and non-precious materials.

Combination of earth electrodes made of different materials

All of the material, configurations and minimum dimensions of the earthing materials / earth electrodes are according to *Table 7, SANS / IEC 62305-3 [2]* (included with the online version of this article).

The cell current density resulting from the conductive combination of two different metals that are buried leads to the corrosion of the metal acting as the Anode.

It is therefore extremely important to design earth termination systems taking into account the various different metals that may be buried. When combined with buried steel installations (pipes, tanks etc.), the earth electrode materials like bare copper or stainless steel will always behave as cathodes when they are covered with soil. The bonding to these buried installation must therefore be carefully considered to prevent corrosion of these buried metallic installations.

Concrete steel reinforcing of foundations

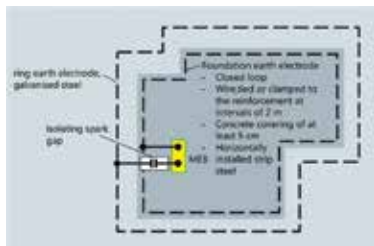
The steel reinforcing of concrete foundations can have a very positive potential (similar to copper). Earth electrodes and earthing conductors that are directly connected to the steel reinforcing of large concrete foundations should therefore be made of copper or stainless steel. This in particular applies to short connecting cables in the immediate vicinity of the foundations or at the rebar bonding terminals.

Material with small area	Material with large area			
	Galvanised steel	Steel	Steel in concrete	Copper
Galvanised steel	+	+ Zinc removal	-	-
Steel	+	+	-	-
Steel in concrete	+	+	+	+
Steel with copper sheath	+	+	+	+
Copper / StSt	+	+	+	+
+ Combinable			- Not combinable	

Table 2: Material combinations – earth electrodes.

Installation of isolating spark gaps

It is possible to interrupt the conductive connection between buried installations with very different potentials by integrating isolating spark gaps. By installing spark gaps at the connection point between the two dissimilar metallic buried objects, it is no longer possible for the corrosion currents to flow. In the case of a surge, the isolating spark gap trips and interconnects the installations for the duration of the surge. Spark gaps should not be installed for protective and operational earthing systems since these earth electrodes must always be connected to the system they are designed to protect.



Figures 4, 5, 6: Spark gap used for equipotential bonding between two dissimilar metallic buried installations.

Other anti-corrosion measures

Externally induced currents: Current flow that causes corrosion of buried conductors, connections and electrodes can also be induced by outside sources. Often the presence of nearby Overhead Power-

lines and Railway Lines can induce currents into the ground as part of their current return path. These induced currents can cause rapid corrosion to buried earth termination conductors, connection points and components. Only copper or stainless steel should be installed in such cases, particular attention should also be paid to the types of components and below ground connections that are installed. Additional protection of the connection points should be installed by means of a corrosion protection covering (e.g. wrapped with an anti-corrosion tape).

Galvanic corrosion: Quality engineering and LPS design requires the understanding of material compatibility. Galvanic corrosion (also called 'dissimilar metal corrosion') is the process by which the different metals/ alloys in contact with each other oxidises or corrodes. The compatibility of two different metals may be predicted by consideration of their anodic index.

A spectacular example of galvanic corrosion occurred in the Statue of Liberty when regular maintenance checks in the 1980s revealed that corrosion had taken place between the outer copper skin and the wrought iron support structure. Although the problem had been anticipated when the structure was built by Gustave Eiffel to Frédéric Bartholdi's design in the 1880s, the insulation layer of shellac between the two metals had failed over time and resulted in rusting of the iron supports. An extensive renovation requiring complete disassembly of the statue replaced the original insulation with PTFE.

In order to prevent galvanic corrosion of the earthing and lightning protection systems, the following procedures should be undertaken:

- Selection of the appropriate materials with similar anodic potential is preferable
- Use of bi-metallic clamps must be employed when joining two dissimilar metals

	Hot dip Galvanised steel	Aluminium alloy/ aluminium	Copper	StSt	Titanium	Tin
Hot dip galvanised steel	Yes	Yes	No	Yes	Yes	Yes
Aluminium alloy/ aluminium	Yes	Yes	No	Yes	Yes	Yes
Copper	No	No	Yes	Yes	No	Yes
StSt	Yes	Yes	Yes	Yes	Yes	Yes
Titanium	Yes	Yes	No	Yes	Yes	Yes
Tin	Yes	Yes	Yes	Yes	Yes	Yes

Table 3: Compatible metal combinations.

- Earthing and lightning protection systems should have a lifespan of between 20 and 30 years.
- Corrosion depends on the earthing materials and the type and composition of the soil.
- Correct site evaluations, design and installation should prevent corrosion of components in lightning protection systems.



Earth entries made of galvanised steel

Earthing conductors made of galvanised steel must be protected against corrosion at the point of entry into the ground. The protection of these galvanised conductors must be at least 300 mm above and below the surface of the earth. A moisture-proof sheath, e.g. PVC insulation or heat-shrinkable sleeves can be used. It is however preferable to use stainless steel or copper conductors to provide corrosion protection.

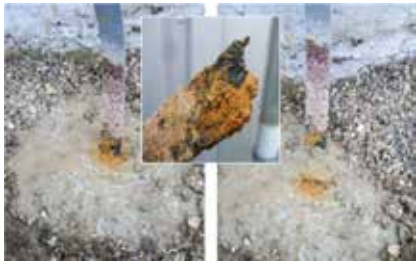


Figure 7: Unprotected galvanised steel earthing conductors entering the soil (corroded).

Other anti-corrosion measures

Below ground connections: Below ground connection of conductors and electrodes probably constitutes the most vulnerable portion of the earth termination system to corrosion. In many cases, the correct conductors and electrodes are selected but inferior connection points corrode rapidly, resulting in an unsafe installation. There are various types of below ground connections, but two main types of connections can be used:

- The **thermite welded connections** form a molecular bond between the two connecting parts. Provided that the two connecting parts can be combined (see *Table 3*), then thermite (or cadwelded) connections are very corrosion resistant. In corrosive soils additional protection by means wrapping the connection with anti-corrosion tape is recommended
- In order to ensure that the below ground connections have the equivalent corrosion resistance as the corrosion protection layer of the earth termination system, the **clamped or crimped connections** must be equipped with a suitable corrosion protection layer e.g. wrapped with an anti-corrosive tape



Figure 8: Protection of connections with anti-corrosion tape.

Aluminium conductors: Aluminium conductors are used for various lightning protection elements like the air termination system and the down conductor system. Aluminium conductors are however quite vulnerable to corrosion and care should always be taken when these conductors are installed. Aluminium conductors should never be installed in the following conditions:

- Aluminium conductors should never be installed directly on or in calcareous building surfaces such as concrete, limestone and plaster
- Aluminium conductors should never be installed directly into the ground
- Aluminium conductors should never be installed in areas where airborne corrosive particles exist

Airborne corrosive particles

The presence of airborne corrosive particles can cause rapid corrosion of air terminals, external down conductors and above ground connection points. Corrosion can be prevented by means of a proper site evaluation and correct design, this would involve obtaining the correct site information from the site authorities. Stainless steel conductors, guides, connections and finials are recommended in corrosive environments.



Figure 9: Unprotected aluminium down conductor – incorrect installation.

Conclusion

When backfilling earth electrodes trenches, pieces of slag and coal must not be in direct contact with the earth electrode material. The same applies for construction waste. Care should also be taken during the backfill of earthing trenches not to backfill with rocks and large stones, these elements can damage any protective coating of the earth electrode materials and cause corrosion. Cathodic protection systems are installed to buried pipelines, vessels and tanks to prevent corrosion on these buried structures. It is imperative that the cathodic protection systems are equipotentially bonded into the site's earthing and lightning protection systems, this bonding is carried out to prevent damage due to potential differences between the two systems. Conventional equipotential bonding however will result in the effectiveness of the cathodic protection system being greatly or totally reduced. It is therefore necessary to utilise spark gaps for this equipotential bonding, the bonding must also be strategically placed in vulnerable positions such as the isolating flanges. This type of bonding is essential in zoned or classified areas where dangerous sparking must be avoided. Besides cable theft, corrosion prevention is probably the single most important factor in ensuring the longevity of the earthing and lightning protection systems. In order to prevent corrosion of the earthing and lightning protection components, the following steps should be taken:

- All earthing and lightning protection components should be tested in accordance with the SANS / IEC 62651 [3] series of standards. Component certificates should also be supplied by the installer.

- Proper site assessments must be carried out including the carrying out of various soil resistivity surveys, appraisal of the soil's corrosiveness and the determination of the various external factors that can cause corrosion of the earthing and lightning protection components.
- Quality engineering and properly designed protection systems must be employed taking into account the various corrosive elements that may exist on the site and the correct combination of the various LPS conductors.
- Additional protection measures such as the use of anti-corrosive tape on the below ground connections should be installed on sites that could be corrosive and where clamped or crimped below ground connections exist.
- Bi-metallic joints must be installed when two dissimilar metals are joined.
- Copper parts should never be installed above galvanised or aluminium parts unless those parts are provided with protection against corrosion. Extremely fine particles are shed by copper parts which result in severe corrosive damage to galvanised parts even where the copper and galvanised parts are not in direct contact.
- LPS should be constructed of corrosion-resistant materials such as copper, aluminium, stainless steel and galvanised steel.

”

Corrosion is the reaction of a metal material with its environment which impairs the characteristics of the metal material and its environment.

References

- [1] SANS10199. 2010. The Design and installation of earth electrodes.
- [2] IEC 62305-3. 2006. Protection against lightning – Part 3: Physical damage to structures and life hazard.
- [3] SANS/IEC 62651. 2013. Nuclear power plants - Instrumentation important to safety - Thermocouples: characteristics and test methods.



Trevor Manas started his lightning protection career at Pontins in 1991. After spending some years in sales, he was promoted to the position of director in 1996, in charge of ensuring the company's compliance with the earthing and lightning protection codes of practice. In 1999, Trevor became the managing director of Pontins.

In 2013, Pontins formed a partnership with DEHN Africa. Enquiries: Email trevor@pontins.co.za

Custom built E Houses... cost effective alternatives

Custom built E-Houses offer a rapid and far more cost effective alternative to the building of brick and mortar substations, and this is especially true in an underground application. This is one of the reasons why Zibulo Colliery contracted **Shaw Controls**, a division of **Zest WEG** Manufacturing, to design and manufacture an E-House for its operation in the Mpumalanga coalfields. Containerised electrical control installations in underground applications are not new. Bevan Richards, Chief Operations Officer of Shaw Controls, says the concept was first used during the sinking of many of South Africa's gold mining vertical shafts when ISO marine containers were equipped with mimic panels and other ancillary equipment.

“However, the evolution and development of pre-manufactured electrical

substations or E-Houses has opened up numerous possibilities including the ability to completely customise the unit according to process and plant requirements,” Richards explains. Specifically designed for this underground application in a coal mine, the E-House was designed with several specific parameters taking precedence. Underground height restrictions meant that the structure itself had to be lower than usual but would still need to accommodate all necessary electrical infrastructure and allow for sufficient headroom for cooling.

Richards says it is testimony to Shaw Controls' mechanical design capability that its engineers were able to design such a low profile steel structure that could house all the equipment and still maintain the requisite internal clearances.

Another important criteria that had to be met was the voltage being used on the mine. The majority of mines use 525 Volts, but in the instance of Zibulo Colliery the voltage being used is 1 000 Volts. This required special design work on both the Motor Control Centre (MCC) and the Variable Speed Drive (VSD) to ensure safe operation at 1 000 Volts.

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Must test portable earthing and short-circuiting equipment

Reduced cable cross-sections of portable earthing and short-circuiting devices (EaS devices), resulting from copper corrosion and breakage of conductor strands or increased resistances in the connections, may have fatal consequences when subjected to short-circuit currents. It is therefore critical that portable EaS devices are tested prior to each use and at regular intervals. This ensures that the installation is isolated from supply voltage while work is being carried out - even in the case of interference voltages, atmospheric surges or accidental reconnection.

Simply hitting a switch for isolation from the supply is not enough. For this purpose, the following five safety rules in accordance with EN 50 110-1 must be observed:

- Disconnect completely
- Secure against re-connection
- Verify that the installation is dead
- Carry out earthing and short-circuiting
- Provide protection against adjacent live parts

Certified electricians know that the most essential rule of the above-mentioned five is earthing and short-circuiting, and that these guidelines can save their lives. However, this safety measure is also as safe as the device that has been used, as over a long period of time these devices may become worn out and become vulnerable.

DEHN AFRICA, the local subsidiary of Germany-based lightning and surge protection, earthing components and safety equipment manufacturer, DEHN + SÖHNE, offers a new, improved test which provides reliable information on the condition of EaS devices, based on static and dynamic measurements of the ohmic resistance.

Tested in three steps, DEHN starts this process by making a visual inspection of an earthing and short-circuiting device for visible signs of damage. Next, a static test is performed, measuring the absolute resistance value of the device when stationary. Finally, step three is a dynamic test, which ascertains the relative change in resistance of the moving earthing and short-circuiting device. The measurement of the resistance change value allows DEHN to detect local damage, such as to conductor strands in the conductor cable.

Enquiries: Kirk Risch. Tel. +27 (0) 11 704 1487 or email alexis.barwise@dehn-africa.com



DEHN protects AFRICA



Arc fault protection solutions DEHN is your reliable partner for arc fault protection solutions.

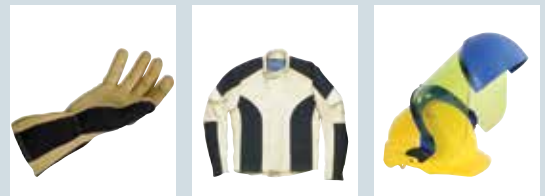
Each and every day electrotechnical work is carried out all over the world. The risk that technical defects, maloperations, contaminants or foreign objects in the installation cause arc faults cannot be excluded. If arc faults occur, workers are exposed to temperatures of more than 10,000° C and suffer severe burns.

In addition to technical systems, arc-fault-tested personal protective equipment protects workers from the thermal effects of an arc fault.

This personal protective equipment consists of:

- Safety helmet for electricians with face shield
- Protective gloves
- Protective suit

DEHN personal protective equipment is tested to international standards. Visors made of nanoparticles, gloves and protective suits made of neoprene and leather provide maximum protection and excellent wearing comfort.



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How to 'safety-check' your meter in the field

Digital multimeters are designed to assist users to carry out, from simple to highly complex test and measurement functions on the bench or increasingly, remotely in the field. From time to time, users should test meters and other equipment in the field, and by paying attention to the following quick steps, could help ensure the safety and efficiency of the meter. Advice offered by **Comtest**:

- Use common sense: Before beginning, take a closer look at the equipment and accessories. Does it look shabby and badly worn? If so, perhaps the unit is beyond functional and shouldn't safely be used
- Inspect leads: Before using test leads, perform an inspection to ensure the leads can safely and accurately conduct electricity for the job at hand. Be sure the leads have:
 - o Shrouded connectors
 - o Finger guards
 - o CAT ratings that equal or exceed those of the meter
 - o Double insulation
 - o Minimum exposed metal on the probe tips
- Continuity testing: Use the meters own continuity testing function to check for internal breaks. Check test lead resistance by:
 - o Inserting leads in V/ Ω and COM inputs
 - o Selecting Ω , touching probe tips and being sure the leads are 0.1 – 0.3 Ω
- Choose accessories that are suitable for industrial work, and check for abrasions and other damage that eventually occur with use: This way, users will never have to worry about the failure of a test lead or probe or the consequences thereof.
- Inspect test lead insulation:
 - o Check and ensure that the insulation is not nicked or cracked. With age the insulation material whether PVC or silicone can be come dried out, brittle and susceptible to cracking

- o A visual inspection will often show any part of the leads that has this problem
- o Ensure that there are no signs of gaps or cracks at the junction between the insulated wire and the moulded banana plugs or probes at each end
- Verify correct voltage rating: Verify that the meter and accessories are appropriately rated and designed for the system and equipment to which they will be connected
 - o Check for the IEC rating (e.g. CAT III or CAT IV) on the tester, and only purchase leads and other accessories that meet or exceed that rating

Safety checking equipment in the field can reduce hazards and ensure that equipment is safely functional. Whether the equipment is a voltage tester or a digital multimeter, users could benefit greatly by carrying out a quick safety scan before commencing work.

Enquiries: Tel. 010 595 1821 or email sales@comtest.co.za



In safe hands with arc protective gloves

When electrical and mechanical work is carried out, it is crucial that employers not only perform hazard analyses but also ensure that workers have access to international standard protective equipment, including gloves, to protect them against the hazards of arc faults – a high power, high temperature discharge of electricity between conductors.

DEHNcare quality combines maximum protection and unique wearing comfort. It is tested to international standards and consists of a safety helmet, trousers, jacket or coat and protective gloves.

"The hand and forearm region is particularly at risk of being burnt by arc faults whilst working on an electrical installation, where workers can be exposed to temperatures of more than 10 000 degrees centigrade," explains Hano Oelofse, Head of Technical division at **DEHN AFRICA**, the local subsidiary of Germany-based lightning and surge protection, earthing components

and safety equipment manufacturer, DEHN + SÖHNE.

"DEHNcare Arc Protective Gloves (APGs), part of the DEHNcare personal protective equipment (PPE) range, are a necessary shield against second-degree skin burns caused by arc faults. The protective gloves are arc-fault-tested according to class 2 (IEC 61482-1-2) and certified according to the EEC directive. The combination of leather and neoprene, as well as the high-quality workmanship, ensures a comfortable fit and protects the hands and arms region from second-degree burns," he states.

The DEHNcare protective glove comes with a long gauntlet, which protects up to the crook of the arm, while the palm of the glove offers touch sensitivity and breathable materials for maximum wearing comfort.

"Protective gloves are used for maintenance and repair work at electrical installations for protection against thermal and

mechanical risks and should be worn at all times when this type of work is being carried out," concludes Oelofse.

Enquiries: Tel: +27 (0) 11 704 1487 or email alexis.barwise@dehn-africa.com





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Paper insulated lead covered (PILC) cables and cross-linked polyethylene (XLPE) cables are used in many electrical distribution and reticulation applications including: • Municipal distribution • Mining (special construction with water blocking as well as flame retardancy for shaft installations available) • Petrochemical industry • Wind farms.

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Amplon Single phase UPS

R Series 1-3kVA

- Double-conversion technology provides 24/7 full-time protection.
- Automatic input frequency detection
- AC-start and battery-start capabilities
- Remote management over network via software



	R-1K	R-2K	R-3K
Voltage	220/230/240 Vac (single phase)		
Input Voltage Range	80 ~ 280 Vac *		
Wave Form	Pure sine wave		
Switching time	1,5-6ms typical (9ms max)		
Interface	RS232 x 1, SNMP slot x 1		

RT Series 1-3kVA

- Standard 19 inches rack / tower configuration(2U).
- Power Factor 0,9
- Efficiency up to 93%
- Battery independent Startup without battery



	1 kVA / 0.9kW	2 kVA / 1.8 kW	3 kVA / 2.7kW
Voltage	220, 230, 240 Vac		
Input Voltage Range	220/230/240 Vac: 175 ~ 280 Vac (100% load); 120 ~ 175 Vac (70% ~ 100% load) 200/208 Vac: 160 ~280 Vac (100% load); 120 ~ 160 Vac (70% ~ 100% load)		
Battery Source Rating	24Vdc	48Vdc	72Vdc
Battery Charging	1,5A	2A	2A

RT Series 5-10kVA

- Output power factor 0.9
- Parallel redundancy or expansion
- Rack/tower configuration
- Multi-language (8) LCD and LED display



	5 kVA / 4.5kW	6 kVA / 5.4 kW	10 kVA / 9kW
Voltage	220, 230, 240 Vac		
Input Voltage Range	100~300Vac. Lower range 100~180Vac is acceptable under 50~100% loading condition.		
EBC* Rating	12V/5.5Ah x 16		12V/9Ah x 20
Battery Charging	Max. 4A, optional 2nd charger, totally 8A		

Maintenance Bypass Box for 5-11kVA

MBB-S - Maintenance bypass when single UPS is installed.
Manual bypass box if one unit is connected, capacity up to 11kVA.

MBB-P - Maintenance bypass when two UPS are connected in parallel.



Manual bypass box if Two units are connected in Parallel-redundant mode, up to 11kVA. Total power is 11kVA due to manual bypass breaker value 63A.



EH series 10 - 20kVA

- Power 10, 15, 20 KVA
- Phase configuration 3Phase IN / 1Phase OUT
- Paralleling up to 4 units
- RS232, Smart and Mini slot for remote management, contacts

Ultron Three phase UPS



	10 kVA / 8kW	15 kVA / 12 kW	20 kVA / 16 kW
Voltage	220/380 , 230/400 , 240/415 (3phase, 4-wire plus ground)		
Input Voltage Range	208~477VAC full load, 208~304VAC 50% -100% load de-rating		
Input/Output Connection	Hard wire (Terminal block)		
Output Voltage	3/1 model : 220/230/240 (single phase)		
Battery Source Rating	240Vdc		

Communication for UPS Range

SNMP Card Legacy - IPv6



ModBus Card



Relay I/O Card



SNMP + Switching Hub



Enviro Probe



Mini SNMP Card



USB Card



Mini Relay I/O Card



TVSS Card



Mini ModBus Card



HPH series 20 - 120kVA

- IGBT technology
- Power 20,30,40,60,80,100,120 KVA
- Paralleling up to 4 units
- RS232, SNMP slot, Relay contacts

	60/80 kVA/kW	100/120 kVA/kW
Voltage	220/380 , 230/400 , 240/415 (3phase, 4-wire plus ground)	
Input Voltage Range	PF1 = 400/230 -16% = > >192/334Vac PF 0,9 = 173~276 / 300~477VAC full load; 132~173 / 228~300VAC 70% derating	
Input/Output Connection	Hard wire (Terminal block)	
Output Voltage	3/3 model : 220/380 , 230/400 , 240/415 (3phase)	
Battery Source Rating	480Vdc = 40 batt. basic configuration; range from 38 up to 46 batt. FW 32-36 batt. with its derating	
Battery Charging	10/15A	20A



DPS Series, Three Phase 60 to 120kVA

- IGBT-based, efficiency up to 96% to meet green data center criteria
- 0.9 output power factor
- Transformer-less architecture and less footprint, compact design
- Double Conversion UPS

	DPS-60K	DPS-80K	DPS-100K	DPS-120K
Voltage	380/220V, 400/230V (3 phase, 4-wire +G)			
Input Voltage Range	-45% ~ 20% (208 ~ 477Vac)			
Output Voltage	380/220V, 400/230V (3 phase, 4-wire +G)			
Output Power Factor	0.9			
Efficiency	Up to 94%			



	DPS-160K	DPS-200K	DPS-300K	DPS-400K
Voltage	380/220, 400/230, 415/240 Vac (3 phase, 4-wire + G)			
Input Voltage Range	-40% ~ 20% (242 ~ 477/140 ~ 276 Vac)			
Output Voltage	380/220, 400/230, 415/240 Vac (3 phase, 4-wire + G)			
Output Power Factor	0.9			
Efficiency	Up to 96%			

NT Series 20-500kVA

- Transformer based Full bridge UPS
- 6 pulse/12 Pulse rectifier
- Economic mode for energy and operation cost savings
- Built-in manual bypass switch for maintenance

	NT-20K	30K	40K	50K	60K	80K	100K	120K	160K	200K	260K	320K	400K	500K
Power Rating - kVA	20	30	40	50	60	80	100	120	160	200	260	320	400	500
Voltage	208/120, 380/220, 400/230, 415/240, 480/277 Vac (3 phase, 4-wire + G)													
Input Voltage Range	± 20%													
Output Voltage	208/120, 380/220, 400/230, 415/240, 480/277 Vac (3 phase, 4-wire + G)													
Interface	RS232 x 1, RS485 x 2, SNMP slot x 1, Status dry contact output x 6													



Modulon Three phase UPS

NH Plus Series 20-120kVA

- Frames 80kVA, 120kVA
- Hot-swappable power modules
- Over 94 % efficiency
- Built-in manual and static bypass switch for maintenance



	NHP-20K	NHP-40K	NHP-60K	NHP-80K	NHP-100K	NHP-120K
Power Rating - kVA	20	40	60	80	100	120
Voltage	380/220, 400/230, 415/240 Vac (3 phase, 4-wire + G)					
Input Voltage Range	208 ~ 477 Vac (line-line)/120 ~ 276 Vac (line-neutral)					
Output Voltage	380/220, 400/230, 415/240 Vac (3 phase, 4-wire + G)					
Interface	RS232 x 1, SNMP slot x 2, Dry contact output x 6, Dry contact input x 2, Battery cabinet temperature x 4, Battery cabinet status detection x 1, Parallel port x 1, REPO x 1					

DPH Series 25 - 200kW

- Hot-swappable function for all major functional blocks
- N+X parallel redundancy (up to 4 cabinets)
- Output Power Factor 1,0
- Up to 96 % efficiency



	DPH 75kW System	DPH 150kW System	DPH 200kW System
Power Rating (kVA)	25, 50, 75	25, 50, 75, 100, 125, 150	25, 50, 75, 100, 125, 150, 175, 200
Input Voltage Range	380/220V, 400/230V, 415/240V (3 phase, 4-wire +G)		
Output Voltage	176~276 / 305~477 Vac		
Interface	System communication port x 1, LCM port x 1		

Telecom Power Solutions



Telecom power systems secure telecommunication equipment in case of grid power interruptions and fluctuations. Delta's power systems are designed for wireless broadband access and fixed-line applications, as well as for Internet backbone and data centres. We provide a broad range of power systems and global services to telecom operators, network manufacturers and integrators.

CabD 4000-48/6/12/24

CabD is an energy efficient, high power density system that is ideal for space critical applications. An integrated modular system allows flexible and adaptable installations. The system includes up to six rectifiers, AC and DC connections, battery connection and the Delta PSC 3 or Orion controller. In addition, easy installation and expand-ability add to the success of the system.

	CabD 4000/6	CabD 4000/12	CabD 4000/24
Dimension (WxHxL)	1800, 2000, 2200mm(H) x 600mm(W) x 600mm(D)	1800, 2000, 2200mm(H) x 600mm(W) x 600mm(D)	1800, 2000, 2200mm(H) x 600mm(W) x 600mm(D)
Max. system power	24kW	48kW	96kW
Voltage range	42 - 58 V _{DC} ; 53.5 V _{VDC nom}		
Controller	PSC 3 / Orion		

CellD - high power for space-critical applications

CellD systems are 19" Rack mount shelves (DPS) with multiple optional slots for power modules (DPR). They can be embedded in the telecom infrastructure and can be used in outdoor and indoor solutions. The products in this series are light and designed especially for installations with limited space.

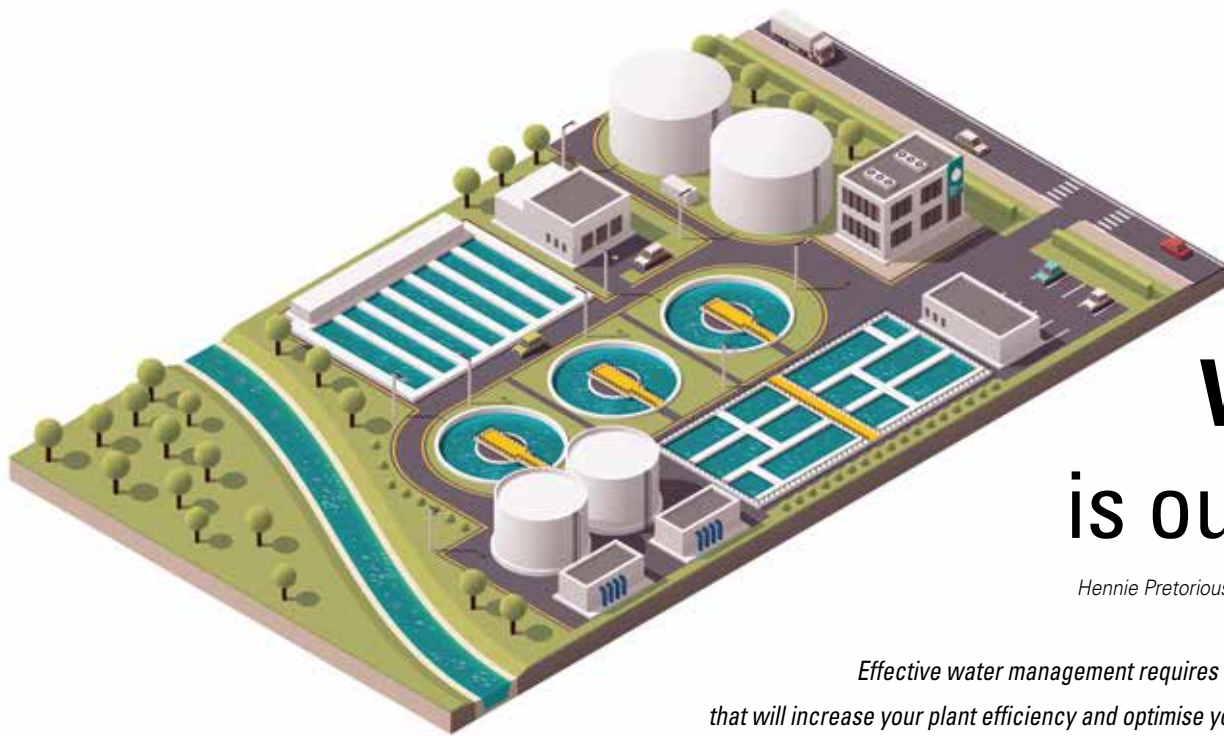


	CellD 40	CellD 100	CellD 300	CellD 600
AC input connection	L + N + PE	6 x L + N + PE or optional 3L + N + PE	3 x (L + N + PE) or 3L + N + PE	2 x (3L + N + PE) or 3L + N + PE
AC input voltage	208 / 220 / 230 / 240 VRMS	208 / 220 / 230 / 240 VRMS	2 x 230 VRMS (L - N)	2 x 230 VRMS (L - N) or 3 x 230 VRMS (L - N)
DC voltage range	42 - 58 VDC, 53.5 DC NOM	42 - 58 VDC, 53.5 VDC NOM	42 - 58 VDC, 54 VDC NOM	42 - 58 VDC, 54 VDC NOM
Power, nominal	2.55 kW	5.1 kW	17.4 kW	34.8 kW or 20 kW
Efficiency rectifier	95.2%	95.2%	96.2%	95 %
Controller	PSC 3 or CSU 50	PSC 3 or CSU 502	PSC 3	PSC 3
Rectifier	DPR 850B-48	Max 6 x DPR 850B-48	Max 6 DPR 2900B-48	Max 9 or 12 x DPR 2900B-48 or max 5 x DPR 4000B-48

Contact us:

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 Bloemfontein: Tel: 051 011 0158, Fax: 051 444-1996
 For more visit: www.deltapowersolutions.co.za /
www.solar-solutions.co.za



Water is our Life

Hennie Pretorius, Endress+Hauser

*Effective water management requires high-quality solutions
that will increase your plant efficiency and optimise your operational costs.*

Water is a vital resource and therefore needs to be managed carefully throughout the complete process. Endress+Hauser assists with technical and process support having expert experience and knowledge of the standards within the water and wastewater industry.

Endress+Hauser South Africa (referred to in this article as the company) is well established in all areas of water and wastewater treatment with a network of global support. These competencies include monitoring the quality of water bodies, drinking water treatment and distribution thereof. As the various regions in South Africa are running out of surface water to use for drinking water, coastal towns and cities will turn to desalination of sea water where inland towns and cities will turn to water-reuse to supplement their water supply.

Membrane filtration

The use of Membrane filtration is key to these water supply solutions and the company has proved to be a reliable partner to various membrane plant builders whether in desalination or water re-use. Further to these, the company has a large footprint in treatment and optimisation of municipal as well as industrial waste water. Robust, reliable and user friendly measurement technology is essential to the reliable operations of water works and sewage treatment. It offers a modern portfolio of measurement devices that makes it possible for you to find the ideal solution for all your applications from one single source.

Platform technologies such as Proline (flow), Liquiline (liquid analysis) and Cerabar (pressure) offer a host of benefits for planners, system integrators, operators, as well as service personnel. These include reduced complexity due to standardisation of similar measuring points, easy multiplication of device settings for comparable measuring points reducing time, potential for errors and they optimise stock keeping of modular replacement parts for device platforms.

Early project stage

The correct selection of your measuring points starts at the design stage of your project. As part of the company's industry focus and

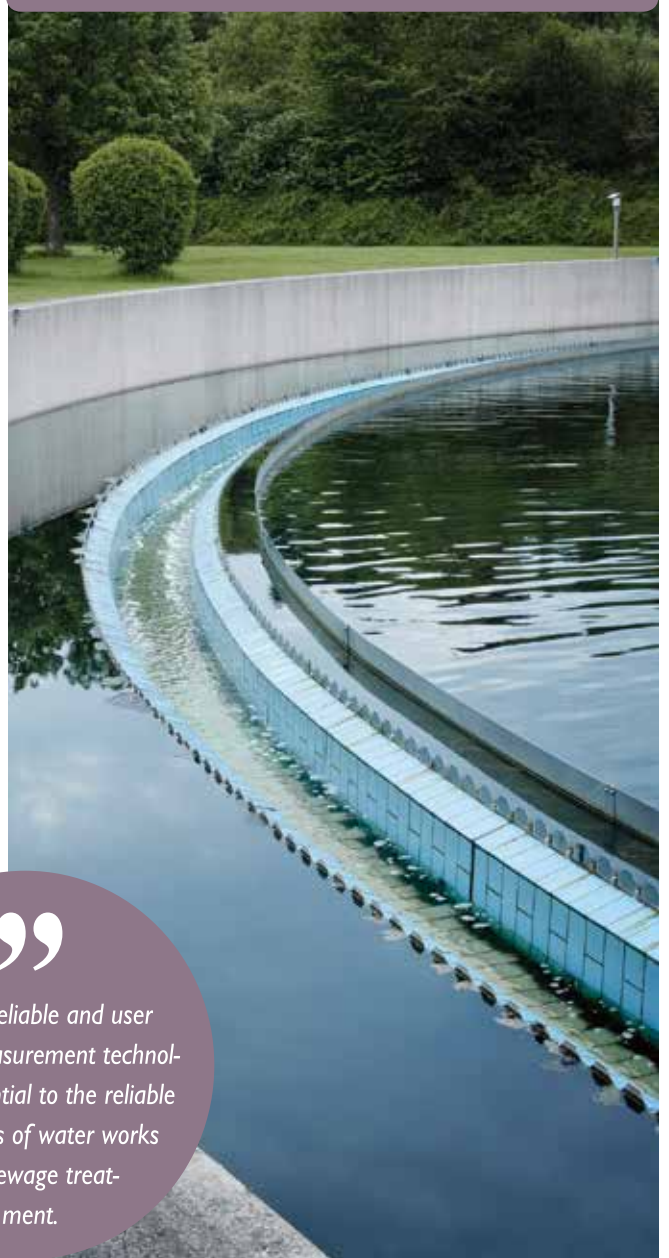
expertise, assistance and consulting services can be supplied early in the project stages. This will assist in selecting the correct and most cost effective solution from their extensive and flexible product basket. Included is the selection of the most suited measurement principal to a particular process as well as selecting the correct segmented product according to required features and capabilities, such as advanced diagnostics. The complete solution to the loop by offering surge arresters, power supplies and displays, can be provided. Smart system components such as data managers and loggers complete the measurement basket and allow smart solutions in respect of data storage, individual preference for I/O types, quantities and linking to various communication protocols. These include HART, WirelessHART, PROFIBUS, FOUNDATION FIELDBUS and Ethernet.

Energy consumption in wastewater treatment

As energy consumption forms a large part of the overall operating cost of a wastewater treatment plant, it is of utmost importance to monitor this continuously. The transparent presentation of energy consumption needs to be broken down into individual processes in order to benchmark the energy optimisation. Endress+Hauser has developed a smart energy monitoring solution for sewage treatment plants based on the advanced and improved Memograph RSG45. As an energy manager, the RSG45 collects, calculates and visualises the defined key performance indicators of the plant. In conjunction with the intuitive Field Data Manager software (FDM), remote access and further processing becomes very easy to implement. Energy monitoring offers:

- Optimised plant performance
- Increased pump efficiency
- Monitoring electricity generation (where biogas is used)
- Improved aeration performance
- Customised KPIs

Biological wastewater treatment is a core process in any modern sewage processing plant. It involves the decomposition of organic loads and nutrients that can cause eutrophication in downstream water bodies. The aeration of the aerobic treatment step is however a major



cost factor, with at least 50% of electrical energy is consumed alone. It has already been proven by many operators that a strategically implemented aeration control system can significantly improve both effluent discharge values as well as energy consumption. In many places phosphate precipitation is also necessary but this also represents a significant cost factor. Load-sensitive phosphate precipitation is an effective solution for cost efficiency and safe phosphate discharge levels.

The company's load sensitive controller, the Liquiline Control CDC81, using ammonia and nitrate levels in the process, aims to achieve safe effluent levels as a first priority and also reduce energy consumption significantly. The controller can be rapidly commissioned and supplies you with identical HMIs for up to three biological treatment zones. It provides you with real time control, fieldbus communication, failure safe modes according to process impact, event and alarm messaging as well as data logging. It is able to control and optimise continuous aeration, intermittent aeration as well as precipitant dosing for phosphate removal.

*Endress+Hauser South Africa will be launching the **LIQUILINE Control CDC81** at WISA 2016 in Durban from 15 to 19 May 2016.*

”
Robust, reliable and user friendly measurement technology is essential to the reliable operations of water works and sewage treatment.

When you need assistance, the company's 24/7 service helpline is there to support you and give you required assistance in order to minimise your downtime. This can be telephonic assistance or on-site diagnostics or repair.

Further support services offered are engineering, commissioning, traceable calibrations, maintenance and expert product training. When you want to optimise your processes based on the services provided, the company can offer further assistance. This includes maintenance and calibration management, maintenance consulting as well as calibration consulting.

Only a clear picture and detailed knowledge of the installed instrument base can act as a solid foundation for a predictive maintenance and optimising strategy for your plant. Whether you need to find information concerning spare parts, verify software versions, trace instrument history records on the basis of key events or view the plant database with its installed instruments – the data must be up to date and rapidly available. W@M Lifecycle management supports these operational matters and can assume strategic tasks. The first step for this implementation is an Installed Base Audit in order to capture all the process equipment and instrumentation. Your main benefits will be:

- Full information traceability of your field instrumentation once the audit is complete
- Information at your fingertips 24/7 – highly valuable in urgent situations
- Efficiency gains in your operations through the significant improvement of your asset information management


Even third party devices can be included but the information update will be a manual process.

Conclusion

Plant managers have a continuous struggle to improve their water processes and reduce operational costs of their plants. With this are the challenges faced in increasing their plant safety and availability. Count on the People for Process Automation to optimise your water process and support you globally as a long-term partner.

take note

- Regions in South Africa are running out of surface water to use for drinking water.
- Coastal towns and cities will turn to desalination of sea water to supplement water supply.
- Inland towns and cities will turn to water reuse to supplement water supply.



Hennie Pretorius is the Industry Manager (Water and Waste-water) at Endress+Hauser. Enquiries: Tel. +27 (0) 11 262 8068 or email info@za.endress.com

Pneumatic energy saving solutions

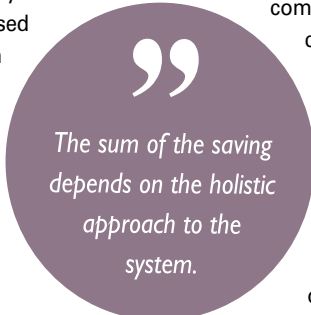
Riaan van Eck, SMC Pneumatics

Energy saving has become more than just a catch phrase. It is something which every business needs to consider in terms of cost and productivity.

It is estimated that a medium-sized business company loses almost 20% of energy used and it is the sum total of looking at an entire system which yields the best energy savings. During the Japan Kyoto Climate Change conference, two objectives emerged:

- More efficient use of direct oil and electricity consumption
- To contribute to the conservation of the environment with the reduction of CO₂

According to recent research in Europe, there are currently more than 320 000 production facilities which use compressed air systems. In total the annual estimated consumption of electricity in European industry is 400 TWh which is divided into three main categories with regards to energy: coolants – 30%, compressed air – 20% and others – 50%. The required electric energy to produce compressed air for such facilities constitutes almost 20% of this total industrial consumption.



Possible energy savings in pneumatics

- In an average facility, 70% of compressed air is used in blowing applications, 10% in actuation and the remaining 20% is lost through leaks
- By focusing specifically on these systems, one could easily achieve energy savings of between 5 – 50%
- The first step in conserving energy would be to look at the reduction in air for blowing processes and looking into air leaks
- The second analysis reveals that 20% to 50% of the air consumption measured as leakage is divided into 25% for connectors/adapters, 20% for connection, 30% for hosing and 25% for other types

If we assume that an average saving of 33% could be made thanks to using more energy efficient compressed air systems (26 TWh), and if we take the average cost of electricity at €0,09/kWh, the total saving in electric energy which could be achieved in compressed air systems in Europe would be €2 340 M. Typical reasons for inefficiency which could be investigated are the following:

Inefficient compressor control, the compressed air pressure is too high Poor design of the pneumatic pipelines Incorrect sizing of the pneumatic actuators Inefficient use of air blowing	Poor air quality Low quality pneumatic elements used Obstructed filters Intermittent demand vs constant supply. Look for leaks in the system
--	--

It must be taken into consideration that leaks are not only produced in the case of compressed air storage but also in pneumatic systems

on standby (such as static or vacuum leaks) and in pneumatic system in operation. Dynamic leaks can be detected while in use. Various methods can be used to increase efficiency, such as:

Reduce the air pressure to the minimum requirement Filter and dry the air using the correct equipment When not in use, isolate the plant by using two-way valves Generate a vacuum by using multi-stage ejectors with vacuum switches Periodically check air consumption	Adapt the size of the pneumatic components to the real performance requirements Use only quality products Detain the air blowing when not required When replacing or installing new components, choose energy efficient options Avoid and reduce air leaks
--	--

In order to generate 1 kW with compressed air we require between 7 – 8 kW of electricity. If we translate this into economic language the result is that the generation of 1Nm³ of compressed air means 1 cent of energy expense and between 2-3 cents when counting compressor maintenance. As an example, a 120 CV (88 kW) compressor is able to provide us with a flow of approximately 850 m³/h. When operating continuously over one year it will consume approximately €70 000 in electric energy (depending on the cost of the kW/h).

Efficiency = Knowing the cost/consumption levels

To ascertain energy saving measures in pneumatics, issues such as the purchase cost and maintenance cost of the machine, how much is spent on compressed air and how much compressed air is efficiently taken advantage of, must be addressed. Only then can you decide on where and when savings are possible.

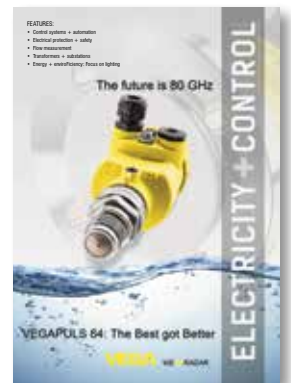
Conclusion

Save today – by reducing energy costs in the consumption of the compressed air by adopting actions which alter its generation and use. Save in the future by demanding energy efficient facilities and machines.

- There are more than 320 000 production facilities in Europe that use compressed air systems.
- By using more efficient energy efficient compressed air systems, an average saving of 33% could be made.
- Reducing the air used for blowing processes as well as the close monitoring of air leaks would contribute towards conserving energy in pneumatics.

Riaan van Eck is the Training Manager for SMC Pneumatics South Africa. Riaan has had extensive training in Spain, UK and Germany and has been in the pneumatics industry for close to ten years working for some of the world's top pneumatic brands. He has experience in manufacturing, factory automation, process control, pneumatics and PLCs among others. Enquiries: Email rvaneck@smcpneumatics.co.za.

New VEGAPULS 64 radar sensor that measures liquids with high frequency technology



VEGA is launching VEGAPULS 64 80 GHz radar level sensor in May 2016. VEGAPULS 64 is the first radar level sensor for liquids on the market that measures with a frequency of 80 GHz. The biggest advantage is the better focusing of the radar beam. Greater reliability is achieved, even under the most difficult conditions such as internal structures, low reflectivity, build up, surface foam and condensation.

Radar level transmitters have largely replaced previous measuring principles such as float-based systems or ultrasound devices in many areas of industry. The areas of application have gradually been expanded so that users are more frequently using this technology. VEGA has installed more than half a million radar sensors worldwide. One and a half years ago, thanks to new developments in electronic components, VEGA launched the VEGAPULS 69, an 80 GHz bulk solids radar level sensor. This device was revolutionary, because it used this higher measuring frequency with a narrower focusing of

the radar beam, delivering a major leap forward in bulk solids level measurement. Now VEGA has set a new milestone: The VEGAPULS 64 is the world's first level sensor for liquids that also uses the 80 GHz frequency range. Once again, this enhanced focusing helps to further distinguish the level measurement signal from interfering signals, especially in containers with internal installations.

Tested components: The advantage for the user is that some of the electronics and technologies have been adopted from the bulk solids radar measuring instrument. The VEGAPULS 64 operates with a 4 GHz bandwidth, so that an even better, clearer separation of all the reflected signals is possible.

Unique focusing and dynamic response: The VEGAPULS 64 radar sensor, using 80 GHz, offers better focusing and a great dynamic response. The dynamic range, or sensitivity of a radar sensor, defines which areas of application it can be used. Never before has there been a radar sensor for liquid applications which can cover a range as wide as this.

Easy installation and commissioning: The commissioning of the VEGAPULS 64 is much easier as complicated interfering signal mapping is no longer required.

Looking Forward

It is evident that the new VEGAPULS 64 radar level sensor will become a problem solver in storage and reaction vessels with many internal installations and agitators. The sensor has demonstrated itself to be insensitive to extreme process conditions, foam or caking. VEGAPULS 64 is suitable for containers with heating coils, or narrow pump shafts in waste water treatment. It is highly effective in many applications in the pharmaceutical and food industry.

Enquiries: Chantal Groom. VEGA Controls South Africa

@ Email chantal.groom@vega.com



For the latest generation of radars, condensate on the sensor is not an issue. Totally unaffected by condensation or buildup on the antenna, VEGAPULS 64 accurately detects the liquid level. With the smallest antenna of its kind and exceptional focusing, it delivers outstanding performance every time. Simply world-class!

Production availability extended

An **Endress+Hauser** client in the Oil & Gas industry presented a challenge, where it had to save costs on maintenance as well as prevent production losses. Endress+Hauser has assisted the client to minimise maintenance and costs. Apart from continuous production processes, an Endress+Hauser Oil & Gas client is specialising in customised batch processes. The flexibility of this client is apparent in high batch cycles and medium changes. A batch runs between a few days and several months. Between every batch, the vessel has to be cleaned to avoid contamination and to avoid safety risks caused by reactions of different chemicals. Complete cleaning is also necessary in case of maintenance work at the plant. The reactor for special chemicals frequently caused control issues since measurements with capillary systems did not work properly. Varying ambient temperatures jeopardised the reliability of measurements. The oil filling in the capillaries expanded and created an increasing output signal independently of any level change in the distillation column. Furthermore, the mechanical and thermal impact destroyed the capillaries every four to six months. The consequences were not only an unreliable process control but also at least one day of production losses due to maintenance work required every four to six months to replace the whole capillary system.

A Deltabar FMD72 electronic dp solution with metal cells was suggested to replace the inferior capillary system. Endress+Hauser also suggested level calculation from two values of the sensor modules within the transmitter due to the problems mentioned, the client decided to use Deltabar FMD72 electronic dp, which eliminates all of the typical issues with traditional differential pressure measurements using capillaries. Since the installation of Deltabar FMD72 at the reactor 18 months ago, it has never been touched again for maintenance as the reliability of the system is outstanding. The client was also pleased with the modular concept compared to capillary systems because individual sensor parts and electronics can be exchanged in case of need. Thanks to the elimination of production shutdowns for capillary maintenance, the client has extended their production capacity by at least three days per year

which results in cost savings. Because of this positive experience, the Plant Operations Manager would like to avoid any further use of capillary systems in these applications and will choose the Deltabar FMD72 electronic dp any time.

The client is a privately held chemical producer for third parties. With batch reactor capabilities of up to 32 000 litres, the client features flexible, multipurpose continuous production and conventional catalytic batch slurry autoclaves. The Plant Operations Manager commented and said that this was installed in 10 minutes, they have just flanged it up, wired it and all his problems was gone. He also said that this system perfectly suits them as it reduced their costs and increased reliability of their processes.

**Enquiries: Tel. +27 (0) 11 262 8000 or email
Jan.Gerritsen@za.endress.com**



Inventors honoured

Year after year, the **Endress+Hauser** Group invests more than 7% of its sales worldwide in research and development. A consistently high rate of patent applications in all areas of measurement technology is proof of the solid power of innovation of the Swiss family company.

"With 270 first applications and 456 patents granted, we're pleased to report that we once more exceeded last year's great results," says Angelika Andres, Head of PatServe, Endress+Hauser's

intellectual property department. "The development shows a high level of continuity and a good spread across all our key technologies." The segment with the strongest growth was analytics, where the strategic acquisitions of recent years.

On average, four out of five invention disclosures from Endress+Hauser's rank and file are forwarded to the patent office. More than half of these have global relevance and are also patented in the USA and in China. Only about 30% of all patents reach business relevance, often after many years, but they are crucially important for the Group's growth.

PatServe opening an office abroad fits well into this context: From 1 April 2016, three experts will protect technical innovations at the Greenwood site in Indiana where Endress+Hauser produces level, flow, pressure and temperature measurement instruments.

**Enquiries: Su-anne Willemse.
Email suanne.willemse@za.endress.com**



Endress+Hauser honouring its inventors at the Innovators' Meeting in Mulhouse, France.

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Turbine control systems for Mongolia's largest thermal power plant

Yokogawa has received an order to supply turbine control systems for thermal power plant No. 4, the largest thermal power plant in Mongolia. This 2,1 billion yen project is being undertaken to improve the efficiency of this facility's operations.

Located in Mongolia's capital city, Ulaanbaatar, thermal power plant No. 4 has a total capacity of 703 MW and accounts for approximately 70% of the electricity output to the central energy system in Mongolia. The plant also supplies 1 373 Gcal/h (12 000 t/h) of hot water for the district heating system in Ulaanbaatar, meeting about 65% of the city's heating demand. Temperatures in this region fall as low as -40°C in mid-winter, so this power plant is a crucial lifeline for the city's residents.

This project, which is financed by a Japanese ODA loan from the Japan International Cooperation Agency (JICA), will improve the efficiency of power generation and stabilise the supply of electricity and hot water by this plant. For six of the plant's turbines, obsolete mechanical speed governors will be converted to electronic governors, and control systems and instrumentation will be replaced. In addition to supplying the CENTUMVP integrated production control system for the control and monitoring of the turbine governors

and auxiliary facilities such as the feed water pump control system, Yokogawa will provide field devices such as DPharp EJA series differential pressure/pressure transmitters, FLXA21/FLXA202 liquid analysers, control valves, and safety valves. Yokogawa will also have full responsibility for the implementation of this renovation project.

Enquiries: Christie Cronje. Tel. +27 (0) 11 831 6300 or email Christie.cronje@za.yokogawa.com



'Wear-n-tear' free monitor for liquid media

KOBOLD Instrumentation, represented in South Africa by **Instrotech** – a **Comtest Group** company, has on offer its model NCW capacitive level monitors for liquid media, ensuring secure protection against overflowing or unintended emptying of tanks or reservoirs. The proven capacitive measuring principle for limit level detection works almost wear-and-tear free. PTFE-coating isolates the stainless steel probes from the medium and guarantees a high chemical resistance.

Four versions enable an individual choice appropriate to the measuring task. In addition to the single probe standard solution for metallic tanks, double probe versions for non-metallic tanks and for aggressive media are also available. For media with low dielectric constants, the units can also be delivered with a coaxial reference tube. A high temperature version designed for fluid temperature of max. 125°C tops off the all-round program.

The length of the measuring probes can be individually configured up to 4 000 mm according to requirements. The devices are compact and beside assembly from the top, the short probes can also be installed from the side. A pluggable electronic module is

situated outside the tank in the connection head. The potentiometer and DIP switches of the electronic module enable precise adjustment of this reliable limit level detector to the respective medium. The measuring system is based on the capacitive measuring method.

Enquiries: Tel. +27 (0) 10 595 1831 or email sales@instrotech.co.za



Stainless steel safety hinge solution

The Leuze S420 safety hinge switch unites the safety switch and door hinge functions in a single component. This stainless steel safety hinge switch, available from **Countapulse Controls**, offers an ideal solution for mechanically and hygienically challenging applications such as the food and beverage,



pharmaceutical or cosmetics industries. There are numerous applications for these high quality safety hinge switches. An example would be for the position monitoring of hard guards such as protective hoods that can rotate by means of a monitoring switch (without guard interlocking) integrated into the hinge. The switch does not require an external actuator which means it is also suitable for use in environments with high dust concentration levels or with heavy particle loads. Fault-free function is ensured even with warped or misaligned doors by means of a repeatable setting (switching angle alignment). The actuator is integrated into the housing while electrical connection is by means of either a cable or an M 12 plug with

optional cable entry from above, below or on the wall or mounting side. This allows for the monitoring of all types of doors, hoods and flaps. The safety hinge switch has an opening angle of up to 180° which can be adjusted as many times as needed.

The Leuze S420 stainless steel switch offers optimum cleaning options even with high pressure cleaning, thanks to a wall side cable outlet, a high grade surface with a roughness of less than 0,8 micrometres and an IP 67, IP 69 K level of protection. In addition, covered tamper proof screws reduce the risk of contamination by a considerable margin.

Enquiries: Gerry Bryant. Tel. +27 (0) 11 615 7556 or email bryant@countapulse.co.za

Where pressure prevails

KOBOLD Messring GmbH, represented in South Africa by Instrotech – a **Comtest Group** company – has introduced the PAS pressure transmitter that enables precise monitoring of absolute and gauge pressures. The PAS is a microprocessor-based, high performance transmitter, which has a flexible pressure calibration and output signal. It has automatic compensation of ambient temperature and process variables. Communication with the instrument and configuration of various parameters is possible via HART protocol. The sensor's data is loaded, modified and stored in EPROM. The device has different measuring ranges of between -1...1.5 bar and 0...600 bar and can be used for a multitude of applications.

The heart of this robust and long-term stable measuring instrument is a piezo-resistive pressure sensor. The accuracy is ± 0,075% of the calibrated span and process temperatures may range from -40°C to +120°C.

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Checking ground electrode impedance for commercial, industrial and residential buildings: *Part 1*

Technical Information supplied by John Wilson on behalf of Comtest for the Fluke Corporation

The first of a two part discussion on earth/ground principles and safety and principle testing methods and the 3 and 4 pole Fall-of-Potential testing. (Selective testing, stakeless testing and 2 pole testing will be published in the June 2016 issue).

Most facilities have grounded electrical systems, so that in the event of a lightning strike or utility overvoltage, current will find a safe path to earth. A ground electrode provides the contact between the electrical system and the earth. To ensure a reliable connection to earth, electrical codes, engineering standards, and local standards often specify a minimum impedance for the ground electrode. The International Electrical Testing Association specifies ground electrode testing every three years for a system in good condition with average up-time requirements.

Why ground?

The US National Electrical Code (NEC) gives two principle reasons for grounding a facility:

- Stabilise the voltage to earth during normal operation
- Limit the voltage rise created by lightning, line surges or unintentional contact with higher-voltage lines

Current will always find and travel the least resistance path back to its source, be that a utility transformer, a transformer within the facility or a generator. Lightning, meanwhile, will always find a way to get to the earth.

In the event of a lightning strike on utility lines or anywhere in the vicinity of a building, a low impedance ground electrode will help carry the energy into the earth. The grounding and bonding systems connect the earth near the building with the electrical system and building steel. In a lightning strike, the facility will be at approximately the same potential. By keeping the potential gradient low, damage is minimised.

If a medium voltage utility line (over 1 000 V) comes into contact with a low voltage line, a drastic overvoltage could occur for nearby

facilities. A low impedance electrode will help limit the voltage increase at the facility. A low impedance ground can also provide a return path for utility generated transients. *Figure 1* shows a grounding system for a commercial building.

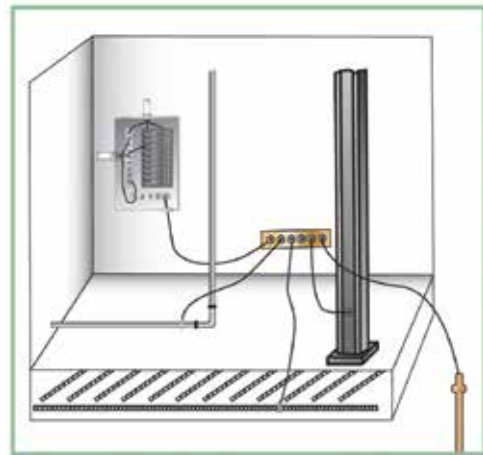


Figure 1: A grounding system combining reinforcing steel and a rod electrode.

Ground electrode impedance

The impedance from the grounding electrode to the earth varies depending on two factors: the resistivity of the surrounding earth and the structure of the electrode.

Resistivity is a property of any material and it defines the material's ability to conduct current. The resistivity of earth is complicated, because it:

- Depends on composition of the soil (e.g. clay, gravel and sand)



- Can vary even over small distances due to the mix of different materials
- Depends on mineral (e.g. salt) content
- Varies with compression and can vary with time due to settling
- Changes with temperature, freezing (and thus time of year). Resistivity increases with decreasing temperature.
- Can be affected by buried metal tanks, pipes, re-bar, etc.
- Varies with depth

Since resistivity may decrease with depth, one way to reduce earth impedance is to drive an electrode deeper. Using an array of rods, a conductive ring or a grid are other common ways of increasing the effective area of an electrode. Multiple rods should be outside of each other's 'areas of influence' to be most effective (see *Figure 2*). The rule of thumb is to separate the elements by more than their length. For example: 8-foot rods should be spaced more than 8 feet apart to be most effective.

The NEC specifies 25 ohms as an acceptable limit for electrode impedance. The IEEE 142 [1] suggests a resistance between the main grounding electrode and earth of 1 to 5 ohms for large commercial or industrial systems.

Local authorities including the Authority Having Jurisdiction (AHJ) and plant managers are responsible for determining acceptable limits for ground electrode impedance.

Note: Power distribution systems deliver alternating current and ground testers use alternating current for testing. So, you would think we would talk about impedance, not resistance. However, at power line frequencies, the resistive component of the earth impedance is usually much bigger than the reactive component, so you will see the terms impedance and resistance used almost interchangeably.

How do ground impedance testers work?

There are two types of ground impedance testers. Three and four point ground testers and clamp-on ground testers. Both types apply a voltage on the electrode and measure the resulting current.

A three or four-pole ground tester combines a current source and voltage measurement in a 'lunch box' or multimeter-style package. They use multiple stakes and clamps. Ground testers have the following characteristics:

- Ac test current. Earth does not conduct dc very well
- Test frequency that is close to, but distinguishable from the power frequency and its harmonics. This prevents stray currents from interfering with ground impedance measurements

- Separate source and measure leads to compensate for the long leads used in this measurement
- Input filtering designed to pick up its own signal and screen out all others

Clamp-on ground testers resemble a large clamp meter, but they are very different because clamp-on ground testers have both a source transformer and a measurement transformer. The source transformer imposes a voltage on the loop under test and the measurement transformer measures the resulting current. The clamp-on ground tester uses advanced filtering to recognise its own signal and screen out all others.

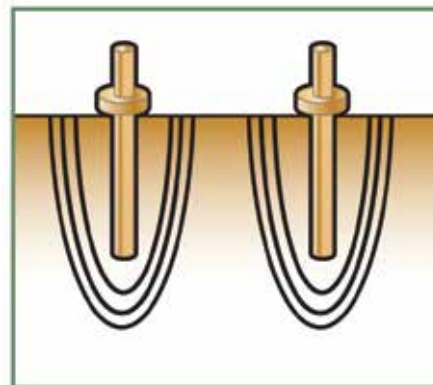


Figure 2: Ground electrodes have 'areas of influence' that surround them.

Ground testing safety

Always use insulated gloves, eye protection and other appropriate personal protective equipment when making connections. It is not safe to assume that a ground electrode has zero voltage or zero amps, for reasons given.

To perform a basic ground test (called Fall-of-Potential) on an electrode, the electrode must be disconnected from the building. New selective methods allow accurate testing with the electrode still connected.

A ground fault in the system might cause significant current to flow through the ground conductor. You should use a clamp meter to check for current before performing any impedance testing. If you measure above 1 A you should investigate the source of the current before proceeding.

If you must disconnect an electrode from an electrical system, try to do so during a maintenance shutdown when you can de-energise the system. Otherwise, consider temporarily connecting a back-up electrode to the electrical system during your test.

Never disconnect a ground electrode if there is a chance of lightning. A ground fault in the vicinity can cause voltage rises in the earth. The source of the ground fault may not even be in the facility you are testing, but could cause voltage between the test electrodes. This can be especially dangerous near utility substations or transmission lines where significant ground currents can occur. (Testing grounding systems of transmission towers or substations requires the use of special 'Live Earth' procedures (not covered in this article).

Ground impedance testers use much higher energy than your standard multimeter. They can output up to 250 mA. Make sure everyone in the area of the test is aware of this and warn them not to touch the probes with the instrument activated.

Checking connection resistance - leading up to the electrode

Before testing the electrode, start by checking its connection to the facility bonding system. Most Fall-of-Potential testers have the ability to measure 2-pole, low ohms and are perfect for the job. You should see less than 1 ohm:

- At the main bonding jumper
- Between the main bonding jumper and the ground electrode conductor
- Between the ground electrode conductor and the ground electrode
- Along any other intermediate connection between the main bonding jumper and the ground electrode

Fall-of-Potential method

The Fall-of-Potential method is the traditional method for testing electrode resistance. The procedure is specified in IEEE-81 [2]. In its basic form, it works well for small electrode systems like one or two ground rods. The Tagg Slope technique (described in Part 2, June 2016) can help you draw accurate conclusions about larger systems. For this method, the ground electrode must be disconnected from the building electrical service.

How it works

The Fall-of-Potential method connects to the earth at three places. It is often called the three-pole method. You may want to use a fourth lead for precise measurements on low-impedance electrodes, but for our initial discussions we will consider three leads. The connections are made to:

- E/C1 – ground electrode being tested
- S/P2 – voltage (potential) measurement stake driven into the earth some distance away from the electrode... sometimes called the potential auxiliary electrode
- H/C2 – current stake driven into the earth a further distance away... sometimes called the current auxiliary electrode

Figure 3 shows this schematically and Figure 4 shows the three connections made using a typical ground tester.

The ground tester injects an alternating current into the earth between the electrode under test (E) and the current stake (C2). The ground tester measures the voltage drop between the P2 stake and E. It then uses ohms law to calculate the resistance between P2 and E.

To perform the test you position the C2 stake at some distance from the electrode under test. Then, keeping the C2 stake fixed, you move the P2 stake along the line between E and C2, measuring the impedance along the way. The tricky part comes in determining where to drive the stakes to get a true reading of the resistance between the electrode and the earth. At what point does the dirt surrounding the electrode stop being a contributor of resistance and become the vast earth? Remember that we are not interested in the resistance between the electrode and our stakes. We are trying to measure the resistance that a fault current would see as it passes through the mass of the earth. The current probe generates a voltage between itself and the electrode under test. Close to the electrode, the voltage is low and becomes zero when the P stake and electrode are in contact.

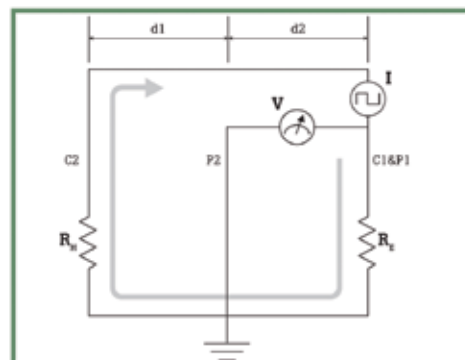


Figure 3: 3-point measurement.

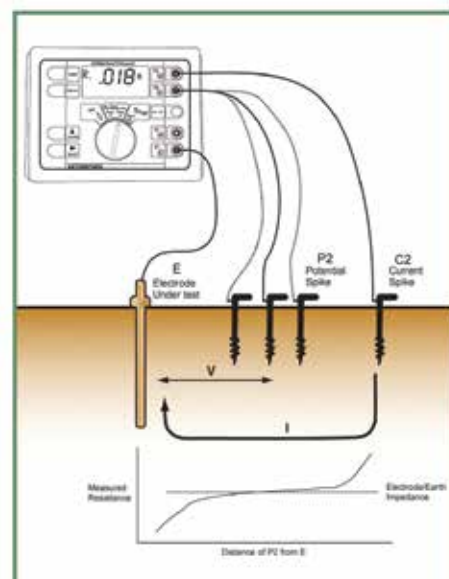


Figure 4: A plot of measured impedances versus position of the potential stake allows us to see the earth impedance.

Measurement tips

- Bring a good, long tape measure
- Finding the horizontal part of the curve will require at least five, but more likely seven or nine measurements
- It's a good idea to take three of your resistance readings with the P2 stake at 20%, 40% and 60% of the distance between E and C2. This will allow you to use the Tagg Slope Technique
- When placing the stakes make sure the current stake, the potential stake and the electrode under test form a straight line
- If you get a very high impedance measurement or over-range, try pouring some water around the test stakes to improve their contact to earth. This isn't cheating since our intention is not to measure the resistance of our stakes, but to measure the resistance of the electrode
- Keep the potential and current leads separated to avoid signal coupling between the two
- At a new construction site, you may want to take multiple sets of measurements. Resistance may drop over time as the earth settles

”
Current will find and travel the least resistance path back to its source; lightning will find a way to get to the earth.

Close to the electrode, the potential probe is said to be within the influence of the electrode. Close to the current probe the voltage is almost the full voltage output by the tester. But somewhere in the middle, something interesting happens.

As we move from the influence of the electrodes and into the mass of the earth, the test current no longer causes significant change in potential. If you plot a series of measurements, moving the potential stake away from the electrode under test, and towards the current stake you will notice a flattening of the curve. An ideal curve is shown in *Figure 3*. The flattest part of the curve is where we read the earth resistance. In reality, the curve never goes entirely flat but reaches a very gentle slope where changes in resistance are small.

The extent of the influence of the electrode depends on its depth and its area. Deeper electrodes require that the current stake be driven farther away (see *Table 1*). For large ground rings, grids or arrays the influence of the electrode may extend for hundreds of feet. *Table 2* gives suggested starting points for current and potential stake placement.

Because of the possibility of interaction between an electrode rings, grids or arrays, and the measurement stakes you should not take shortcuts – plot the Fall-of-Potential graph to be sure you are getting accurate results.

In testing a bonded array of electrodes the combined resistance of the array will be less than the lowest reading you measure for any individual electrode. If, for example, you have two eight foot rods spaced more than eight feet apart you can be confident that the combined resistance will be substantially less for the combined system.

The three-wire measurement will deliver good results if you use a short C1 lead, or if you do not mind having a fraction of an ohm of lead resistance in your reading. For ground resistance measurements

over 10 ohms, the effect of the resistance of the C1 lead will be small. But for very precise measurements, especially at low resistances, a four-wire tester allows you add a fourth lead to eliminate the contribution of the C1 lead. By running a separate potential lead (P1) to the electrode under test you can take the drop along the C1 current lead out of the measurement.

Depth of Electrode under test (E)	Distance from E to Potential Stake (P2)	Distance from E to Current Stake (C2)
6	50	82
8	62	100
20	81	131
30	100	161

Table 1: Approximate distance to auxiliary stakes using the 62% rule (in feet).

Widest dimension (diagonal, diameter, or straight line) of Electrode Array under test (E)	Distance from E to Potential Stake (P2)	Distance from E to Current Stake (C2)
65	100	165
80	165	265
100	230	330
165	330	560
230	430	655

Table 2: Approximate distance to auxiliary stakes for electrode arrays (in feet).

The 62% rule

You may be able to use a shortcut if your test meets the following criteria:

- You are testing a simple electrode (not a large grid or plate)
- You can place the current stake 100 feet or more from the electrode under test
- The soil is uniform

Under these conditions you can place the current stake 100 feet or more from the electrode under test. Place the potential stake at 62 % of the distance between the current stake and the electrode under test and take a measurement. As a check, take two more measurements: one with the potential probe three feet closer to the electrode under test, and one three feet farther away (see *Figure 5*). If you are on the flat portion of the Fall-of-Potential curve then the readings should be roughly the same and you can record the first reading as your resistance.

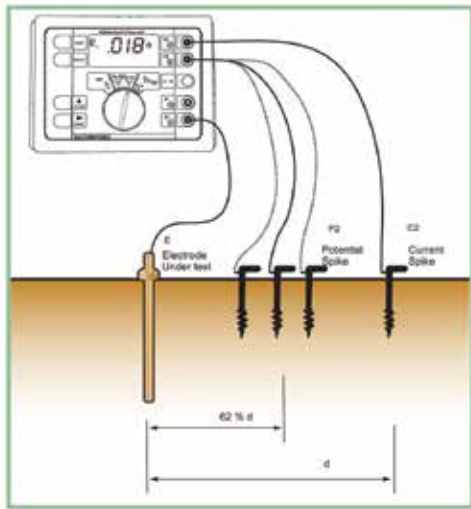


Figure 5: Stake positions for the 62 % rule.

References

- [1] IEEE 142. 2007. Recommended practice for grounding of industrial and commercial power systems ('Green Book').
- [2] IEEE-81. IEEE 81. 2012. Guide for measuring earth resistivity, ground Impedance, and earth surface potentials of a ground system.

- Most facilities have grounded electrical systems – in the event of a lightning strike, current will find a safe path to earth.
- A ground electrode provides the contact between the electrical system and the earth.
- Electrical codes and standards specify a minimum impedance for the ground electrode.



John Wilson specialises in Metrology and Accreditation consultation and training. He is a Senior member of the SA Institute of Electrical Engineers, a Fellow of the Society for Automation, Instrumentation, Measurement and Control. John has over thirty years' experience with Fluke products (including having worked directly for Fluke) and has practical experience in different fields of metrology and electronic design. John has recently presented ECSA CPD Point Approved Seminars on this subject at Comtest's Linbro Park Offices.
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As per the Designation document released by the DTI in December 2015, Enclosures must be made from SMC and moulded in South Africa and a 65% minimum local content threshold must be obtained on DC Combiner Boxes in all of the following:

- National Departments and Constitutional Institutions
- All Municipalities and Municipal Entities
- All Schedule 2 and 3 Public Entities

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New cable and pipe locator

Built on a proven design, and with Pathfinder SAF Technology at its core, the 8879v3 offers RYCOM's most advanced signal acquisition and filtering technology. The 8879v3 cable and pipe locator offers a utility locator FrequencyFlex allowing users to adapt the system to their specific needs. Multiple active frequencies allow the user to accurately locate the cable and / or pipe with minimum interference and maintain the ability to continue locating past faults and around conduit bends. Passive frequencies identify 'live' and charged lines by their naturally occurring electromagnetic fields. The 8879v3 offers multiple passive frequencies – 50 Hz, 60 Hz, Radio Frequency, Cathodic Protection Rectifier and CATV allowing line locating without the use of a transmitter.

Updated transmitter functions include improved transmitter induction, multi-frequency coupled induction ranging from 8 kHz to 118 kHz, and automatic impedance matching for direct connections. The 5W or 10W transmitter has the ability to simultaneously apply two frequencies to a utility. From one transmitter setting the user can locate the main line as well as other services by 'lighting up' the entire site. This set-and-forget feature streamlines operation by reducing the need to repeatedly relocate the transmitter. All functions are accessed via weather-proof membrane buttons and both user input and transmitter status are verified with audible responses. The ergonomically designed and balanced 8879v3 receiver

provides instant push-button depth up to 7,6 metres and current measurement to help identify target utilities in crowded easements.

Enquiries: Tel. 010 595 1831 or email sales@instrotech.co.za



Leak-detection in coal-fired power stations

Instrotech - a Comtest Group Company - has designed and developed at the request of and, in consultation with the South African Power Utility (where 93% of all electricity is currently generated using coal) an advanced acoustic leak detection system called *Inspecta FFT*, to detect boiler tube leaks in coal fired utilities as well as in oxygen plants and gasifiers.

This technology and equipment is now in use in power stations worldwide, where the early detection of tube leaks to reduce down time and prevent consequential damage is vital. According to the World Coal Association, the importance of coal to electricity generation worldwide is set to continue, with coal fueling 44% of global electricity in 2030. (Source IEA 2010). The *Inspecta* installed base

includes power stations in South Africa, Germany, Australia, Turkey, India, Malaysia and China.

Authorised distributors in these countries are on hand to provide all the services required to provide high levels of pre- and post-sales support as well as any spare parts required to keep the systems running efficiently.

Enquiries: Tel. 010 595 1831 or email sales@instrotech.co.za



Repair contracts from Sasol

Actom Group division, Marthinusen & Coutts has secured three separate contracts from SASOL for the repair of low voltage motors, the repair of medium voltage motors up to 1 MW and the repair of medium voltage motors from 1 to 5 MW.

According to Richard Botton, managing director of **Marthinusen & Coutts**, the company is known for its technical ability and the provision of a superior quality and technical service, and the award of these contracts is testament to its extensive capabilities. "Marthinusen & Coutts has worked with SASOL for many years and is regarded by the organisation as a highly competent and technically qualified OEM repairer."



The company underwent a lengthy prequalification stage whereafter its facilities in Cleveland were audited for quality, as well as technical capability and capacity. "Our ability to comply with SASOL's demanding specifications and to render complex repairs in accordance with the necessary quality was a big differentiator for us.

We can leverage an impressive 57 years of industry experience in both the

local and global market as Africa's largest medium voltage machine repairer," adds Botton.

Marthinusen & Coutts is Level 4 BBBEE rated, ISO 9001 accredited, holds SANS 1561 LV motor repair, SANS IEC 60079-0/1 flame proof and SANS IERC 60079-15 non-spark permits and has been awarded a five-star NOSA rating.

Enquiries: Richard Botton. Tel. +27 011 607 1700 or email richardb@mandc.co.za

Power protection and isolation in unit substations for onshore wind farms

ABB has supplied and advised in the implementation of power protection and isolation using a special medium voltage switch-fuse combination switchgear in unit substations for one of the country's largest wind power projects – the Longyuan Mulilo De Aar 1 and 2 wind project in the Northern Cape, South Africa, with an expected installed capacity of 100 and 139 MW respectively. ABB's NALFWind 36 kV switch-fuse combination units will be incorporated into 163 unit substations as part of a R15 M order from Adenco Construction, the EPC (Engineering, Procurement and Construction) contractor for the R5 billion wind project which was part of the third round of the DoE REIPPPP

program. The R15 M order from Adenco includes the supply and delivery of 163 ABB 36 kV NALFWind switch-fuses, 20 ABB 36 kV OVB-VBF outdoor vacuum circuit breakers and 10 ABB 145 kV LTB SF6 circuit breakers. The MV and HV equipment will be supplied by ABB's local Electrification Products and Power Grids divisions. The first delivery of the breakers and fuses from ABB will begin in May 2016 and complete delivery is expected in October 2016. The 36 kV switch-fuses combination units will be sourced from ABB in Poland, the 145 kV circuit breakers from ABB in Sweden and the 36 kV outdoor circuit breakers from ABB in India.

The ABB NALFWind 36 kV switch-fuse combination units are especially designed for use in wind electricity distribution environments where HRC fuses are required to handle high levels of fault energies.

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Maximising power potential

Ricardo Energy & Environment is supporting Electricity North West to unlock additional capacity from the UK's North West electricity network by enhancing the thermal efficiency of substation assets, maximising the power potential of existing infrastructure.

Over the next 30 years the introduction of low carbon incentives and technology – such as domestic heat policies, electric vehicles, ground source heat pumps and renewable energy generation – is predicted to significantly increase peak electricity demand. In the newly launched 'Celsius' project, funded via Ofgem's Network Innovation Competition, Ricardo Energy and Environment and Electricity North West will identify innovative methods to accommodate this demand by optimising the capacity of substation assets, such as transformers.

Drawing on experience devising and managing smart power network projects, Ricardo Energy and Environment will work with Electricity North West to improve the thermal management of power substation assets. Power specialists from Ricardo Energy & Environment will perform detailed analysis of substation asset performance and determine their capacity to handle increased electricity demand across a range of environments and demand characteristics, including time of day and seasonal variability. These insights will allow the team to develop operational strategies and retrofit cooling techniques that enhance thermal performance and capacity, avoiding the need for early replacement while safeguarding costs for energy users.

Enquiries: David Williams.
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Improving wastewater treatment plant efficiency

SEW-EURODRIVE Cape Town branch manager Byron Griffiths indicates that there are a number of plans for upgrades to wastewater treatment plants across South Africa and Swaziland to improve current infrastructure.

He reveals that the company recently supplied ten FF107AM132 parallel helical geared motor units to the Matsapha Greenfields Wastewater Treatment Plant in Swaziland. "These units are ideally-suited for a mixing application in the wastewater treatment plant."

SEW-EURODRIVE has supplied geared motors for the mixers at the Saldanha Wastewater Treatment Works. "We provide detailed calculations that are custom-designed to each and every client's individual specifications and preferences," Griffiths continues.

He points out that SEW-EURODRIVE supplies equipment for applications such as aerators, Archimedes screw pumps, mixers, screen drives, bridge drives and rotary filters. "On each quote or tender, we provide geared solutions that meet and exceed the specification that the industry expects when looking at bearing life, service factor, thermal and gear ratings, and shaft stresses."

Griffiths believes that the greatest challenge in the industry is supplying a good quality product that meets the specifications laid out by industry at the best possible price. "Our value-added service, combined with comprehensive stockholding and a national foot print, places us in a good position, especially if planned projects go ahead as scheduled," he concludes.

Enquiries: Byron Griffiths. Tel. 021 552 9820



Connectivity for power applications

M12 Connectors for Power Applications are now available from **RET Automation Controls**. As electronic devices are becoming increasingly more compact, customers are demanding compact power supply connectivity solutions. Most manufacturers tend to prefer the industry-proven M12x1-interface. ESCHA from RET Automation Controls has now developed a complete M12 portfolio providing reliable power transmission. All components have been basically redesigned and meet the IP67, IP68 and IP69 requirements and thereby fulfilling UL 2237. Due to a connection cross-sectional area up to 2,5 mm², the products allow for a large extension of power distribution; a further advantage – especially in case of dc-current distribution – is the slight voltage drop in contrast to the small cross-sectional area. Two coding types have been developed for M12x1-power transmission:

- Connectors with S-coding type are particularly adapted to alternating-current applications (ac-applications of up to 12 A / 630 V)
- For direct-current applications (dc-applications of up to 12 A / 63 V), connectors with T-coding type are used

With 'Power S' and 'Power T', ESCHA has the right flange as well as the connector in straight- and angled versions, female or male for all applications.

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Gas-powered gensets strengthen partnership

Rolls-Royce and the VPower Group have recently signed a strategic agreement that strengthens their partnership in power generation markets across China and the rest of Asia.

A framework agreement for 2016 was also signed for the supply of 160 MTU Onsite Energy gas gensets based on 16 V 4000 L32 units, each with 1 560 kW electrical power output. These agreements cement a long-lasting collaboration between MTU Onsite Energy and VPower, a world leader in decentralised power generation. By sign-

ing the framework agreement, VPower is able to secure production capacity within MTU Onsite Energy enabling it to meet the needs of its customers at short notice. The MTU Onsite Energy brand is part of Rolls-Royce Power Systems. Rorce Au-Yeung, Co-CEO, VPower Group said: "Our past successes in cooperation with Rolls-Royce on numerous power plant projects have motivated us to develop our partnership. The high rates of efficiency, outstanding reliability and low service costs of gas gensets from MTU Onsite Energy make them the

ideal product for this application." VPower customers also benefit from the worldwide service networks that MTU Onsite Energy and VPower have in place to ensure swift delivery of spare parts. Matthias Vogel, Vice-President Power Generation, Rolls-Royce Power Systems, said: "China and the Asian region as a whole are key strategic markets where MTU Onsite Energy is very keen to grow by joining forces with a strong partner such as VPower."

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Power distribution and UPS in a single-system solution

Efficiency and reliability of power supply in the rapidly expanding data centre business is crucial to feed the ever-hungry global information economy. As a leading technology innovator, **ABB** has considered the needs of data centres and continually enhanced products to meet ever-expanding needs.

"MNS-Up is the result of ongoing customer-centric product development. Data centres are continually growing and two key aspects, space requirements and scalability have needed to be addressed" says Ronald van Leeuwen, Business Unit Manager for Electrification Solutions in South Africa. "MNS-Up addresses these two areas very efficiently by combining the switchgear and uninterrupted power supply (UPS) technologies into a single unit. No

other provider of power distribution and uninterrupted power supplies is able to offer this level of technology in the market currently", notes van Leeuwen.

Space saving: In traditional power distribution environments three discrete areas are required. ABB's MNS-Up eliminates the need for the three separate areas, allowing for a single assembly housing the power input, uninterrupted power supply modules and the power output (distribution). Footprint savings of 20% are typical for a 500 kW system, rising to a significant 30% for 2 MW systems upwards.

Scalability: Avi Ramdhin, Sales Manager for Electrification Solutions, points out that, "With modules of 100 kW capacity that can be added to accommodate power requirements MNS-Up can quickly react to market

driven power demands, increasing the data centre's ability to service clients." This flexibility is also demonstrated in the ability of the system to be assembled to meet the space layout available; straight line, back-to-back, L and U-shape, without employing external bus ducts or cables.

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NEW utility-scale solar inverter testing laboratory

A new multimillion dollar facility designed to test high power central photovoltaic (PV) inverters has been opened in Helsinki. The new laboratory features a unique, large climate chamber capable of full power electrical testing in conditions simulating the arctic tundra to an equatorial rainforest. In addition, full verification and grid code requirements testing enable ABB to develop larger, more powerful inverters to meet the developing customer and industry trends. The laboratory supports testing and verification of inverters for safe operation, endurance in a wide range of climatic conditions, compatibility to the most demanding renewables-specific grid code requirements, and to measure and test harmonics and grid interactions.

Marc Gomez, Global Product Group Manager for solar inverters at ABB states: "Our customers are asking for more powerful central inverters. They want to maximise their return on investment and connect more incoming PV power to one inverter. With this lab, we are able to test new inverter concepts, under varying weather conditions, and that allows us to deliver new innovation to our customers and ensure we lead the market."

Climate testing can last several weeks for the equipment under test. Powered by a dc supply, the inverters are run at varying power levels with different simulated weather conditions to test inverter reliability. The climate chamber allows for accelerated product testing, important when the inverters are typically expected to operate for over 20 years. The climate chamber can vary temperatures from as low as -40°C to as high as +100°C, and relative humidity levels up to 95%.

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The utility-scale solar inverter laboratory, located in Helsinki, Finland.



The climate chamber.

A motor controller to overcome typical in-plant communication barriers?

Definitely.



Industrial and chemical plants use numerous motors to provide the necessary motion. Any unplanned or sudden motor stops may result in costly process interruptions, making control and monitoring essential. Multiple in-plant communication protocols are used to control and monitor these motors. ABB's UMC100.3 accommodates a wide range of communication methods; simply plug-on the required fieldbus interface or connect to the ethernet network interface. Additional information: www.abb.co.za/lowvoltage

ABB South Africa (Pty) Ltd.
Electrification Products
 Tel. +27 10 202 5880
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Power and productivity
 for a better world™





Smart lighting and beyond

Smart urban networks in the Internet of Things

Gianni Minetti, Paradox Engineering SA

Smart Lighting means switching to LED technologies, which would cut energy use by at least 50%. The benefits, however, could be even higher.

World population is growing and increasingly moving to urban areas. By 2050, about 70% of world population will live in cities and we will count around 40 megacities with more than 10 million inhabitants across the globe, most of them in emerging countries. Urban infrastructures are under severe stress, as it becomes harder to satisfy people expectations in terms of quality of life and quality of services including transportation, healthcare, education and public safety.

These assumptions are at the core of the intense debate around Smart City models... how can a city become smarter in managing its own infrastructure and resources, leading the way to sustainable development in a far-sighted perspective?

Street lighting is one of the domains on which many communities around the globe have started to focus. It represents a major cost item in cities' balance sheets, has a clear impact on liveability and affects environmental performance. The Smart Lighting Alliance estimates that there are about four billion street lamps in the world, with lighting representing almost 20% of global electricity consump-

tion and 6% of global carbon dioxide emissions according to the latest data from International Energy Agency.

Typically, Smart Lighting means switching to LED technologies, which would cut energy use by at least 50%. However, benefits could be even higher if turning existing infrastructures into smart networks to better control energy consumption and increase lighting efficiency.

A modular wireless full mesh network platform – such as PE.AMI by Paradox Engineering (from hereon referred to as the company) – is the ideal technology to put this vision into practice, as it allows cities to build a self-configuring and self-healing architecture which can easily be managed and possibly scaled over time. By connecting luminaires to an integrated network, these acquire the capability to receive and transmit data as well as execute commands, thus enabling remote monitoring and control functions.

As a result, municipalities or local service providers are able to define a customised lighting pattern for single districts, streets and even single lamps, managing on/off and dimming actions according to programmed schedules (ie. combinations of time, daily solar



times, specific local circumstances or events, weekly variations for given groups, etc.), environmental inputs (i.e. measured light levels, temperature, motion, etc.) or on demand (ie. in case of emergencies or public security issues). Benefits in terms of energy efficiency, reduction of overall footprint and public money savings are proved to be significant, especially if combined to human/ vehicle motion sensors and other similar devices.

Our evidence-based experience demonstrates that solutions based on open standards stand out as truly future-proof investments, as cities are not locked into any proprietary technology, but are granted interoperability and full compatibility with any existing or future field device, application and system. Favouring IETF 6LowPAN protocol and IPv6 addressing is also a wise choice to ensure network performance, reliability, appropriate data security levels, and even fast-track innovation.

A centralised software management suite is finally to be recommended to manage distributed networks over large areas. It should enable full control of all network components, monitoring and management of measures and alarms generated by controlled devices, generation of reports and data export.

But there's something more. Lighting is not only an essential public service; we can think of it as a city-wide distributed commu-

nication system, connecting any domestic as well as business user, enabling any kind of private or public activity. The bottom line is that it is a network of objects producing and consuming data – and data are valuable, a key resource to be transformed into actionable intelligence to feed decision making.

Internet of Things

By framing Smart Lighting in the **Internet of Things (IoT)** perspective, cities can go one step further and leverage street lighting as the backbone to building a genuinely smart urban network. The IoT unlocks the possibility of transforming luminaires as well as the multitude of objects which are disseminated in our cities (meters, parking lots, solid waste bins, etc.) into smart nodes of a wider network, supporting narrowband and broadband bidirectional communications to enable a number of applications, from public lighting to parking, from energy distribution to video surveillance, and many more.

Let us take **Smart Metering** as an example. Implementing a smart urban network allows utilities and multi-utility companies to cost-effectively manage gas, electricity and water meters, as well as thermostats, sensors, actuators, and other field devices. This enables remote meter reading and sub-metering, and grants superior and real time visibility over distribution networks. A reliable control of possible supply break ups, leakages or tampering allows service providers to better manage supply activation and interruption, alarms and scheduled events, with clear benefits in terms of efficiency and effectiveness. An IoT Smart Metering solution is at the cornerstone of any additional or advanced service, thus enabling the innovative integration of alternative forms of power generation, distribution and use, and offering the opportunity to launch tailored accounting and billing schemes. Even though this IoT-based approach to Smart Cities might sound as something arduous, it has already been successfully developed by several cities in the world.

Turning Switzerland's Chiasso and Bellinzona into Smart Cities

Swiss municipality in Ticino canton, Chiasso has approximately 8 500 inhabitants. The City is strongly committed to sustainability and innovation, and it was awarded with the Energy City label for its forward-looking energy efficiency policies. Together with AGE SA, the local utility managing water, electricity, gas distribution in the area,



Chiasso constantly aims for new ways to achieve higher green targets.

In 2013, the City started to invest on its street lighting infrastructure to reduce energy consumption, pilot future proof technologies and improve quality of service. The Smart Lighting project was kicked off by replacing existing lamps with LED devices and implementing PE.AMI as advanced system for remote monitoring and control. Latest deployments were made in summer 2015 in Via Dante Alighieri, prominent arterial road in the city centre, and the Smart Lighting infrastructure now covers multiple areas of the City, ie. the ring road, a portion of the city centre, some municipal buildings and sports facilities.

"Investments we are shouldering to improve street lighting are paying relevant benefits back to Chiasso citizens and businesses, as well as to local government and AGE itself", confirms Corrado Nosedà, director at AGE SA. "Thanks to LED transition and the possibility to calibrate each light point from remote, we estimate a 70% cut of daily energy consumption in Via Dante Alighieri, and similar results in the other areas.

"As for service quality, we can ensure every street, crossroad and crossover to be properly lighted, using the light intensity which is indeed needed. Management and maintenance costs have been reduced too".

AGE and the City of Chiasso decided to gradually leverage the same network platform to manage other urban applications, such as public Wi-Fi in some city areas, traffic video surveillance along the ring road through IP cameras, and a pilot smart metering project.

Discussions are currently in place to extend PE.AMI network to a smart parking project and test some pioneer drone applications in the same area, thus pushing the idea of the Smart City even further.

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How can a city become smarter in managing its own infrastructure and resources, leading the way to sustainable development in a far-sighted perspective?



A similar Smart City transformation is under way in Switzerland's Bellinzona, capital of Ticino canton with more than 18 thousand inhabitants.

The smart evolution started in 2013 from its public lighting infrastructure: about 600 mercury vapour lamps have been replaced with LED-based devices so far, and 900 more will be substituted by the end of 2016 to further reduce light pollution, achieve greater cost-savings and offer a greater quality of life to citizens.

Having implemented PE.AMI as remote management and control platform, local utility AMB managed to better calibrate lighting intensity and reduce it by 50% in selected streets. Without impacting quality of services, this enabled the City to significantly cut energy consumption and spending.

The project also involves a Smart Metering pilot initiative, using the same PE.AMI platform to control a portion of the power distribution network and a set of electrical meters, and an ambitious FTTH – Fibre To The Home plan, aiming at bringing optical fibre to all homes in Bellinzona and surroundings.

Phnom Penh City, Cambodia

In the Kingdom of Cambodia, demand for construction and improvement of infrastructures has been showing a marked increase due to the rapid economic growth, while the price of electricity is among the highest in ASEAN countries due to the dependence on the electricity imports. Public lighting was identified as one of the key infrastructures to be optimized, and the Japanese multinational company Minebea committed to a high-efficiency LED Street Lighting project in close collaboration with the author's company and Iwasaki Electric.

By 2017, about 9 000 street lights will be replaced with LED luminaires and connected to a wireless network to allow remote monitoring and control. The infrastructure will cover four different locations: Boeng Kak Lake area and Japan Kizuna Bridge area in Phnom Penh City, Siem Reap City and Angkor Wat ruins area.

According to the feasibility study conducted by Minebea at the end of March 2015, this project would reduce CO₂ emissions of 3 590 tCO₂/year and strongly tear down energy consumption, therefore representing a great contribution to Cambodia's financial and environmental goals.

- Streetlighting represents a major cost item in cities' balance sheets.
- There are approximately four billion street lamps in the world.
- Streetlighting constitutes 20% of global electricity consumption and 6% of global carbon dioxide emissions.



Gianni Minetti is President and CEO of Paradox Engineering SA. Before founding the Company in 2005, he worked as director of information systems in international corporations and as a consultant in project management, leadership, and software engineering methodologies. He holds a MSc in Computer Science at Università degli Studi in Milan (Italy) and has a Master's degree in Program and Project Management from University of British Columbia (Canada).

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Solar roads find many uses

Dr Peter Harrop, IDTechEx

Solar roads are firmly on agendas in various parts of the world – Amsterdam, France and the USA, for example.

Nowadays a major trend is the move to off-grid clean energy created by 'energy harvesting' to produce electricity where it is needed. This is more controllable and increasingly at lower cost than grid power or diesel gensets, cleaner and often less subject to interruption. It is taking new forms as revealed in the IDTechEx Research report, 'High Power Energy Harvesting 2016-2026'. Installing photovoltaics in roads seems a daft idea at first. It sounds expensive and unlikely to work unless the surface is cleaned, free of snow and ice and in direct sunlight – all too infrequent in most places. Indeed, roads are constantly dug up by utilities, repairmen and others. How do you do that with sheets of glass?

Problems can be overcome

A closer look reveals that most of the problems are easily overcome and even at poor efficiency, that local electricity has viable uses. The United States start-up Solar Roadways has a modular system of specially engineered solar panels that can be driven upon but also carry cables. They contain LED lights to create lines and signage without paint and heating elements to prevent snow and ice accumulation. Microprocessors allow the panels to communicate with each other, a central control station, and vehicles.

The glass has a tractioned surface which is equivalent to asphalt. So far they can only support the weight of semi-trucks but eventually these panels will be available for highways, but first will come non-critical applications such as driveways and parking lots. Solar Roadways has completed two funding contracts with the U.S. Department of Transportation, and has been awarded a third contract in November 2015. An Indiegogo Campaign took things further and

the company says on its website new in 2016 that, 'Our goal is to modernise the infrastructure with modular, intelligent panels, while producing clean renewable energy for homes and businesses. We'll be able to charge electric vehicles with clean energy from the sun, first on our solar parking lots and when we have enough highway infrastructure, while driving'.

At IDTechEx we do not see solar roads replacing power stations... that can be done with a field full of solar panels not transmission and maintenance over long distances on roads. However, they could be excellent for dynamic (in-motion) charging of electric vehicles possibly coupled with roadside wind turbines or tethered multicopters providing Airborne Wind Energy (AWE) in the new jargon.

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Solar roads probably won't find a place on the South African energy agenda any time soon. However, they are firmly on agendas in other parts of the world.

Bike path

The bike path that connects the Amsterdam suburbs of Krommenie and Wormerveer is popular with 2 000 cyclists riding its two lanes daily. Back in 2014, TNO made a 70 metre stretch into the world's first public road with embedded solar panels. Costing around €3 M (\$3,6 M) and funded mostly by the local authority, this road is made up of rows of crystalline silicon solar cells, encased within concrete and covered with a translucent layer of tempered glass. A non-adhesive finish and a tilt

help the rain wash off dirt. The panels produced roughly 30% less energy than those fixed on to roofs but when the path is extended to 100 metres in 2016, it will produce enough kilowatts to power three households, they claim.

From traffic lights to electric cars

Sten de Wit of TNO predicted that up to 20% of the Netherlands' 140 000 km of road could potentially be adapted, helping to power anything from traffic lights to electric cars. Tests have seen the solar panels successfully carry the weight of vehicles such as tractors. Not to

be outdone, a subsidiary of the French construction giant Bouygues is joining in. Minister of ecology and energy, Ségolène Royal, announced the French government would pave 1 000 km (621 miles) of road with photovoltaic panels in the next five years. The project aims to supply electricity to five million people – about 8% of France's population.

Wattway

The road photovoltaics are being produced by a French company called Colas, which is calling the project Wattway. The panels are composed of stacked photovoltaic cells that ensure resistance and tire grip. They do not require destruction of existing roadways: they can simply be added on to them. There are issues beyond cost and servicing pipes and so on beneath them. When their heating is on, animals will lie on them and be crushed by traffic. The heating will not cope with extreme cold or with deep snow or mud. To work at all the heating will have to be connected to the grid or too expensive, short-lived, batteries needing regular maintenance unless designs improve. Solar roads have competition. The USA is funding research into roads

- Moving to off-grid clean energy created by energy harvesting to produce electricity where it is needed is a trend of today.
- This is controllable, lower in cost, cleaner and more reliable.
- Problems associated with installing photovoltaics in roads can be overcome.



that harvest movement to make electricity but IDTechEx considers moving parts in such an application to be potentially troublesome. All the same, although piezoelectric walkways have not proved commercial, Pavegen is having some modest success with electrodynamic ones.

Conclusion

The huge move to energy harvesting both on land and on and in vehicles and buildings will be covered exceptionally thoroughly in the IDTechEx Show! in Berlin (27 – 28 April). Over 50 of the 160+ exhibitors participate in the EH value chains and the parallel conferences, 'Energy Harvesting and Storage' and 'Electric Vehicles: Everything is Changing' reveal new advances in thermoelectric, photovoltaic, electrodynamic, piezoelectric and other EH technologies and applications, including use Energy Independent electric Vehicles (EIVs) that never plug in and are currently mainly solar like those roads.



Dr Peter Harrop PhD, FIEE is Chairman of IDTechEx Ltd. He was previously Director of Technology of Plessey Capacitors Scotland and Chief Executive of Mars Electronics He has been Chairman of 15 high tech companies over a period of years including turnarounds on behalf of venture capitalists such as Computer Security International. Peter lectures and consults internationally on electric vehicles, energy storage, RFID and printed/organic electronics. Enquiries: Alison Lewis. Email a.lewis@IDTechEx.com or research@IDTechEx.com

ROUND UP

ENERGY + ENVIROFICIENCY: FOCUS ON DRIVES, MOTORS + SWITCHGEAR

Power management in mobile vehicles

The compact, flexible and inexpensive mini controller, available from **ifm electronic**, replaces the conventional relay logic and also demanding and complex process controllers. The control electronics integrated in a compact plastic housing provides all the necessary connections for the inputs and outputs, communication and programming. The coded connectors for mobile use are easy to handle and available all over the world. The connection of sensors and actuators is carried out without further external wiring. Due to an increase of the protection rating through a cover and a pluggable cable seal the BasicController can also be used in areas that are exposed to splashing water.

The integrated 32-bit processor and the electronics are optimally tailored to the application. Inputs and outputs can be configured to the application via the user program. The powerful plug-in relay outputs ensure the connection of high-current consumers. All relay outputs are with diagnostic capability and individually protected. Each output has a freely programmable status LED. Thanks to the ad-

ditional multi-functional inputs a flexible control module for mobile machines is available. The CODESYS software enables a clear and easy creation of the application software for the user. The control module BasicController supports all common CODESYS programming languages. Simple and clearly structured function libraries are available for communication and special device functions.

The BasicController is equipped with two CAN interfaces to ISO 11898. These interfaces are used to exchange data with the connected BasicDisplay, further BasicController modules or the engine controller. Among others, the interfaces support the CANopen protocol and the J1939 protocol. The CAN interfaces are also used for programming. To do so, the unit electronics is directly and conveniently activated via the powerful PC-CAN interface CANfox. In this way, operating system and application program can be loaded or parameters changed.

Enquiries: Alwyn Skelton. Tel. +27 (0) 12 450 0400 or email info.za@ifm.com

Bringing AEE international qualifications training to Cape Town

The **Energy Training Foundation** is set to descend on Cape Town in 2016 in April and May with the Certified Energy Manager (CEM), Certified Energy Auditor (CEA), Certified Measurement and Verification Professional (CMVP) – all are Association of Energy Engineers (AEE) qualifications training programmes.

The AEE qualifications are recognised in 98 countries and offers an opportunity for persons with years of experience to receive a qualification. The course content is of value to any person, whether they wish to write the examination and pursue certification or not. You will learn a great deal and will be able to implement changes in your workplace directly after the training. Cape Town training will be held at Hotel Verde on the following dates:

DATE 2016	COURSE
18 - 20 April (Mon - Wed)	Fundamentals to Energy Management Training (FEMT) your introductory training to CEM and CEA
21 April (Thurs)	Carbon Tax 101 – a must to update you on the latest in Carbon Tax
30 May - 3 June (Mon - Fri)	Certified Energy Manager (CEM)
30 May-2 June (Mon - Thurs)	Certified Energy Auditor (CEA)
30 May-1 June (Mon - Wed)	Certified Measurement and Verification Professional (CMVP)

Enquiries: Thieda Ferreira. Tel. 041 582 2043 or email info@entf.co.za or visit www.energytrainingfoundation.co.za

Student competition 2016

Rosatom is hosting a student competition this year. A 2 000 word research paper on one of the following topics is to be submitted before 15 June 2016:

- What is the perception of nuclear in South Africa; what are the main contributors to this perception? How can the nuclear industry change this perception?
- What are the economic benefits of a nuclear build? Which South African industries will benefit most from a build in the next 10 years and why? What is the optimum level of localisation in South Africa?
- Nuclear beyond energy: what SA industries can benefit from the use of alternative nuclear technologies? What are does the next decade hold for these technologies and their perspective uses in South Africa?

- Climate Change and Nuclear: has nuclear reduced South Africa's carbon footprint through Koeberg and if so by how much? Does nuclear have a role to play in combatting global climate change?
- The LCOE (Localised Cost Of Electricity) of electricity produced by nuclear compared to other sources of electricity. This considered is nuclear a viable and affordable option for South Africa's Energy mix?
- The current energy mix considers 9,6 GW of nuclear power. Is this amount of nuclear sufficient to achieve the country's economic goals?

Please send your research paper along with a 350 word annotation in English, short CV and copy of identity document to nuclearcontests@gmail.com before the closing date 15 June 2016.

40 years in condition monitoring

2016 is a very auspicious and exciting year for leading condition monitoring specialists **WearCheck**, as they proudly celebrate their 40th birthday.

From small beginnings as a soil-testing laboratory in the founding director's garage in Durban in 1976, WearCheck has grown into a well-respected condition monitoring company in Africa, operating eleven laboratories in seven countries across the continent and beyond, with further expansion in the pipeline. With the fundamental goal to save money and time for customers, WearCheck has evolved into a convenient 'one-stop-shop' for any mechanical or electrical operation that can benefit from reliability solutions services.

The optimisation of plant performance management is facilitated by a range of services offered by WearCheck, some of which include the scientific analysis of used oil, the analysis of fuels, transformer oils, coolants, greases and filters. Other monitoring techniques are also employed, such as the testing and control of the efficiency of combustion, heat transfer, thermography, vibration analysis, balancing, laser alignment and milling.

A wide range of industries has benefited from WearCheck's services over the past 40 years, and continues to do so. WearCheck's laboratories process in excess of 600 000 oil samples per annum from many operations,

among them mining, construction, transport, electrical, shipping, industrial and aircraft.

WearCheck recently joined the Torre Industries family – an exciting development with lots of potential for business growth.

Enquiries: Email.support@wearcheck.co.za

Neil Robinson, Managing Director of WearCheck.



Wits takes delivery of oscilloscope

WITS University, High Energy Physics (HEP) Group, recently took delivery of a Tektronix MSO70804C, 8 GHz 25GSa/s Mixed Signal Oscilloscope, together with an 8 GHz Trimode differential probe for the oscilloscope, which will enable the HEP staff get the full, diverse range of measurement out of this powerful combination. The project falls within WITS Physics School, and is briefly described as a collaboration with CERN 'Conseil Européen pour la Recherche Nucléaire', or European Council for Nuclear Research.

Leader of the WITS HEP Group, Professor Bruce Mellado comments: "We were extremely fortunate to be granted a major funding application from the university last year for a very high-end oscilloscope, which we plan to use for measuring Peripheral Component Interconnect (PCI)-Express - a high-speed serial computer expansion bus standard, designed to replace the older PCI, PCI-X, and AGP bus standards - and other high speed signals. We have been making signal measurements and the scope works perfectly so far. Hopefully other staff and post-grads at the university will find this oscilloscope useful to their research as well. We hope to get many years' of good service from this awesome piece of equipment," he added.

Enquiries: The Comtest Group. Tel. 010 595 1821 or email sales@comtest.co.za



Dr. Chamunorwa Oscar Kureba, Postdoctoral Research Fellow, WITS HEP Group, with the Tektronix MSO70804C – 8 GHz 25GSa/s Mixed Signal Oscilloscope shortly after successful installation.

Pneumatics training course schedule released

SMC Pneumatics has released its training schedule for 2016 which boasts three to four day courses in Johannesburg, Durban and Cape Town. From April 2016, customers are able to undergo quality training courses at SMC's new state-of-the-art training facilities. The qualified training team has National Training Manager, Riaan van Eck at its helm. Courses include; Basic Pneumatics, Electro-Pneumatics, Basic Hydraulics, Electro-Hydraulics and Mechatronics. Additionally, SMC Pneumatics also prides itself in its constant pursuit for customisation and thereby offers customised training courses should businesses require a tailored curriculum. "By designing our curriculum to meet the changing needs of the industry, we are able to offer comprehensive up to date courses which truly drive value in your business."

"All of our courses cover the relevant, key aspects of fluid power and mechatronics ranging from the basic theory to practical examples to ensure that our customers are kept in-the-know and are able to use our products and applications to the best of their abilities," says van Eck. Classes are limited to 12 participants to provide individual attention.

Enquiries: Riaan van Eck. Email rvaneck@smcpneumatics.co.za



SMC Pneumatics National Training Manager, Riaan van Eck.

Bizz Buzz

Two new electric substations for Oman

Abengoa has been awarded by the Oman Electricity Transmission Company (OTEC) the construction of two new electric substations and the associated transmission lines in North East Oman. Abengoa will be responsible for the construction, supply, assembly, and commissioning of two new substations 132/33 kV, one located in Samad and the other in Sinaw. The construction project is expected to last for two years. Subcontracting of local businesses for specific tasks will generate local employment in the area throughout the construction period.

Enquiries: Email communication@abengoa.com

Customer network possibilities expanded

Emerson Process Management, working with MYNAH Technologies, has expanded customers' network possibilities and application options by adding PROFINET protocol abilities to the DeltaV distributed control system (DCS) further opening plant-floor integration to DeltaV users. The addition of PROFINET saves DeltaV users time and effort by enabling direct connection between the DeltaV DCS and plant floor devices such as motor control centres, variable speed drives, and PLCs in process automation businesses. "PROFINET is a growing bus protocol choice in process industries," said Emerson Process Management's chief strategic officer Peter Zornio. "The DeltaV system has a strong history of interconnection to busses of all types with seamless information integration for end users.

Enquiries: Email Michael.Eksteen@Emerson.com

EOH partners with Cloudera

EOH has partnered with **Cloudera**, the global provider of data management and analytics. EOH Cloudera Services, provides an information management platform that is built on Cloudera Enterprise, Apache Hadoop solution. Built on Hadoop and the latest open source technologies, Cloudera Enterprise can help solve the toughest business challenges, delivering the right information to gain accurate, timely insights. Currently, more than 65% of the Fortune 100 is using big data to drive their business. EOH Cloudera Services Competency Manager, Louis de Gouveia, says that according to a recent Gartner survey, more than 75% of companies are investing or planning to invest in big data in the next two years.

Enquiries: Victor van der Watt. Tel. +27 (0) 11 607-8100

At work with 'Females in Energy Efficiency'

At a mentorship breakfast held at the University of Johannesburg (UJ) on 10 March 2016, hosted by the Southern African Females in Energy Efficiency (SAFEF), a number of young, female students and future entrepreneurs had an opportunity to share their concerns, ideas and aspirations with regard to fitting into South Africa's engineering and energy industry. The SAFEF (a division of the SAAEE) has ventured into mentorship programmes at tertiary institutions promoting educational interest in the energy sector as a career option. This... in an effort to empower women and make all things equal in an historically gender-disparate industry. The support and motivation at the mentorship event was offered by highly respected and well established women across the country's energy sector.

A better life for women

Women bear the brunt and burden of energy poverty with risks to their health, safety and wellbeing as a result of household air pollution, lack of lighting, the heavy fuel loads that they carry daily... not to mention their time spent on tasks that would not be necessary in a society that embraced sustainable energy solutions. At this point in the 21st Century, the lowering of renewable energy technology costs has changed the energy outlook with an end to the brunt and burden in sight. The gender discrepancy exists on a different scale in the corporate sense... where often, men are selected for top positions in preference to their equally or

better qualified female colleagues. These are challenges which women have faced for many years... but the time has come and women are taking a stand.

SAFEF objective

With the objective of increasing women's access to sustainable energy and, therefore, making the associated opportunities accessible, the SAFEF has the vision to 'Establish a large representation of females playing an influential role in the energy management sector'. In the belief that opportunities in the energy sector should be available to everyone with appropriate qualifications, the SAFEF gives women a platform to support, motivate, encourage and network with one another. The organisation has embarked on a journey of assisting women to become powerful agents for change in the transitional phase to sustainability. To this end, the SAFEF has planned many networking, coaching, mentorship and information sharing events for 2016.

In an interview with Leanne Manas on SABC's Morning Live, third year chemical engineering student, Edinah Joy January, described the mentorship programme as very beneficial to students. "The breakfast mentorship programme was quite amazing, very empowering. I got in touch with phenomenal women and what I learned from it is the fact that there are a lot of opportunities in the energy sector. It has encouraged me to consider a career opportunity in the energy sector... more specifically in environmental engineering."

Join the SAFEF

You need to be a member of the SAAEE in order to join the SAFEF. Being a member will enable you to contribute towards discussions throughout the year, to ask for assistance play a part in achieving a gender-equal engineering industry and energy society.

**Enquiries: Tel. +27 (0) 11 038 4300
or email SAFEF@saaee.org.za**



Mentors: Helen Couvaras (Left) and Ntombenhle Ndwandwe (Right); Student (centre): Siphwe Mosiane (University of Johannesburg).



Mentors: Daphney Ramaphosa (left) and Joy Msoki (right); Student (centre): Edinah Joy January (University of Johannesburg).



SAFEF Committee Members: Santa Scheepers, Faith Mkhacwa, Lesego Gaegane, Coretta Magongoa-Mohale and Noxolo Kahlana (Committee Chairperson).



Carbon Tax Seminar

A Carbon Tax Seminar, presented by Carbon Check SA's chief executive officer, Adam Simcock and hosted by Schindlers Attorneys in Melrose Boulevard (Thursday and Friday, 10 and 11 March 2016) was highly informative. An article on the Carbon Tax law that will come into effect in January 2017 will appear in the May 2016 issue of Electricity+Control. Look out for it!

Peter Newell (Impact Choice SA), Silvana Claassen (Carbon and Energy Solutions), Adam Simcock (presenter of the seminar and CEO of Carbon Check), Lazaruz Mahlangu (Department of Energy) and Puleng Bothole.



Vocational training in energy for previously disadvantaged students

A function at the Schneider Electric Midrand Campus on 3 March 2016 witnessed Schneider Electric sign partnership agreements with the Cape Peninsula University of Technology, College of Cape Town, University of Johannesburg and Sedibeng College for the establishment of four additional training centres. Read article on page 15.

Enquiries: Isabel Mwale. Isabel.mwale@schneider-electric.co.za



Representing the French Ministry of Education and Training, Marianne de Brunhoff; Deputy Minister of Higher Education and Training, Mduzizi Manana; French Ambassador HE, Elisabeth Barbier; Joe Madungandaba, non-executive chairperson for Schneider Electric South Africa and Schneider Electric Country President - South Africa, Eric Leger.



Alexia Tardivel and Dr Jean-Paul Toutain (Embassy of France in South Africa).



Mr. Pitshou Bokoro (Lecturer, F'SASEC-UJ Program Manager) and Dr. Babu Sena Paul (HOD, Electrical and Electronic Engineering Technology) University of Johannesburg.



From Schneider Electric South Africa: James Shirley, Kholiswa Fulumeni, Prisca Mashanda, Isabel Mwale, Zanelle Dalglish and Canninah Mapena.

SMC Pneumatics



Conrad Schmitt,
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Johannesburg



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Johannesburg



Tarryn Clarke,
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Secorex 2016

24 to 26 May 2016,
Gallagher Convention Centre in Midrand,
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Secorex is Africa's leading security and fire exhibition. Along with being the largest platform for industry's leading technologies and services and a host of visitor attractions, the exhibition presents a thought provoking educational seminar programme.
Enquiries: Email svenr@specialised.com or zeldaj@specialised.com

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POWER-GEN Africa 2016 & DistribuTECH Africa

19 – 21 July 2016,
Sandton Convention Centre
POWER-GEN Africa and its sister event, DistribuTECH

Africa, will once again provide comprehensive coverage of the power needs, resources and issues facing the electricity generation industries across sub-Saharan Africa.

Enquiries: Email registration@pennwell.com

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Electra Mining Africa

12 – 16 September 2016,
Expo Centre, Johannesburg
Enquiries: Email leatitiavs@specialised.com

...

SAEEC 2016 - 11th Annual Southern African Energy Efficiency Convention

8 – 9 November 2016,
Gauteng, South Africa
Bringing together energy management/engineering, environmental, facilities building upgrades, cogeneration, power generation, efficiency improvement industries to discuss RE, power generation, lighting efficiency, thermal storage and more.
Enquiries: Email marketing@saeec.org.za



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