MARCH 2015

ELECTRICITY + CONTROL

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- Control systems and automation
- Hazardous areas and safety
- Drives, motors and switchgear
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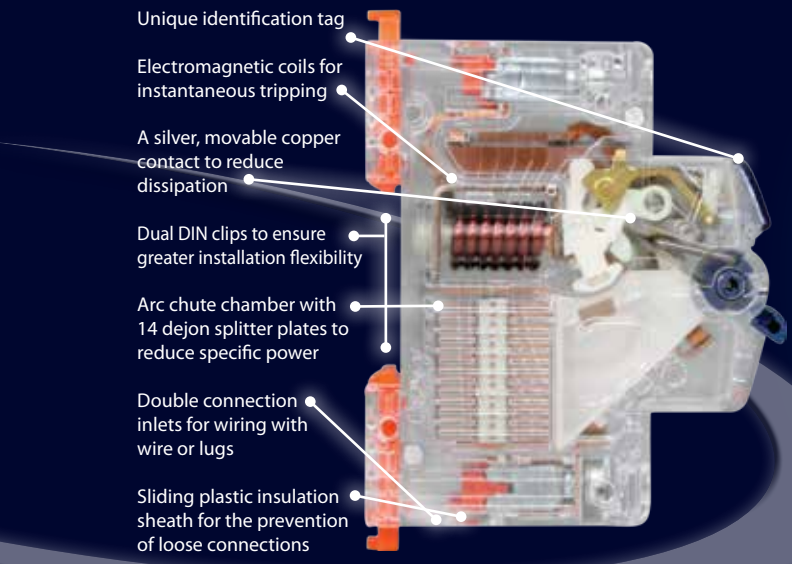

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Editor:
Wendy Izgorsek

Design & Layout:
Adél JvR Bothma

Advertising Managers:
Helen Couvaras and
Heidi Jandrell

Circulation:
Karen Smith

Reader Enquiries:
Radha Naidoo

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Karen Grant

Editorial Technical Director:
Ian Jandrell

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Wearing another hat, I have just had to contend with the new intake to our University system and there are a couple of things that really should be noted.

The first point - notwithstanding the massive drop out in our school systems between grades one and 12, it is patently obvious that we do not have enough capacity in our higher education sector to absorb the young people eager to grow and develop.

To some extent this can be understood, but if we are to really give ourselves a chance of reaching the lofty heights to which we aspire as a nation, then we need to be strategic about how we propose to educate our youth.

The second point is more worrying. There is a significant number of young South Africans who make the entry requirements of University, are accepted, and then simply do not have the resources to study.

At some Universities this is a small proportion of the students; at others, it is a larger proportion. In other words a significant number of youngsters who have all the credentials to study, are not able to do so because there is not enough funding to support them. This is an absurd situation, and one that should trouble us deeply.

A large portion of student support, of course, comes from the private sector, but the State makes available the National Student Financial Aid Scheme (NSFAS), which offers an opportunity to needy students to access a loan to cover their studies. However, there is not enough funding for students who nominally qualify for this support.

Another troubling situation relates to the level of state funding that our Universities are receiving (ie via the funding line referred to as the State Subsidy). Let me be clear – it is a wonderful thing for a University to be self-sufficient and I strongly support the concept of private education. But the real issue relates to how a State manages the expectations of its youth, and how it strives to achieve its own goals and objectives and those of its people.

This should also trouble us deeply.

We have a situation in South Africa where the State subsidy component has dropped so low in some cases that it is not beyond the realm of imagination that some of our large and competitive Universities may seriously consider privatising.

Our top Universities are ranked very highly, but a University, driven by the agenda of a private institution, will quite rightly turn its attention to matters of finance and funding – at the potential risk of being able to address the pressing issues of our society.

I consider it a deeply worrying trend that State subsidy is dropping, and support for needy students is not at the level it needs to be. Is this an indication that the State is effectively beginning to privatise our Universities?

What is even more disturbing is the value that is attributed to corruption in our economy. If the numbers are correct – and we have no reason to doubt them – we could double the amount of funding available for higher education overnight. The funding is there.

Ian Jandrell

Pr Eng,
BSc (Eng) GDE PhD,
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Catering to the growing needs of its southern African customer base, **Schneider Electric** has introduced its EasyPact TVS range of low-voltage motor starters for applications from 6 – 95 A to this market. *Read more on page 29.*

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Convergence of energy data acquisition and **'Big Data'**

By M Holländer, Beckhoff Building Automation

Optimised acquisition of data in public buildings allows for efficient data monitoring.

Optimised energy management in public buildings requires acquisition of information about the consumption of water, electricity and heat resources at the shortest possible intervals through energy monitoring. With this in mind, the Aachen urban region in Germany (StädteRegion Aachen) has followed an example set by the city of Aachen. Together with the city of Apache's owner-operated municipal enterprise for building management and the IT service provider, regio iT GmbH, the e2watch monitoring system (referred to in this article as the 'energy monitoring system') has been implemented to establish enhanced energy monitoring. This technology is based on an integrated data logger solution.

Using the energy monitoring system, energy consumption data is made available on the Internet to building users, as well as to interested members of the public in a freely accessible area. This transparency makes building users more sensitive to the need for more economical use of energy resources. Via an internal work area, building managers receive extended detailed evaluations, from which malfunctions or increased consumption can be identified and analysed, allowing for prompt resolution of the particular issue.

Leverages extensive application experience

The city of Aachen has maintained its keen focus on energy monitoring since the prior project, E-View, started in 2007. The new energy monitoring system is positioned as a replacement for E-View, with data migration currently in progress. The success of this energy monitoring concept is clearly demonstrated by energy cost savings of approximately 600 000 euros since 2007. Currently, about 200 properties are connected to the energy monitoring system, including schools, childcare facilities, administration buildings, swimming pools, and other sports facilities. Energy monitoring via the energy monitoring system will initially be operated until the end of 2015, focused on selected properties in municipalities belonging to the urban region, with the goal of gaining experience with the new technology. Connection to further properties is on the agenda in coming years.

> *The 'energy monitoring system' technology described is based on an integrated data logger solution.*

The connected properties encompass a total of 1 000 measuring points, broadcasting data at 15 minute intervals. Adding up to an immense volume of information, the system collects around 100 000 data records per day, with each consumption meter obtaining a data volume of 200 bytes. This provides a comprehensive basis for analyses, fault finding, consumption forecasts, and – in the long run – for the identification of optimisation potential.

The requirements necessary for the successful implementation of such energy monitoring systems include the very short measuring intervals required for energy monitoring that can be achieved only through automated data transmission and data preparation.

BDM – Big Data Management
OLE – Object Linking and Embedding
OPC – OLE for Process Control
OPC – Open Platform Communications

Abbreviations/Acronyms

Energy data stored in the Cloud can be analysed conveniently with the e2watch monitoring system. (Photo courtesy regio iT, Germany)

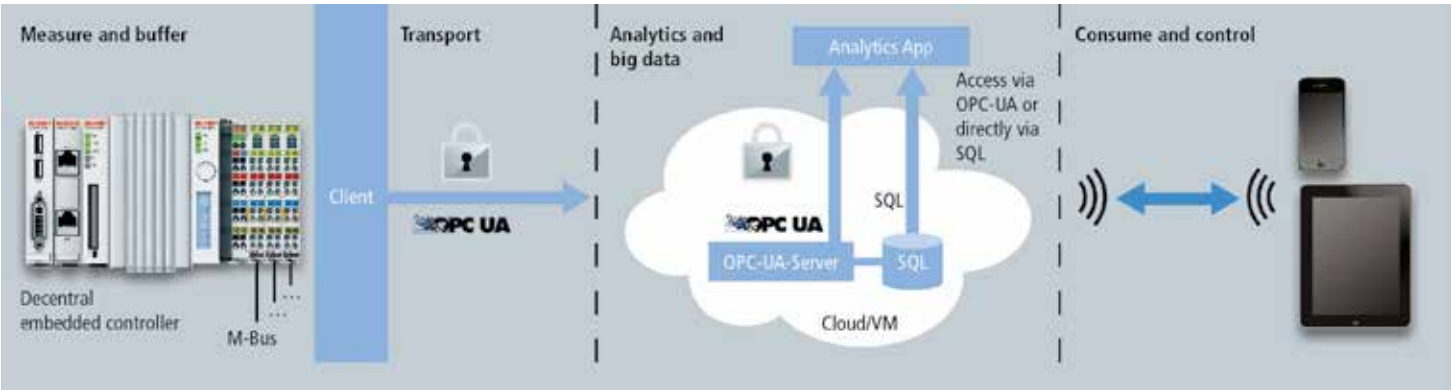
This includes the simple connection of consumption meters via the established M-bus protocol, the decentralised buffering of energy data on-site, and reliable data transmission to regio iT.

Decentralised data logger with embedded PC for BDM connection

Acquisition, storage and forwarding of the data are implemented via decentralised data loggers in the respective properties. These are supplied by Beckhoff as an integrated solution, considerably reducing on-site installation expenses. A CX-series Embedded PC running TwinCAT 3 automation software forms the core of each data logger. The KL6781 M-bus master terminal is used for the convenient integration of the consumption meters into the control technology. In addition, the data logger can be simply connected and commissioned via the energy monitoring system portal without special TwinCAT knowledge; therefore, no programming work is required. The data logger acquires the measured data on-site, buffers them locally, and synchronises the information at freely configurable times with the energy monitoring system at regio iT. In case of concrete fault diagnoses, there is also an option to directly initiate the data transmission. The data are transmitted from the data logger to regio iT, where they are prepared and stored in a Big Data Management (BDM) system as the basis for the energy monitoring system. The standard OPC UA (Unified Architecture) protocol with integrated security is used for data transmission to the BDM. As an OPC UA client, the controller pushes the information via a Microsoft SQL database into regio iT's BDM for further analysis. On the client side, i.e. on the Embedded PC of the data logger, TwinCAT 3 PLC is used (for the logic) with a PLCopen-standardised OPC UA Client (for the data transfer) and database server (as the local buffer). TwinCAT 3 runs with an OPC UA server on the server side at regio IT.

Efficiency, security, and flexibility assured

PC-based data logging offers numerous advantages in practice. First, there is the benefit of the complete system from a single supplier.



Across Germany there are potentially between 5 000 and 10 000 single-purpose buildings that are suitable for Smart Energy concepts with Cloud connectivity such as e2watch. (Photo courtesy Beckhoff)

Accordingly, this makes the installation simpler, eliminates additional wiring work, and minimises error frequency. Second, PC Control from Beckhoff offers an industry-proven, powerful, adaptable, and freely programmable system. Object-oriented programming in the development of the application is possible – thanks to TwinCAT 3. This applies to the implementation of the M-bus protocol and the different, but nevertheless very similar, meter variants, because the similarities can be mapped very efficiently through object-oriented programming practices.

In addition, data security is similarly important. OPC UA offers the option of secure data transfer, standardised according to IEC 62541 [1]. The connection requires 'only' a router with a NAT and/or SPI firewall; the connection technology used (DSL, ISDN, analogue) is irrelevant. Further VPN connections are not required, so there are no additional hardware costs or administration tasks.

Conclusion

The high flexibility of the PC-based data logger is a further benefit: The original M-bus data loggers had much poorer remote maintenance options and were rather inflexible. If necessary in the context of the system migration, however, even their reduced functionality can be mapped and enriched with added value as required using TwinCAT. Measuring intervals of almost any desired length can be stored locally with the Embedded PC. Over 100 000 measuring cycles, each with 40 measuring points, were stored without problem in tests. Such a high-performance buffer is particularly important as no measured values are lost, even in the event of an interruption in the connection between the measuring point and BDM.

take note

- Energy management in buildings requires information about the consumption of water, electricity and heat at very short intervals.
- Short measuring intervals can be achieved through automated data transmission and data preparation.
- Energy data stored in the Cloud can be analysed conveniently with the energy monitoring system described in the article.

Reference

[1] IEC 62541. 2010. OPC Unified Architecture.

The data logger used in Aachen, Germany is approximately 40 cm in height and width, requires little space, and can be installed as an integrated solution with minimal effort. (Photo courtesy Beckhoff)

Michael Holländer has a position in the building automation department at Beckhoff Automation, Germany.
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New Automation Technology **BECKHOFF**

Dialogue module for mobile machines

Powerful process and dialogue modules for operation and visualisation in mobile machines are providing users with a safer and more reliable performance. With its high-resolution and modern 303 mm graphic display, the PDM360 NG-12 dialogue module from **ifm electronic** has a powerful 32-bit controller and provides optimum readability and flexible operation.

Advanced 'optical bonding technology' eliminates the clearance between the front glass and display and prevents interfering condensation. In addition, it improves readability of the display under different viewing angles. Protected by a scratch-resistant glass pane, the 300 mm TFT display with a resolution of 1 024 x 768 pixels ensures good visual detection even with unfavourable sunlight conditions. The new development also provides backlit function keys and a navigation key with tactile feedback.

Thanks to the extremely flat and fully sealed die-cast zinc housing with the protection rating IP 65 / IP 67 the PDM360 NG-12 is especially suitable for use outdoors. Four CAN interfaces with CANopen and SAE J1939 protocol, an internal mass storage, USB interface and interfaces for analogue cameras ensure universal use.

Enquiries: Tel. 012 450 0370 or email info.za@ifm.com

Reduce measurement system cost with the rugged controller

The CompactDAQ 4-slot controller integrates the processor, signal conditioning and I/O into a single CompactDAQ system, making it possible for **NI** engineers and scientists to reduce overall system cost and complexity while increasing measurement accuracy. Integrated measurement systems reduce the number of components, connections and wiring needed, where noise and additional costs are often introduced, to ensure high-accuracy measurements and cost-optimised systems. "Because the CompactDAQ controller is a stand-alone device, we don't have to spend money on a separate computer, signal conditioning or cabling," said Ryan Ewart, mechatronics engineer at Yanos Aerospace. "Using the CompactDAQ platform, we've reduced system complexity, cost and installation time." The CompactDAQ controller features an Intel Atom dual-core processor that can run either industry-standard Windows Embedded 7 or NI Linux Real-Time for ultimate system reliability. By pairing industry-standard OS options with LabVIEW system design software, customers can easily port LabVIEW code from existing measurement systems to these new CompactDAQ controllers. Engineers and scientists can combine LabVIEW and over 60 sensor-specific I/O modules for CompactDAQ to quickly customise data acquisition systems to meet their specific application needs. "We designed this next-generation CompactDAQ controller based on customer feedback, making it smaller, less expensive and more rugged," said Stefanie Breyer, director of data acquisition R&D at NI. "By leveraging the latest Intel Atom 3800 processor within the controller, our customers can deploy powerful processing paired with high-accuracy measurements anywhere."

Enquiries: Mark Philips. Email mark.phillips@ni.com or ni.southafrica@ni.com

New line of electronic controls and software - mobile, off-road

Power management company Eaton has launched a new line of Pro-FX electronic controls and software, including the HFX controllers and VFX displays families, and the Pro-FX Control software suite to precisely control machine functions for mobile off-highway applications, such as within agricultural, construction, material handling and surface mining vehicles.

"The new Pro-FX family offers customers best-in-class hardware and software to solve control challenges without digging into the bottom line," said Christophe Natter, product marketing manager, **Eaton**. "Simplifying electric control integration without sacrificing customisation options helps end users in a wide range of markets improve productivity, operator safety and energy efficiency."

New HFX controllers are IP67 and IP69K rated. Their die-cast aluminium housing is rugged enough to withstand wide temperature ranges and water depths. Multiple inputs and outputs, including three CAN ports, provide flexible configurations to meet individual customer's needs. With one of the fastest processors on the market, the controllers allow for precise equipment control. Additionally, memory can be allocated to perform data logging functions that can reduce cost by taking the guesswork out of maintenance by predicting problems before they happen. The new line also includes two displays – 4,3 and 7 inches. Like the controllers, the best-in-class display screens are extremely rugged, built to withstand high and low temperatures, and are readable in direct sunlight. With a powerful backlight and an optically-bonded liquid crystal display (LCD) screen, the displays not only provide sunlight optimised viewing capabilities at every angle, but also protect against fog and dust contamination – a must-have in the mobile off-road market.

In addition to the new controllers and displays, Eaton has released the new Pro-FX configuration software, which is based on CoDeSys V3.5, a non-proprietary common programming tool, and is International Electrotechnical Commission (IEC) 61131-3 compliant. With full customisation and automation options, Pro-FX software helps maximise machine productivity by simplifying operations and minimising operator impact.

Enquiries: Visit www.eaton.com/pro-fx

Small-scale barrel sensors - ideal for tight spaces

TURCK has added new 4 mm and 5 mm barrel sensors to its existing line-up. EG05K and EH04K are 15 mm shorter than the standard EG05 and EH04, which allow the new offerings to be used in applications previously not possible. These more compact sensors will benefit the stamping industry, medical device manufacturing and any application where small sensors are a requirement.

The EG05K and EH04K are housed in a stainless steel barrel and come with a high flexTPU cable that can withstand harsh applications, including those involving corrosive chemicals. Offering a 1 mm sensing range and full flush mounting, the EG05K and EH04K reduce the chance of damage while still offering the sensing range demanded. The EG05K and EH04K come equipped with a high visibility LED to provide users a visual indication of the sensor's status.

"We created the EG05K and EH04K in response to hearing customers request a solution that met the increasingly compact requirements brought on by the shrinking size of machinery," explained John Murphy, product manager for TURCK. "These new additions provide our customers with the shortest M4 and M5 sensors on the market while retaining the robust qualities our customers expect from TURCK."

The EH04K is available in two metres of potted cable, while the EG05K is available in two metres of potted cable or with an integral M8 connector. The sensors are IP67 rated, have an operating temperature range from -25 °C to 70 °C, and offer PNP and NPN configurations for increased application flexibility.

Enquiries: RET Automation Controls. Tel. 011 453 2468. Visit www.retautomation.com

Increased colocation management capabilities

Schneider Electric has introduced StruxureWare Data Centre Operation v7.4, which provides new capabilities, allowing companies to strike the right balance between high availability and peak efficiency throughout the data centre life cycle.

As part of Schneider Electric's data centre infrastructure management (DCIM) solution, StruxureWare for Data Centres, StruxureWare Data Centre Operation v7.4 will optimise colocation management, power monitoring and network management, helping data centre and facility managers free up power capacity, right-size physical infrastructure and integrate with existing DCIM systems. This, in turn, allows them to reduce capital and operational expenses.

The new version caters for specific DCIM solution requirements from the marketplace, particularly pertaining to data and actionable intelligence.

"There is a great demand for accurate monitoring and measurement of colocation environments, as well as the need to reduce stranded capacity, right-size the data centre and make the most of existing DCIM systems for all types of data centres," says Mate Mudzimu, software solutions architect at Schneider Electric South Africa.

A key feature to optimise colocation management includes paired receptacles to provide an overview of complete power redundancy at the cage or rack level. This allows facility and data centre managers to simulate the impact of a failure and accurately display the failover load for each receptacle.

Enquiries: Ntombi Mhangwani. Tel. 011 254 6400 or email ntombi.mhangwani@schneider-electric.com

Vision sensor sets new standard for image inspection and code verification

According to **Omron** country manager, Victor Marques, the recently launched FQ vision sensor was created to primarily address the market's requirements for an easy-to-use vision sensor that can address more complex applications, thanks to improved performance, expanded functionality and a wider range of models. The FQ2 vision sensor combines the camera, lens and lighting in a single compact package, complete with image processing capability which eliminates the need for a separate controller.

The FQ2 supports all of Omron's inspection algorithms, including shape search, colour inspection, optical character recognition (OCR), code reading and verification. For shape detection, the Shape Search II algorithm achieves high speed, highly reliable detection of position and 360°angle even if the objects are overlapping. In addition the Shape Search II algorithm can detect up to 32 objects in the same image, enabling high speed inspection of groups of items.

For character recognition, Omron's unique OCR technology enables stable recognition and verification of even worn or distorted characters, and requires no setting of parameters to compensate for character contrast or positional offsetting.

The large, built-in dictionary includes over 80 different fonts, plus worn, blurred and distorted character variations, and numerous size and background variations. Ensuring the best possible image detection, models are available with resolutions from 360 000 pixels up to 3 million pixels. The FQ2 can make up to 32 simultaneous measurements, checking more than 5 000 pieces per minute.

Enquiries: Michelle le Roux. Tel. 011 5792600 or email michelle.le.roux@eu.omron.com.

High performance HMI with smartphone-like navigation

Schneider Electric's Magelis GTU allows users to create the perfect HMI for their application by simply snapping together the panel box and display of their choice.

Optimised for the latest HMI configuration software from Schneider Electric, Vijeo XD, Magelis GTU is as easy and comfortable to use as a smartphone or tablet, with intuitive navigation and many connectivity options, including remote access.

Magelis GTU is easy to integrate with system architecture, thanks to an unmatched variety of embedded interfaces: dual Ethernet Gigabit port for network connectivity, dual serial and one optional fieldbus interface for easy communication with industrial devices, and up to four USB ports for connecting peripherals while minimising wiring.

"Magelis GTU offers unmatched ease and comfort of use for both the application developer and operator. Thanks to industrial multitouch, users can zoom in/ out, swipe, and scroll through intuitive menus while wearing protective gloves or through protective screen cover," says Quintin McCutcheon, marketing and operations manager for the Schneider Electric's Industry Business in southern Africa.

The high-resolution, 16-million colour screen delivers a crystal-clear view of the same key functions and tools as a PC, including Office viewer, Adobe viewer, Internet Explorer, multimedia player and more. Magelis GTU applications can also be accessed through a second display via the DVI interface and managed remotely through the Vijeo Design'Air app for mobile devices.

Enquiries: Quintin McCutcheon. Tel. 011 254 6400 or email Quintin.McCutcheon@schneider-electric.com

Comprehensive cybersecurity solutions

Yokogawa Electric Corporation announces a collaboration with Cisco Systems, Inc to deliver Shell's SecurePlant initiative. SecurePlant is a comprehensive security management solution for plant control systems that was jointly developed as an initiative between Cisco, IT industry, Yokogawa, mission-critical plant automation systems, and Shell. The three companies have agreed to proceed over the next three years with the implementation of SecurePlant at around fifty Shell plants globally. Industrial producers around the world face a wide range of operational challenges in areas such as cyber security that pose a pervasive threat to safety and availability. Most companies with global operations, however, still take a relatively simplistic plant-by-plant approach, such as implementing operating system security patches and anti-virus pattern file updates. As a result, security levels tend to vary at each plant.

In the general practice of control system security management, individual control system vendors extensively validate security patches and anti-virus pattern files to confirm that they do not interfere with system operation, and then report the results to their customers for implementation. Since plants tend to use a variety of control systems and equipment from different vendors, occasionally with multi-generation platforms from a single vendor, this process is often complicated. For this reason, plants increasingly have the need for plant-wide integrated services that take a more holistic and efficient approach to the management of system security. With the aim of standardizing security practices at Shell plants around the world and minimising control system vulnerability, Yokogawa and Cisco collaborated on the design of the SecurePlant service and will jointly provide deployment and operational services. The SecurePlant solution is designed as a standard solution that consists of the delivery of OS patches and anti-virus pattern files for control systems and the provision of real time and proactive monitoring of solution delivery, as well as a help desk operation to manage this solution.

Enquiries: Christie Cronje. Tel. 011 831 6300 or email Christie.cronje@za.yokogawa.com

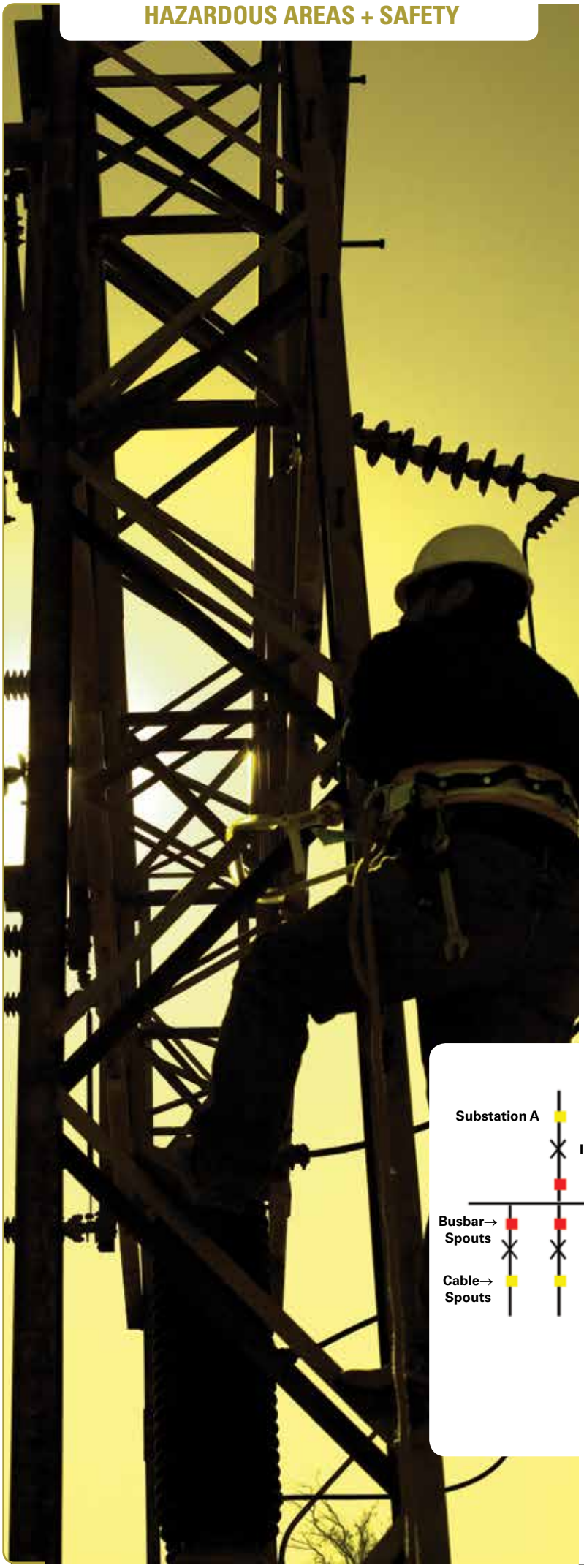
Programmability added to compact temperature transmitters

To broaden the functionality of its temperature transmitters, **TURCK** expanded its TTM sensor line to include dynamic programmability and special features via IO-Link. These fully programmable sensors allow a user to program the temperature range required, rather than be constrained to specific ranges, for more specific temperature control. This new functionality also allows the sensor to be programmed and used as a temperature switch. The TTM sensor line includes several models, including remote-mount transmitters, transmitters with integral Class A RTDs (Resistance Temperature Detector), as well as all stainless steel configurations to meet different measurement, space and material needs of applications. To eliminate problems associated with conventional transmitter assemblies, all of TURCK's compact temperature transmitters are factory assembled with an over-moulded or welded housing, and come ready for installation.

"These additions to our TTM line are really about providing our customers with a wide variety of options so they can have exactly what their application needs," said product manager, Rich Tallant. "This new offering provides a solution that is ready to plug in and play out of the box, with no terminal screws or wiring assembly needed."

The over-moulded remote transmitters are ideal for applications with limited clearance because they ensure electronics stay out of harm's way. Remote versions can also be mounted separately from the RTD, for improved temperature readings by isolating the transmitter circuitry from the temperature being measured.

Enquiries: RET Automation Controls. Tel. 011 453 2468.
Visit www.retautomation.com



Substation **accident** *– a case study*

By B Gass, Training Manager

This case study considers a particular fatal incident, the causes and what could and should have been done to prevent it.

An Authorised Person received an electric shock and was badly burned when testing for voltage, at the back of an isolated 11 kV circuit breaker in a substation. The Authorised Person died three days later in hospital from the injuries he sustained in the accident. His assistant survived the incident, escaping with burns to his hands, face and upper body.

Sequence of events

An Authorised Person had to isolate an 11 kV cable, in order to cut in a new mini substation (MSS), between a substation (S/S) and a MSS. He had already Switched, Isolated, Tested and Earthed the cable on both sides correctly.

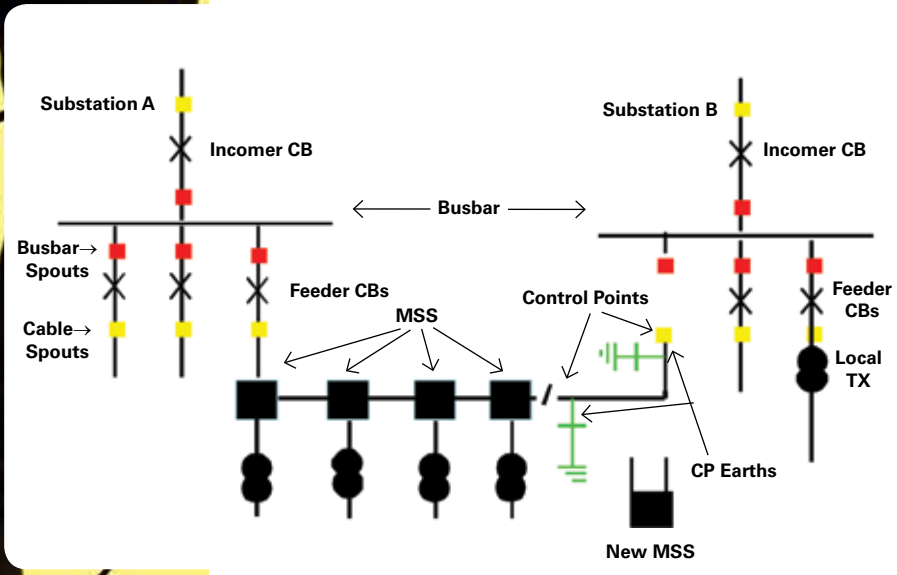


Figure 1: Single line diagram - cut in a new mini substation.

CB – Circuit Breaker
HV – High Voltage
MSS – Mini Substation.
MV – Medium Voltage
OHSAct – Occupational Health and Safety Act
PPE – Personal Protective Equipment.
S/S – Substation
SOP – Standard Operating Procedure

Abbreviations/Acronyms

take note

- There is no substitute for safety.
- To maintain safety, a risk assessment must exist for each task.
- Substation staff must be trained on Hierarchy of Control to ensure the safety of personnel.

A risk assessment had been conducted and a work permit issued, in accordance with the company's rules and regulations. (A work permit is written authorisation for work to be carried out on electrical mains or apparatus). The circuit breaker (CB) had integral earthing and had been tested and placed in the earth position, locked off and a danger tag applied. During the course of the work, the Authorised Person had to remove the back cover of the panel (cable end box), in order to disconnect the 11 kV cable. The Authorised Person chose to identify the correct back cover to be removed by counting the number of breakers in from the LEFT hand side. He walked around the back of the panel, from the right and counted the breakers from the RIGHT hand side, instead of from the LEFT. The Authorised Person also checked the label on the back of the panel to confirm that he was at the correct breaker. Unfortunately, this cover was a removable cover and had been incorrectly replaced on the wrong panel from a previous job that had been done.

As the cable was earthed at the MSS and the circuit breaker at the front of the panel by integral earthing, the Authorised Person decided that it was not necessary to wear a flash suit when removing the back cover and testing. He removed the back cover and decided, as an extra safety precaution, to safety test the conductors before removing the tape from the conductors. He decided to use a live tester to penetrate the insulation before removing the tape for safety. However, instead of using an approved medium/high voltage live tester, as required in terms of the company's regulations, he picked up a low voltage multimeter to test for the presence of voltage. He also enlisted the help of his assistant to hold the multimeter, whilst he tested the conductors. The assistant was not wearing any special PPE (flash suit). On penetrating the tape, there was an explosion, causing third degree burns to 80 % of his body and his assistant sustained burns to his hands, face and upper body.

Cause of the incident and injury

- The cover on the back of the panel had been replaced on the wrong panel the last time that work had been carried out
- The Authorised Person counted from the wrong side, when he went around the back of the switchgear
- The Authorised Person used the wrong tester to test that the cable was dead
- The Authorised Person was not wearing a flash suit whilst testing that the cable was dead
- The Authorised Person allowed his assistant to work too close to the cable, without wearing adequate PPE (flash suit)

Root cause

The wrong cover plate was removed, exposing the workers to live 11 kV conductors. He counted from the wrong side and used a low voltage multimeter to test the live 11 kV cable.

Contributing factors

- The Authorised Person had not taken all the risks into account when conducting the risk assessment, nor had he explained the dangers and hazards of the task to his assistant.
- He did not follow the correct safety rules and operating regulations
- He was not fully concentrating on the job in hand
- He was late in performing the planned switching operations and was pressurised by other staff, waiting for him to finish, so that they could work on the cable
- No flash suit was worn

In the ensuing investigation, it was found that the Authorised Person's mind was not on the job, as he had had an argument with his wife, before leaving for work that morning and was late in isolating the cable. He was pressured by staff, waiting to work on the cable and did not follow the correct procedure, in order to get the work done. He rushed the job and picked up the wrong tester (low voltage multimeter) to test the 11 kV cable. He failed to wear a flash suit and did not make sure that his assistant was safe, by allowing him to work too close to the back of the panel without the required PPE.

Remedial action

- All existing circuit breaker panels, in all substations, to be checked to make sure that they are labelled correctly and in the correct manner, in terms of the company's regulations, i.e. panels should be labelled on the front, back and top of the panel and where possible, on non-removable covers

- A Standard Operating Procedure (SOP) needed to be compiled, stating the correct safe procedure to remove the back cover and test the cable, before removing the tape
- Training needed to be provided, on the above SOP, to all staff required to remove such covers
- It was decided that an insulated rod or pole should be held on the front of the panel, that would be visible from the rear of the panel, as well as the other identifying method used in this incident
- It was also decided that, if it were required to test 11 kV conductors in a similar situation, before the tape is removed, they shall be tested using a proximity tester
- The tester should be fixed onto an approved insulating rod of the correct voltage rating, maintaining safety clearance and an approved flash suit shall be worn
- All conductors are to be discharged, using an approved single pole discharge device, before attempting to remove the tape, after confirming that they are dead
- All panels are to be painted different colours to indicate their function i.e. **RED** for a Ring and **BLUE** for an Incomer (this can also assist with identification)
- In order to maintain safety, it is essential that a risk assessment exists for each task
- A risk assessment (Take 5) must be carried out at all work sites, over and above the general risk assessment, as the risk changes at each work site, although the task remains the same
- Risk assessments to be reviewed to ensure that they cover all areas (including Hierachy of Control) training to be conducted.
- It is a misconception that PPE is the first line of defence, in fact it is the last. Therefore, staff to be trained on Hierachy of Control to ensure safety of personnel

Hierarchy of Control

Most effective means of control	Elimination Substitution Separation Administrative Control
Least effective means of control	Personal Protective Equipment (PPE)
Elimination	Whenever possible, eliminate the hazard Eliminating the hazard eliminates the risk
Substitution	When eliminating a hazard is not practical, consider substituting a less hazardous alternative. For example, you might replace a noisy machine with a quieter one
Separation	Isolate the hazard with mechanisms such as isolation and lock out, machine guards, barricades or interlock
Administrative control	Develop controls such as safe work procedures and improving operator skills (training)
Personal Protective Equipment (PPE)	This is the least effective risk control. The use of PPE alone is not adequate and must be supported by one of the controls mentioned

- All safety rules and operating procedures to be reviewed, updated and monitored regularly
- Enforce discipline at the work site
- Ensure compliance with rules and regulations
- It is essential to comply with the OHS Act and to follow company safety rues and operating procedures. This is not only a legal requirement, but can also prevent damage to equipment, prevent injury to personnel and save lives
- Full flash suits must be worn when testing for zero potential and during all MV/HV operations and other staff to stand away, in such a position that they cannot be injured by an explosion
- Training MV/HV Operating must be conducted and reviewed every two years (refresher courses conducted)

Safety before production, NOT production before safety. There is no substitute for safety.

Conclusion

You should always seriously consider what can go wrong and the associated consequences. In this situation, the most important questions should have been - what voltage am I testing and what safety precautions do I need to take? Use the reasonable man approach; always ask yourself - would I let my 16 year old son or daughter do the job? If the answer is no, then why should I do it, or ask someone else to do it? It must be remembered that for every action there is a reaction. No operating condition or urgency of service can ever justify endangering the life of anyone.

Live tester:
A tester designed to make physical contact with the conductor under test, in order to determine if the conductor is live or dead

Proximity tester:
A tester designed not to make physical contact with the conductor under test, to determine if it is live or dead (generally only used above 6,6 kV and on overhead lines)

Integral earthing:
Method of earthing, built into the equipment, as part of the manufacture of the equipment

Barry Gass is a qualified training and safety officer; registered with the EWSETA as an assessor and moderator. He is passionate about safety and has over 40 years' experience in the electrical industry. He provides training and consultancy services to various industries, mines and municipalities. Enquiries: Email bgass@vodamail.co.za

New relay extension module safety controller

The new Leuze MSI-EM-4RO relay extension module for the MSI 200 safety controller, available from **Countapulse Controls**, can control multiple devices via potential-free output contacts, Gerry Bryant, managing director, says.

Most modern safety sensors and Active Opto-electronic Protective Devices (AOPDs) are equipped with semiconductor outputs today. With such electronic safety-related switching outputs (OSSDs), high voltages in excess of 24 V cannot be connected, however, and they are not suitable for controlling devices with high power consumption, such as contactors, locking devices, pumps and motors.

In such instances, the new MSI-EM-4RO extension module with its four, one-channel or two, two-channel relay outputs helps out. At a maximum switching voltage of 250 Vac/dc, it delivers high switching power in a rugged and compact design with housing width of 22 mm. Four freely configurable message outputs indicate operating states of the total system.

The extension modules are simply connected to the base module (the MSI 200 safety controller) on the DIN rail by means of mounting rail connectors. The system satisfies the requirements for Performance Level PL e in accordance with EN ISO 13849-1 and SILCL 3 in accordance with EN IEC 62061.

Enquiries: Gerry Bryant. Tel. 011 615 7556 or email bryant@countapulse.co.za

New I/O modules for extreme conditions

The Axioline F I/O system from **Phoenix Contact** for signal acquisition in the control cabinet now includes versions with an extended temperature range of -40 °C to 70° C.

The robust modules with the XC (extreme conditions) extension are based on standard versions. In addition to bus couplers, they also include digital and analogue input and output modules as well as a range of function modules.

The PCBs used are coated with a special paint which improves their resistance to moisture and corrosive gases. This means that the new XC versions are ideal for use in applications with harsh ambient conditions, such as wind power plants or solar parks in regions with extreme climates.

The new XC versions follow in the footsteps of the complete Axioline F I/O system with particularly high immunity to interference up to 8 kV, rapid signal acquisition, and a highly robust design, which means they can handle mechanical loads such as shocks up to 30 g.

Enquiries: Patrick Rowland.
Email patrickr@phoenixcontact.co.za

Leads meet high safety standards

Fluke's new ultra-rugged TL 175 TwistGuard test leads are a world-first - featuring a manually adjustable guard. The patented Twist-Guard extendable tip shroud meets the highest electrical safety requirements to reduce tip exposure while providing the versatility needed for most measurements.

Simply twisting the test lead cuts the exposed probe tip length from 19 to 4 mm. Extra-heavy duty strain relief on both probe-end and plug-end has, remarkably, tested beyond 30 000 bends without failure! WearGuard double insulated silicone leads ensure added safety as each lead has two silicone insulation layers: red or black on the outside and white inside.

Any white showing through warns of nicks or scuffs in the insulation. The double insulation also means they can withstand high temperatures and remain flexible in cold temperatures. The leads are CAT II 1000 V (extended) or CAT III 1 000 V and CAT IV 600 V safety rated (retracted). Universal input plugs are compatible with all instruments that accept standard 4 mm shrouded banana plugs.

Enquiries: Comtest Distribution. Tel. 010 595 1821. Visit www.comtest.co.za

Buck-boosted constant current LED driver

Mean Well has introduced a buck-boost-type dc-dc potted module type constant current LED driver - LDB-L/LW series. This series offers multiple models of different current levels, 300 mA /350 mA/ 500 mA/ 600 mA.

A very wide I/O range is provided and regardless of the voltage difference between output and input, the drivers operate ideally. With the built-in EMI filter, LDB-L/LW complies with the lighting standard EN55015 without the need for additional external anti-electromagnetic components.

In addition, the potted design makes it workable in a harsh environment with high dust and high moisture.

The LDB-L/LW series is recommended for the LED lighting modules, such as street lighting, landscape lighting, tunnel lighting, household lighting, and backlighting.

Enquiries: Email ca@rectifier.co.za

Cable junction box – for harsh environments

Renowned for their innovative electrical termination products, **Pratley** has developed a new cable junction box that is perfectly suited for harsh environments. Called the Ex e Enviro Junction Box, it is IP68/66 rated and is dual certified Ex e and Ex n – 'Explosive Protected'.

The Enviro Junction Box is suitable for use in hazardous gas zones 1 and 2 as well as combustible dust zones 20, 21 and 22. To assist with visual inspection, the box has red bands that allow it to be easily identified as Ex rated equipment. The Pratley Enviro Junction Box is manufactured from a tough, impact-resistant material which will not crack or corrode during its lifetime and it may safely be installed in both domestic and industrial reticulations. It is available with either a black lid or a transparent Polycarbonate lid to simplify inspection of the electrical circuit.

In hazardous locations, Pratley Kwikblok rail mounted Ex e terminals may be fitted to the junction box. For versatility and convenience the Pratley Enviro Box is supplied with two blanking plugs. It is also recommended that the junction box be fitted with Pratley's range of Enviro Cable Glands which are suitable for both armoured and unarmoured cables.

Enquiries: Tel. 011 955 2190 or email sales@pratley.co.za

Risk-based portable appliance testing

Apollo's 600 portable appliance tester marks a new era in risk-based portable appliance testing and health and safety management. With built-in risk assessment tools for any work-place hazard and a variety of testing and inspection reports, including portable appliance testing; fire detection and emergency lighting, the Apollo 600 offers an all-in-one solution to managing a risk-based approach to health and safety in any workplace.

Apollo 600 follows in the footsteps of **Seaward**'s long line of trusted PAT testers, offering a comprehensive suite of fast and accurate electrical safety tests to enable any workplace appliance to be tested, including 3 phase equipment and residual current devices (RCDs). Apollo 600 also enables point-to-point testing of fixed appliances as required by the 4th edition of the IET Code of Practice for In-Service Inspection and Testing of Electrical Equipment. In addition to its electrical test features, the Apollo 600 has a built in electrical risk assessment tool which determines a risk-based suggested retest period, as required by the IET 4th Edition Code of Practice for In-service Inspection and Testing.

Enquiries: Justin Clarkson. TIA-Online. Tel. 010 595 1863 or email sales@tiafrica.co.za

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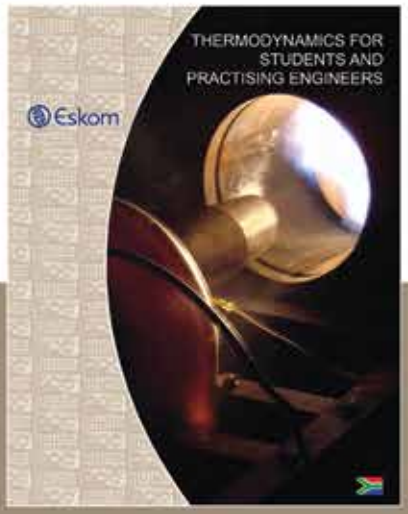

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An understanding of thermo-flow processes requires a thorough understanding of the basic principles. In 'Thermodynamics for Students and Practising Engineers' the basic concepts are introduced with a ramp up to the analysis of operating engines, gas turbines and steam plant.

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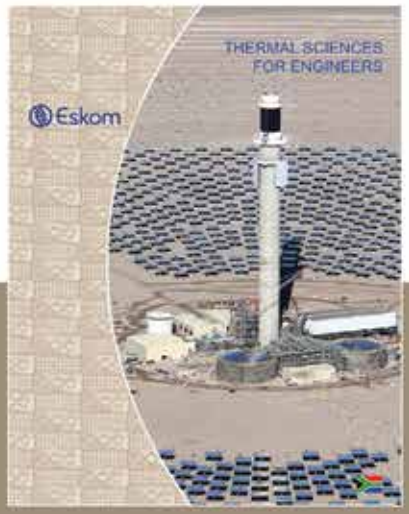

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The key objective of 'Thermal Sciences for Engineers' is to present the influence of thermodynamics, fluid mechanics and heat transfer on the technical component of generating and new build businesses. More importantly, the application of the essential theory to operating plant and new designs is discussed using language familiar to engineers.

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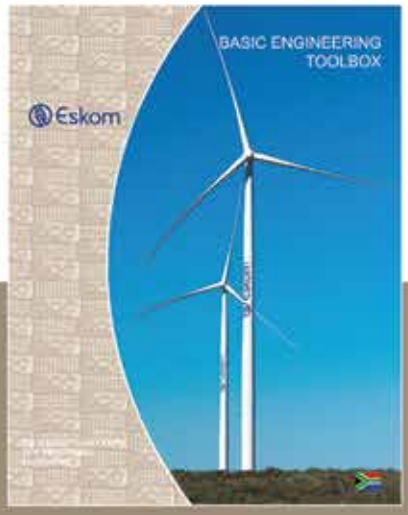

VOLUME 12

Basic Engineering Toolbox (six excellent apps) presents six indispensable tools that are excel based, require little set up and are easy to use. The apps are for simple fluid flow; basic generation plant for gas engines and gas turbines; wind turbine site classification for three year measured data sets, coal calorific value determination based on supplied volatile and non-volatile compositions; solar angle calculator based on the geographic plant location; and a concentrating solar plant levelised cost estimation tool for central receiver plants at 100 MW capacity. The last app is based on Upington (South Africa) data and is presented as a capacity factor versus solar multiple curve for various storage hours. The user will need to generate these curves using bespoke software for other locations.

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Sweep angle control valves – harsh applications

Mitech's range of Sweep Angle Control valves is specifically designed for severe applications with highly erosive process fluids where pressures and/or temperatures are too high for pinch valves or similar slurry valves. The Sweep angle design reduces fluid impingement through the body to offer high resistance to erosion damage. Custom designed to suit various applications, the valves are also ideal for applications where severe flashing is expected.

With a modular design, the valves are offered in sizes from 1"to 16" and if required, larger sizes are available on request. The Sweep Angle Control valve has flange ratings of up to 2 500. The plug and seat can be manufactured in hard material, up to and including tungsten carbide or other ceramics. The body can be bronzed or coated with high velocity spray coated tungsten carbide in critical areas.

The valve has a flow-to-close configuration and few components in the flow path which eliminate any sharp changes in direction. The seat ring is clamped between the valve body and the downstream pipe work, eliminating the need for a traditional retainer or cage.

Typical applications for the valve include those found in mining, petrochemical, food, pulp and paper and power generation industries.

Enquiries: Pieter Badenhorst. Tel. 011 927 4850 or email enquiries@mitech.co.za

Flexible relay solution – improved safety

Machine builders can easily implement required safety functions while improving productivity with the Allen-Bradley Guardmaster 440C-CR30 safety relay from **Rockwell Automation**. Users can programme the safety relay through the free Connected ComponentsWorkbench software from Rockwell Automation.

This free software reduces programming time and helps increase productivity by allowing users to create, control and monitor a safety system in the same software environment as their standard control. The Guardmaster 440C-CR30 safety relay meets PLe, SIL 3 per EN ISO 13849-1 and IEC 62061 standards. It is ideal for applications requiring four to nine safety circuits and control of up to five zones.

"Machine builders across all industries are seeking safety solutions that go beyond meeting compliance requirements, to helping significantly increase both configuration and operation productivity," saidThomas Helpenstein, product manager, Rockwell Automation. "The flexible, compact Guardmaster 440C-CR30 safety relay configured via Connected Components Workbench software meets their needs for improved safety, uptime and productivity. The distinct graphical user interface and drag-and-drop capabilities of the software help guide users through a simple process of selecting certified safety function blocks for the safety relay. Once programmed, an embedded Modbus interface allows the safety relay to easily communicate diagnostic data to Allen-Bradley Micro800 controllers, Allen-Bradley PanelView graphic terminals or Allen-Bradley CompactLogix controllers. Leveraging the embedded communication capabilities and the software allows users to easily monitor, troubleshoot and quickly modify their applications, including performing partial or conditioned shutdowns, as needed. Five status and 16 user-configurable LEDs on the safety relay's faceplate provide local diagnostics to further aid in status reporting and troubleshooting.

Enquiries: Christo Buys. Tel. 011 654 9700 or email cbuys@ra.rockwell.com

Intensive **transformation** in the engineering profession

ECSA
ENGINEERING COUNCIL OF SOUTH AFRICA

By Engineering Council of South Africa

The magnitude of young engineering practitioners has increased in recent years, which can be attributed to the increasing number of the previously disadvantaged people registering in the engineering field at higher education institutions. This has been found by the Engineering Council of South Africa (ECSA) after conducting the engineering skills survey, which was commissioned in 2013.

"Understanding the issues that influence the engineering profession is one of ECSA's top priorities, hence the commissioning of this kind of a research," says Sipho Madonsela, chief executive officer at ECSA. "We have gone to considerable lengths to review the respondents' feedback and compile a thorough report on our profession to date," he added.

ECSA, together with the Department of Higher Education (DHET), and the Economic Development Department (EDD) collaborated on the engineering skills survey, which was commissioned to gain a better understanding of the skills pool of engineers, technologists, and technicians, with the focus on their qualifications, and current state of employment. The survey indicated that 90 % of all respondents are employed and working in the different engineering disciplines in the country. Of the registered engineering practitioners who possess engineering degree among therespondents, 74 % are white professionals, followed by 14 % of black practitioners, and 8 % of Indians, with only 2 % and 0,5 % being Coloured and Asianrespectively. Engineers form the largest category of those that are registered with ECSA, although there are equivalent numbers of technicians and technologists who are registered with ECSA. Only 28 % of the respondents hold a National Diploma as first qualification, and the bulk of this figure are historically disadvantaged individuals (Black, Coloured, and Indian). A small percentage of respondents possess an N4, N5 and N6 certificates as their first qualification but have progressed through the alternative route to become registered with ECSA.

"One of ECSA's mandates is to champion the cause of transformation within the profession, and to achieve that we need complete buy-in from the profession to ensure that there is adequate and consistent transfer of skills and mentoring of younger black engineering professionals," says Madonsela. Having noted, amongst other issues, gender imbalances and a need for more professionals of colour, ECSA has undertaken to make this their top priorities – to increase the number of women joining the profession. Through programmes like Engenius and SakhimfundoTrust, ECSA inspires young scientific and mathematical minds to strive for the required grades in pure maths and science, to ensure acceptance into institutions of higher learning, and girls are particularly encouraged during these outreaches. Involvement in the profession is important to the bulk of the respondents, with 68 % of the group playing an active role in the different Voluntary Associations (VAs).

The ongoing stakeholder engagement strategy being undertaken by ECSA has paid off, with the study demonstrating that registered engineers had a positive perception and experience with ECSA. The majority of the respondents who participated in the engineering skills survey are registered with the Council and value the recognition of expertise, professional designation and statutory requirements that form part of the benefits that come with registering with ECSA.

"Although we still have considerable work to do, we are encouraged by the responses from the industry about ECSA's efforts raising the profile of the profession, and we will continue to ensure we are aligned with the needs and requirements of the profession through more aggressive public engagement in 2015," concludes Madonsela.

The full report on the results of the engineering skills survey can be accessed by visiting https://www.ecsa.co.za/news/SitePages/Surveys.aspx.

Enquiries: Edgar Sabela, Executive: Strategic Services Engineering Council of South Africa. Tel. 011 607 9500 or email edgar@ecsa.co.za

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Power **quality** meets operational **efficiency**

By H Dettmer, Impact Energy

The innovative design of a new device series is a technological break-through that provides the perfect Power Quality (PQ) analysis solution.

The main objective of an engineer troubleshooting a PQ event is to identify the source of the disturbance in order to determine the required corrective action. To identify the source, the engineer depends on recorded data captured by monitoring equipment. The management demands a cost effective method to solve the problem in the least time possible. The electrical engineer speaks of installing instrumentation, collecting data, analysing data, re-installing and re-analysing. It is not uncommon for months to pass until the problem is isolated and a solution is implemented. PQ analysis has traditionally posed a unique challenge to the engineer, demanding an accurate assumption as to the dimensions of the disturbance in order to capture the event to memory for examination. The correct balance between memory size and the deviation of the disturbance from the norm is often elusive. Thresholds set too low capture too many events of little or no consequence, filling the memory before the sought after damaging event occurs. Setting the threshold too high can overshoot the event.

What is data compression technology?

Revolutionary data compression technology takes the guess-work out of isolating the source of PQ problems by eliminating the need for devising set points and calculating threshold values. The ability to capture all the wave form data in high resolution in its entirety over an extended period of time is the only way to ensure that the event will be recorded, allowing the engineer to analyse the data and define a solution.

Until now, monitoring and analysing system electrical trends have presented a true challenge because certain data compromises were required to counteract capacity, processing and physical limitations. Data compression technology provides unlimited capacity for PQ data storage.

This means that you are no longer required to set constraints on system data, rendering the risk in data selection based on set thresholds and triggers obsolete. Operators of electrical networks

EMC – Electro-magnetic Compatibility
IPP – Independent Power Producer
PF – Power Factor
PQ – Power Quality

Abbreviations/Acronyms

are constantly faced with power events and transient occurrences that affect PQ and heighten energy costs. In the past, to determine whether such events reflect system trends or isolated incidents, electrical engineers relied on partial information indicating what events occurred and when; not all events were recorded due to data capacity limitations and missed thresholds. Now, by analysing multi-point, time-synchronised real-time PQ data, you can actually reveal why all power events occur and what causes them. In short, data compression technology pushes PQ analysis capabilities into the next generation.

Why consider data compression technology?

Data compression technology allows for both immediate PQ problem solving as well as for true proactive energy management. The ability to analyse total data anytime enables energy managers to call up and analyse historic time-based energy consumption trends in order to make supply side decisions. Data compression technology allows control over both the consumption and quality of the supplied energy. Considerations for optimal system functionality in diverse network topologies are based on the capabilities of the energy suppliers, service providers and industrial and commercial consumers of energy to provide PQ over time and to successfully analyse, predict and prevent energy events using multi-point, historic and true-time logged data.

Achieving benefits

To reduce losses, utilities and customers need to identify the source of power events, identify the problem sources and prevent their reoccurrence (for example, the utility may be identified as the problem source, or if the failure occurs within the facility, the cause must be determined). Problem sources are many and often reflect the need for predictive and preventative maintenance measures. Utility operators face problem sources such as capacity, weather conditions and equipment failures.

Consumers suffer from equipment failure, faulty installations and incompatible equipment usage creating destructive resonant situations. When effective monitoring is installed, power providers will strive to avoid negative impacts due to diminished quality and service capabilities, so as not to cause damages due to the following factors:

- Data compression technology takes the guess-work out of isolating the source of PQ problems.
- Data compression technology provides unlimited capacity for PQ data storage.
- Using data compression technology avoids capacity issues and therefore data is uncompromised.

take note

In industrial sectors:
- Downtime
- Product quality
- Maintenance costs
- Hidden costs (reputation, recall)

In commercial and service sectors:
- Service stoppage
- Service quality
- Maintenance costs
- Hidden costs (reputation, low customer satisfaction level)

Once a PQ event is fully characterised by accessing compressed PQ data, a solution can be implemented successfully.

Analysis resources and capabilities

Implementing data compression technology in your electrical installation means:
- Everything you want to see is stored; there are no more data compromises to counter recording resolution and capacity issues
- Years of data for every network cycle is available with no data gaps
- Thresholds and triggers are no longer needed; missing events becomes a thing of the past
- All data parameters are recorded; there is no need to select measurement parameters
- Comprehensive PQ reporting and statistics for data analysis and report generation are accessible and organised
- Multi-point time-synchronised recording provides a true snapshot for any period in the entire network

Tracing the evolution of PQ analysis technologies

Over the years, various technologies have evolved for monitoring and logging PQ data. Throughout this period developers addressed the same challenges regarding potential PQ, data capacity and system trends and transferring data volumes across networks. Ultimately, the analysis of sampled data serves to manage, maintain and optimize system operations and costs.

4+ PQ generation technologies

Generation 1: Power meter/ monitor: The first-generation technologies provide display capabilities for system monitoring only.
Generation 2: Data logger: The second-generation technologies use periodic logging mechanisms and present data in paper or paperless

form. Still, the information is utilised for only display capabilities and system monitoring.

Generation 3: Event recorder/ PQ analyser: The third-generation technologies require the setting of thresholds and triggers, which are always difficult to assess correctly given that memory capacity is finite and quickly filled. When values are set too low the capacity is filled instantly; when values are set too high very few events are recorded.

Generation 4: PQ data centre: The fourth generation technology provides limitless, continuous logging and storage of PQ data using data compression technology. Setting of parameter values, thresholds, triggers and other constraints on data are no longer required. Additionally, the trouble-shooter can determine why PQ events occur over the entire electrical network and then successfully identify what causes them, regardless of their cycle occurrence. This measurement and analysis technology enables the engineer to optimise electrical network efficiency and cut PQ losses by relying on the analysis of ungapped data.

Data compression technology provides unlimited capacity for PQ data storage.

Benefits

Of the generations of technological evolution for storing PQ data for analysis, only fourth generation data compression technology affords the unprecedented advantage of infinite, continuous logging and storage of high resolution data.

Using this new technology avoids capacity issues and for this reason yielded data is entirely uncompromised. This represents a clear advantage when analysing system power trends and events. The natural and desired outcome of in-depth system analysis is prediction and prevention of power events, reduced power costs and the constant supply of enhanced PQ.

Spot the opportunity

It is common, widely published knowledge that continuous mining and manufacturing process plants and digital industries are the most vulnerable to PQ related disturbances. And of similar significance is the growing awareness of Economic losses that supply related entities i.e. Eskom, IPPs and municipalities have to factor and account for as part of economic sustainability. Network components suffer extra losses, reduced operational efficiency, abnormal tripping, progressive degradation and premature failure because of various PQ anomalies.

The long term financial losses as a result of poor PQ are those that are not commonly and easily quantified i.e. production losses, scrap, inferior product quality, rework, additional labour and maintenance costs, increased and frequent sustaining capital investment etc. So spotting the opportunity is simple, the challenge really lies in quantifying the size of the prize.

Conclusion

Different industries have varying perceptions of how PQ affects the reliability of the operation. It is vitally important when conducting PQ Impact Assessments to look beyond theoretical and technical impacts of poor PQ.

Every effort as far practical should be made to draw correlation and congruity between perceived customer operation implications and PQ data. The technical loss considerations and associated implications are tabled and hold true for almost all types of industry regardless of customer perceptions. This, together with any form of quantified operational loss analysis serves as a sound basis for investment into PQ solutions.

Estimating the financial losses associated with PQ disturbances can be complex as there are many uncertainties involved. Where effective analysis has been conducted these costs have been found to be significantly high compared to the overall cost base of an organisation.

It has been found that the highest contributor (approximately 85 %) to PQ related financial losses are as a result of voltage dips, transients and interruptions. Other financial losses (15 %) are because of poor Power Factor (PF), harmonics, flicker, earthling and electromagnetic compatibility (EMC) related problems.

Hylton Dettmer is the technical director and one of the founding members of Impact Energy. Hylton has spent much time at Elspec's Head Office in Israel undergoing comprehensive product training. Enquiries: Tel. 0861 357732 or email elspec@impactenergy.co.za

Thorough surveillance and analysis of electrical networks

The Class 0.2s Enerium 300 power monitor supervises electrical networks' compliance with the EN50160 standard and is an essential aid for thorough surveillance and analysis of your electrical network. It is a power monitor designed for efficiency providing detailed harmonic analysis and qualimetry. Local communication via multifunction optical head enabling programming, information reading, metrological testing and remote communication via the Ethernet network or RS485. The simple, intuitive navigation with icons, directional menus and keys with optimum legibility thanks to size and quality of the back-lit LCD screen. The embedded system and graphic screens can be updated easily to meet the user's specific requirements. Some of the meter's features include: Load curves for each utility measured; programmable multi-criteria alarms; time-stamped event log; Configurable input/output cards, including up to eight analogue inputs, eight binary inputs, eight contact outputs, four analogue inputs; measurement of voltage between earth and neutral; Detection of voltage dips and surges; and harmonic analysis. The PC based E View software is available for configuration and display of the electrical parameters and processing the quantities covered by EN50160 by means of summary tables, histograms and load curves.

Enquiries: Blaize Magee. Woodbeam. Email blaize.magee@woodbeam.co.za

Contract for Shondoni mine

JB Switchgear Solutions was recently awarded a contract by Sandvik for the design, manufacture and supply of numerous electrical panels destined for Sasol's Shondoni mine material handling project in Mpumalanga. Sandvik will supply materials handling systems for underground and surface operations. JB Switchgear will manufacture and supply the boards for five substations supplying the power to said operations.

Enquiries: Johan Basson. Tel. 011 027 5804 or email info@jbswitchgear.co.za

Benchmark steam turbine project – Mondi Richards Bay

The **Zest WEG Group**, through subsidiary company Zest Energy and its technology providers, has successfully completed a benchmark steam turbo generator set contract at Mondi Richards Bay that showcases the Group's value addition, innovation and customer focus. The original contract was awarded in May 2012 and partially handed over in December 2013, with final hand over in March 2014.

The scope of work included the design, manufacture and delivery as well as complete installation and commissioning of the steam turbo generator set and associated equipment. Original equipment manufacturer (OEM) supervision services were provided during installation and commissioning, with 24/7 on call support for a period of four weeks following handover. The flagship project achieved a number of records: the largest ever steam turbine manufactured by technology provider TGM Turbinas. "Not only was this the first project to utilise a combination of a TGM turbine with a WEG EM alternator, it was also a first reference for both equipment manufacturers in South Africa," Coenraad Vrey, managing director at Zest Energy, says.

Zest Energy supplied the turbo generator set equipment and took the overall lead on the package, which included steam technology from TGM Turbinas of Brazil and generator technology from WEG Electric Machinery of the United States. Local subcontractor TGS (Turbine Generator Services) undertook the mechanical installation portion of the scope.

Bosch Projects was appointed by Mondi as the official Engineering, Procurement and Construction Management (EPCM) contractor on the project. Rigging sub-contractor Lovemore Brothers, under the supervision of TGS, was tasked with lifting and positioning the equipment in areas with constrained access and onto the reinforced concrete floor of the power house.

Enquiries: Kirsten Larkan. Tel. 011 723 6000 or email kirstenl@zest.co.za

The Zest WEG Group executives involved in the Mondi project: *(from left) Nicky Hariparsad, financial director; Coenraad Vrey, managing director, Zest Energy; Gary Daines, group energy systems director; Louis Meiring, chief executive officer; Alastair Gerrard, general manager, Zest Energy; Luiz Fernando Ribeiro, group operations and logistics director.*

New motor protection relay

The new Rho-C 7SR17 motor protection relay can be applied to 3-phase induction motors of all sizes. The Rho can be supplied with current and voltage inputs and so can provide full current and voltage protection and metering functionality. When the 7SR17 Rho is utilised with the optional voltage functionality, a comprehensive, integrated protection and metering solution is available to the customer ensuring safe and secure operation of plant. Summary of the relay features:

- Stall/ locked rotor protection
- Current unbalance protection
- Motor thermal overload
- Frequent starting
- Undercurrent
- Instantaneous overcurrent
- Directional earth fault
- High impedance
- Under/ over voltage
- NPS voltage/ phase reversal
- Backspin protection
- Power/ Power Factor
- Under/over frequency
- And more...

Enquiries: Blazie Magee. Tel. 0861 966 323 or email blaize.magee@woodbeam.co.za

Underground battery chargers ... in no time at all

Becker Mining South Africa's recently launched IGBT mine traction battery chargers have been designed to charge underground traction batteries in the shortest possible time, at the lowest possible temperature, to ensure optimum battery performance. "The most common causes of battery failure and reduced service life are associated with incorrect charging techniques," says Andrew Trentelman, senior general manager: electronics, Becker Mining South Africa. "Becker Mining's new IGBT mine traction battery chargers, which utilise insulated-gate bipolar transistor (IGBT) technology for quick on and off switching, are more efficient and cost effective than conventional transductor controlled, oil-cooled traction battery chargers.

"These IGBT battery chargers are lightweight air cooled units, which are controlled by an intelligent micro processor circuit that acts as the main control computer, responsible for the logging, charge functions and controls.

"Becker Mining's new chargers utilise Delta Volts/Delta Time (DV/DT) for the precise detection of a battery's gassing stage so the charger can terminate the second rate charge more rapidly. This technology, which prevents over-charging often associated with conventional battery chargers, ensures reduced charging times and lower power consumption. By reducing the charge current once DV/DT is reached, batteries are charged at a significantly lower temperature."

Enquiries: Andrew Trentelman. Tel. 011 617 6300 or email info@za.becker-mining.com

Earth leakage protection with harmonic filtering

NewElec's GA relay range eliminates concerns when protecting variable speed drives against earth leakage faults or down-grading earth leakage protection thresholds due to unease relating to nuisance trips on start-up. All GA relay models may be configured for either IDMT or instantaneous trip delay and include harmonic filtering. It is possible, for instance, to start a 250 kW motor by the direct-on-line method with a set 250 mA sensitive earth leakage trip threshold and not experience any nuisance trip whatsoever in the process. This can be done even when the instantaneous trip selection has been selected. GA relays may be used to advantage when structured grading protection is required from the motor upstream in the distribution feeding train, as a number of GA models starting at 30 mA upwards are available. The relay is not passive and will require a supply of either 110 or 220 Vac, ideally supplied from a source upstream of the main feeder.

Enquiries: Email sales@newelec.co.za

Profibus accredited motor protection and control relay

The NewCode motor protection and control relay from **NewElec** is fully Profibus accredited and retains the user-friendly features that are synonymous with the company's products. Customers will benefit from the Vectorial stall protection that allows the disengagement of the motor if a stall condition occurs on start-up, should there be no improvement in the power factor after 3 s. The relay provides pre-motor start insulation failure protection and power measurements that distinguish between real and apparent power consumption. NewCode's load loss/ dry-run protection allows the user to decide if the load loss measurement will be done on current or power factor measurements and accommodates the required priming time. Earth leakage protection is provided with user-selectable tripping curves and sensitivity levels and includes harmonics filtering. The onboard data base stores events and fault records and the continuous coloured flashing LED provides a visual indication of the communications address. Control panel mounted display LEDs indicate the I/O status.

Enquiries: Email sales@newelec.co.za

Schneider Electric EasyPact TVS perfectly balances performance, cost and quality

Catering to the growing needs of its southern African customer base, Schneider Electric, the global leader in energy management, has introduced its EasyPact TVS range of low-voltage motor starters for applications from 6 to 95 A to this market. Formerly known as TeSys E, the EasyPact TVS range is the newest addition to the EasyPact family of protection and control offers.

"The range includes a wide choice of contactors and overloads, providing the essential features required to address 80 % of the most common AC1 and AC3 motor applications, such as HVAC, textile manufacturing, and material handling," says Jaque Maré, low voltage product manager at Schneider Electric South Africa. According to the Transparency Market Research report: 'Circuit Breaker Market - global industry analysis, market size, share, trends, analysis, growth and forecast report, 2013 – 2019', circuit breakers are a vital part of the power protection industry. The study finds that currently, the need for circuit breakers has gone up considerably with increasing concern for safety in electronic, electrical, automotive, and telecommunication equipment.

The EasyPact TVS range is precision-engineered to give designers, OEMs, and panel builders a motor starter solution that perfectly balances performance, cost-effectiveness, and quality. According to Maré, Schneider Electric has expanded on the successful TeSys E series by including four sizes of contactors that cover an even broader range of current ratings. These are well matched to a choice of thermal overload relays. "Schneider Electric leveraged 80 years of motor starter experience to produce a single range that delivers exceptional simplicity, flexibility, reliability, and value. And, the EasyPact TVS starters range demonstrates the perfect fit between quality, features and price, making it an easy choice for customers," he says.

The capabilities of the EasyPact TVS range have been application-optimised, so that customers pay only for what is needed to meet each project requirement. A clear reference system makes selection and ordering easy, while a maximised number of solutions within one range helps reduce stocking requirements and simplifies design.

EasyPact TVS components are designed for compatibility and ease of installation, either in new or existing motor control panels. Direct mounting of the contactor and thermal overload relay further reduces cabling and installation time, while saving panel space and enhancing reliability.

Manufactured from premium materials in ISO 9001 and ISO 14000 certified production plants, the EasyPact TVS range is fully tested and certified by national, international, and third party organisations to all relevant safety standards. The EasyPact TVS complements Schneider Electric's EasyPact MVS, CVS and EZC range of LV motor starters available now from Schneider Electric South Africa.

Enquiries: Jaque Maré at jaque.mare@schneider-electric.com

Commanding the **highest efficiency** of core system functions

By S Blanckensee., Enviropower

Smaller than a PLC, more affordable than a PLC … ideal for smaller systems that need to be monitored but are not covered by a PLC.

Industrial operations in South Africa can now remotely control numerous machinery functions without having to invest in large capital-intensive programmable logic controller (PLC) technology.

The innovative new i-Commander control and telemetry device is locally manufactured and distributed by Enviropower. It is a smaller, more affordable solution to a traditional PLC, which allows the user to control the required equipment or functions from a cell phone.

It is the ideal solution for smaller systems that may not be covered by a PLC, but have certain aspects that need to be monitored, such as temperature, pressure and oil analysis. The i-Commander allows the user to set the parameters that it functions within, setting off an alarm if the system operates outside of those parameters.

> *The only limitation of the i-Commander is your own imagination.*

How it works

The heart of the system comprises a range of GSM/GPRS devices utilising cellular communications with powerful control and easy programming. Each device utilises a standard network SIM card and application specific antennae to connect to a cellular network for communication.

The device is configured to perform site specific functions using SmartSetup programming software. Programming makes provision for intricate timed operations, logic combinations and counting variables to name a few.

Cellular communications enable the device to communicate via text message to any number of authorised phones and also to communicate via GPRS. GPRS communications via Airdrive GPRS web-based platform allows for logging of data and incidence management online. Airdrive provides the user with real-time ability to detect and address problems before they become major issues.

GPRS – General Packet Radio Service
GSM – Global System for Mobile Communications
PLC – Programmable Logic Controller
SIM – Subscriber Identity Module
SMS – Short Message Service
UPS – Uninterruptible Power Supply

Abbreviations/Acronyms

take note

- The control and telemetry device described in the article is best suited to smaller operations.
- A unique feature on the device is its cable theft monitor.
- The device can be used in a variety of industries.

Depending on which device is selected, the number of inputs and outputs to the device can be expanded up to 32 inputs and 32 outputs (which means a wide variety of devices or conditions can be monitored, controlled and reported on by a single i-Commander, simultaneously).

Types of inputs supported typically are dry contact (is the device being monitored on or off?) and/or analogue inputs (what is the temperature, pressure, flow rate, moisture level, oxygen level, etc?) Outputs can be tailor made to the exact client's requirements, for example:

If analogue input temperature reaches 70 °C, a 'temperature warning' SMS will be sent to the client informing them of the exact temperature, as well as the time and date of the recording. If the temperature reaches 75 °C and remains above this temperature for longer than one minute, the customer will receive an additional 'actionable' SMS.

This warns the customer that their motor is running hotter than optimum. They can now exercise a number of options, including; ignore the message, arrange for an inspection of the motor, switch the motor off (send SMS 'motor off').

If the motor heats up to dangerous levels and stays over that level for a period of one minute, the customer has a built-in a fail-safe to opt to automatically switch off the motor and notify all necessary parties. With 24/7 control of a system through i-Commander, users are guaranteed of tremendous safety and efficiency benefits.

Endless applications

The i-Commander is best-suited to smaller operations, however, if an operation expands and the user requires a larger system, it is possible to add multiple i-Commanders to the system. In addition, the i-Commander sends alerts directly to any number of cellular phones and not just to a controller in an operations centre.

A unique aspect of the i-Commander is its cable theft monitor feature. Cable theft is a major challenge for farmers and other industries, as it is costly to replace the stolen cable. The cable theft monitor function allows the user to constantly monitor their cabling, setting off an alarm if any predetermined parameters are breached.

The i-Commander uses a SIM card and can be run off of multiple cellular networks. It allows the user to enter numerous contact numbers for the most effective communication. For example, if there is a power failure where the device is being used, the i-Commander will send selected users a message indicating the time and date of the initial incident, and when the power is restored again.

Predetermined command features also enable more effective communication between the user and the device. By sending the word 'status' to the i-Commander, the user will be instructing the device to check all aspects of the system and send a report. It is also possible to enable or disable certain tasks by sending a message to the device. The user can also set a pattern of events to take place one after the other, when certain conditions are met.

In addition, users are able to log the performance of the equipment over an extended period, allowing them to determine if there is a problem in the system, or identify where maintenance needs to be carried out. Through proper management of the system with the i-Commander, there can be a drastic increase in productivity.

The i-Commander is not designed for any specific application, and can be used in a variety of industries, including mining, agriculture and power generation. Some interesting applications include, but are not limited to:

- Plant asset protection, mobile equipment monitoring, tank level control and monitoring, pump and reservoir control, vibration analysis and monitoring, industrial instrumentation, generator monitoring and remote start, productivity monitoring, industrial control, UPS system monitoring, security systems, cable theft prevention, hatchery and pivot monitoring and access control.

Conclusion

Initial set-up of the i-Commander is quick and simple. As part of its value-added service, Enviropower pre-sets the device for its clients, thereby ensuring that the user simply has to select the parameters that the i-Commander is required to operate within. The only limitation of the i-Commander is your own imagination.

Stewart Blanckensee is the chief operating officer at Enviropower.
Enquiries: Tel. 011 466 1268

Optical spectrum analyser offers higher performance

Yokogawa has introduced a new version of its successful AQ6373 optical spectrum analyser incorporating a new monochromator with a sharp pass band filter edge plus a number of new features including a double-speed measuring mode, a multipeak /bottom search function and a data-logging function.

The new AQ6373B is designed for measurements in the short wavelength region, from 350 nm to 1 200 nm, and is based on the same proven platform of the AQ6373, featuring a fast start-up time - about two minutes including self-calibration - and fast measurements, with only 0,5 s for a measurement covering a 100 nm span. The sharper passband filter edge of the new monochromator is helpful for clearly separating spectral signals in close proximity to one another.

Like the AQ6373, the AQ6373B offers a high resolution of up to 0,01 nm in the 400 - 470 nm range, a high close-in dynamic range of up to 60 dB, and a high sensitivity down to -80 dBm in the 500 – 1 000 nm range. It also includes a free-space optical input, enabling the instrument to accept optical fibres with core diameters from 9 µm to 800 µm, and a colour analysis function for determining the exact colour of the input light, as experienced by the average human eye sensitivity (according to the CIE 1931 XYZ standard). Wavelength calibration on the AQ6373B can be performed using the emission line of a common low-cost xenon lamp.

Enquiries: Email colinf@protea.co.za

10 kVA UPS range for small and medium businesses

Jasco Power Solutions has launched a new range of high frequency 1-10 kVA UPS' that will offer small and medium-sized local businesses the daily risk coverage they need to survive the load shedding that is likely to become the norm in South Africa. Jasco Power Solutions' Jnet range of UPS' are compact, flexible, meet international standards, and are extremely cost competitive.

Jasco Power Solutions believes its Jnet UPS range is highly relevant and will capture 20 % of the estimated R 600 M market for these devices in the next six to 12 months. This range complements Jasco Power's existing 20 – 100 kVA and 100 kVA to 1,2 MVA UPS ranges, and its power quality, assurance and management services.

"South African businesses can expect to deal with regular load shedding and the threat of rolling blackouts for the next three to five years," says Marco da Silva, managing director of Jasco Power Solutions. "To remain viable, businesses will need to be proactive, putting in place solutions to protect their IT and operational systems and keep mission critical systems up and running. We recognised a clear gap in the market for a cost effective, high quality UPS solution that meets the needs of this sector. This led to the development of our Jnet range."

Enquiries: Marco da Silva. Tel. 011 746 6800 or email marco.dasilva@jasco.co.za

Current probes - measure ac/dc current up to 2 000 A

The Universal Technic model SC 2000 which has a capability of measuring ac/dc current up to 2 000 A. Frequency range is from dc to 10 kHz with a accuracy on dc ± 1 % and ac accuracy at 50 Hz of ±0,5 %. The model in the illustration has a 52 mm jaw and a co-axel cable terminated with a BNC connector. Other jaw sizes and current ratings up to 7 500 A are available.

Enquiries: Denver Technical Products. Tel. 011 626-2023 or email denvertech@pixie.co.za

New spectrometer technologies cut operating costs

A new whitepaper detailing how new ICP-OES spectrometer technologies are substantially cutting operating costs in environmental, industrial, and academic laboratories is available. Controlling costs associated with the operation of ICP-OES instruments is a continuing challenge for laboratories, regardless of application, given the variety of operational, maintenance and hidden expenses that dramatically increase their total cost of ownership. Traditional spectrometers bear the burden of a number of inherent problems in their design. 'How new spectrometer technologies substantially cut operating costs' explores how engineering innovations have addressed design issues to enable significant savings while improving performance. The advancements, detailed in the paper, include:

- New system designs that deliver improved uptime and throughput while reducing operating costs
- A unique sealed optical system that abolishes the need for the constant purging of argon or nitrogen, eliminating purge gas consumables cost and purging delays
- Improved spectrometer technology that removes the need for a separate, external, water-based cooling system along with the associated purchase, installation, power and maintenance costs
- Innovations in optical technology that improve performance measures such as sensitivity and stability
- A robust generator design that provides ample power reserves, so it can handle extreme plasma loads, and adapt to quickly changing demands

Such advancements, according to the whitepaper, cut operating costs by enabling easier, less expensive installation, operation, and maintenance, while improving both ICP-OES performance and usability. The paper is authored by **SPECTRO Analytical Instruments**, a leading global supplier of analytical instruments for optical emission and X-ray fluorescence spectrometry. Download the white paper at http://icp-oes.spectro.com.

Enquiries: Email spectro.info@ametek.com

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Every year, industry experiences catastrophic fires, explosions or toxic releases. These events can result in injury, loss of life and can have a huge economic impact. This conference has been created to offer you the most up to date information to enable you to analyse, specify, design, install and maintain safety systems and electrical equipment in your plant whilst complying with the latest standard requirements.

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- Introduction to Dusts and their Explosive Properties
- Certification Processes and Requirements for Hazardous Locations (Ex) Equipment in South Africa and Internationally
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High-precision tension, pressure and flow control applications

The new analogue I/O units from **Omron** offer a conversion resolution of 1 part in 12 000, making them an ideal choice for high-precision tension, pressure and flow control applications, and for use with measurement sensors in quality inspection systems. The units available are input-only versions with four analogue inputs, output-only versions with four analogue outputs and mixed I/O versions with four analogue inputs and either two or four analogue outputs. All versions support the full range of standard current and voltage signals.

Omron's new temperature sensors are offered in two versions. The first has twelve inputs for use with thermocouples, and is well suited for use with extrusion moulding machines and large ovens. The second version has four thermocouple inputs, two of which can optionally be configured for use as standard analogue inputs (1 to 5 V, 0 to 10 V, or 4 to 20 mA). This version allows temperature sensing and analogue sensing to be combined cost effectively in a single unit.

Both units deliver high accuracy and performance, and they are complemented by Omron's PID function block and CX programmer, which make it easy to implement temperature control systems.

Enquiries: Michelle le Roux. Tel. 011 5792600 or email michelle.le.roux@eu.omron.com

Photoelectric sensors with PMD technology – and Laser Class 1

The tried-and-tested photoelectric O5D sensors from **ifm electronic** are distinguished by switch point setting to the nearest centimetre, colour-independent detection and reliable background suppression.

The PMDLine series even detect shiny surfaces without any difficulty. ifm has now extended this sensor family with laser class 1 allowing it to meet the requirements of applications in the automotive industry.

In its compact housing, the O5D variant combines long range, reliable background suppression, visible red light and high excess gain – plus laser class 1. Another advantage is its ease of use and switch point setting to the nearest centimetre via +/- buttons and display. The O5D family is an intelligent alternative to standard sensors, since their price and size are in the same range.

Enquiries: Tel. 012 450 0370 or email info.za@ifm.com

Integrated **energy efficiency strategy** for deep mine ventilation and refrigeration - *A study*

By Dr AJ Schutte and Prof M Kleingeld, Centre for Research and Continuing Engineering Development (CRCED), North-West University (Pretoria campus) and consultants to TEMM International and HVAC International

South Africa's electricity supply is under pressure due to a lack of supply to meet demand [1]. Further, mining is one of South Africa's largest electricity consumers with its electricity-intensive services such as compressed air, cooling, ventilation and others [2].

There is a need to reduce the operational cost on a mine as the electricity prices are set to increase at least 2 % above South Africa's inflation target [3].

Deep level gold and platinum mines in South Africa require extensive cooling and ventilation to create acceptable conditions for both people and equipment. Therefore, more than 40 % of mine electricity consumption is used for cooling and ventilation [4].

The most common electricity management projects are Load Management (LM) and Energy Saving (ES). LM projects alter the electricity load profile according to the Eskom Time Of Use (TOU). Alternatively, ES projects reduce the amount of energy used by the system. Both types of projects realise a monetary saving.

Mining projects simulation

Mine cooling and ventilation systems differ. Therefore, in order to compare a project's results with other project results, a typical mine was simulated.

As shown in *Figure 1*, the simplified typical mine has the following ventilation and cooling sub-sections:

- Pumping
- Surface service-water refrigeration
- Underground service-water refrigeration
- Surface air refrigeration
- Underground air refrigeration
- Ventilation fans (booster and main)
- A water distribution network

The power usage for the simulated mine is 22 MW as is shown in *Table1*.

Table 1: Simulated electricity usage for the investigated mine.

System	Power (kW)
Pumping	7 542
Refrigeration	10 241
Fans	4 167
Total	**21 949**

The work-weekday cost is determined in *Table 2* at R79 M per annum taking the power over 24 hours and an average cost of 61c/kWh.

Table 2: Simulated annual electricity cost for the investigated mine.

Total hourly power	21 949	kW
Hours per day	24	h
Weighted average power cost	0,61	R/kWh
Number of week days	248	days
Annual cost	**R79**	**million**

The mine has therefore been established with a baseline energy usage along with the annual cost of this usage.

Implementing a sequenced combination of cooperative projects on a typical mine resulted in substantial annual savings. This was due to substantial reductions in the ventilation and cooling electricity bill.

Abbreviations/Acronyms

BAC – Bulk Air Cooler
EHS – Environmental Health and Safety
ES – Energy Saving
LM – Load Management
PAI – Project Appeal Indicator
TOU – Time of Use

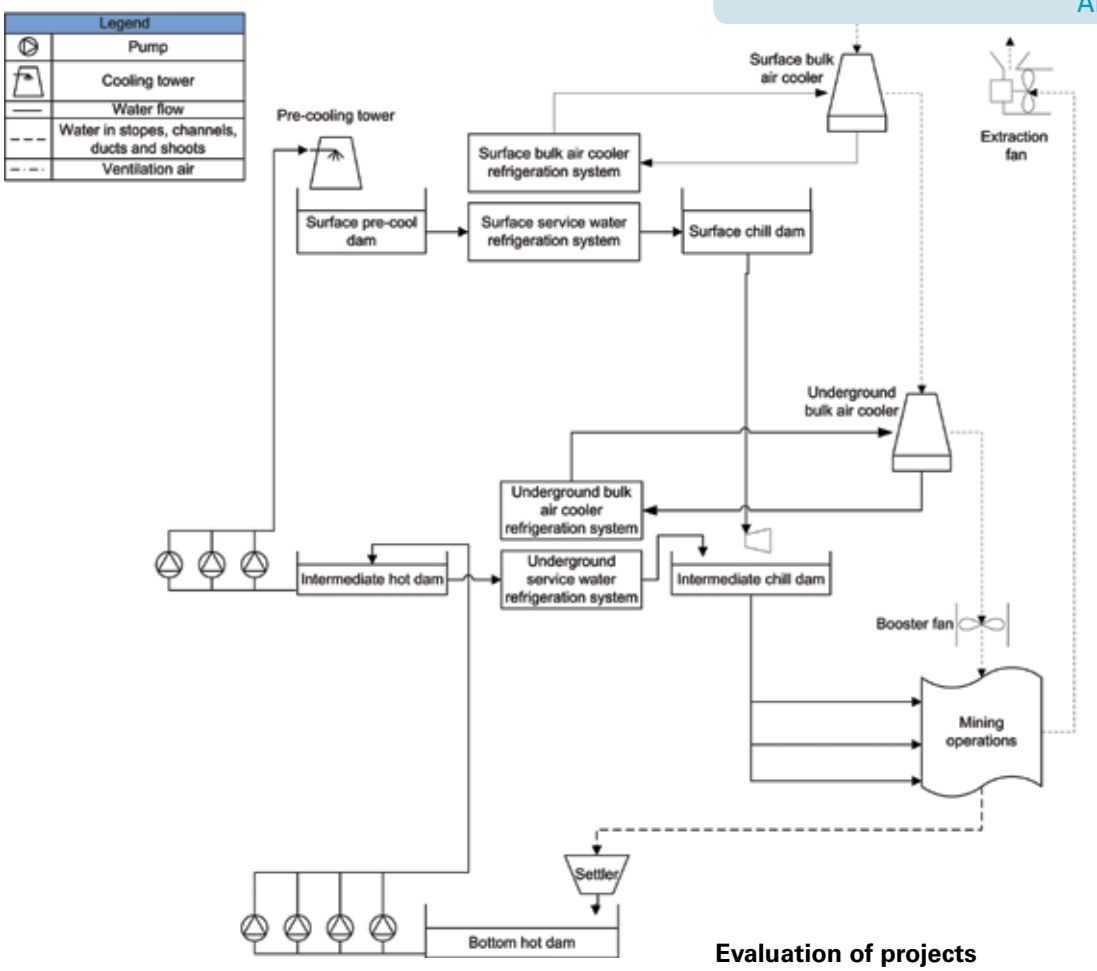


Figure 1: Simplified typical deep level mine ventilation and refrigeration sub-sections [5].

Further, there are the eleven cooling and ventilation LM and ES projects:

- Pump control [6]
- Fridge plant control [7]
- Thermal ice storage [8]
- Ice circulation [9]
- Energy recovery [10]
- Water-supply optimisation [11]
- Cooling auxiliaries [12]
- Auxiliary fans [13]
- Main fan control [14]
- Main fan carbon blades [15]
- Closed-loop underground Bulk Air Cooler (BAC) [16]

These projects are currently implemented ad hoc and are seldom combined unless they are on a low level of interaction with each other such as varying the pumping water supply to the fridge plant enables the fridge plant water processing to vary.

Therefore, an evaluation system is needed to combine and sequence their implementation to ensure that the maximum possible saving throughout the entire mine-cooling and ventilation system is achieved.

Evaluation of projects

Each project was evaluated against yearly monetary savings, potential risks and other factors. The monetary savings takes into account the effect the project has on the simulated and simplified typical deep level mine power profile as well as the Eskom TOU cost structure. The monetary saving was normalised by being divided by the total cost. The risks for each project were evaluated according to:

- o Service delivery
- o Production
- o Environmental Health and Safety (EHS)
- o Overhead cost

The risk matrix used in the evaluation of each project on this simplified typical deep level mine is shown in *Figure 2*.

The hazard and risk of each project on the simplified typical deep level mine was determined from consultation, literature, deductions and the authors' decades of hands-on experience in industry.

The identified risk and hazard with regards to service delivery, production, EHS and overhead cost was evaluated against the magnitude and severity starting from Not possible to Catastrophic.

Then the likelihood of the project's risk and hazard was evaluated with regard to the aforementioned aspects starting from never to frequent.

In the example it is seen that with regards to production, the Pumping LM project poses a risk or hazard which is insignificant in

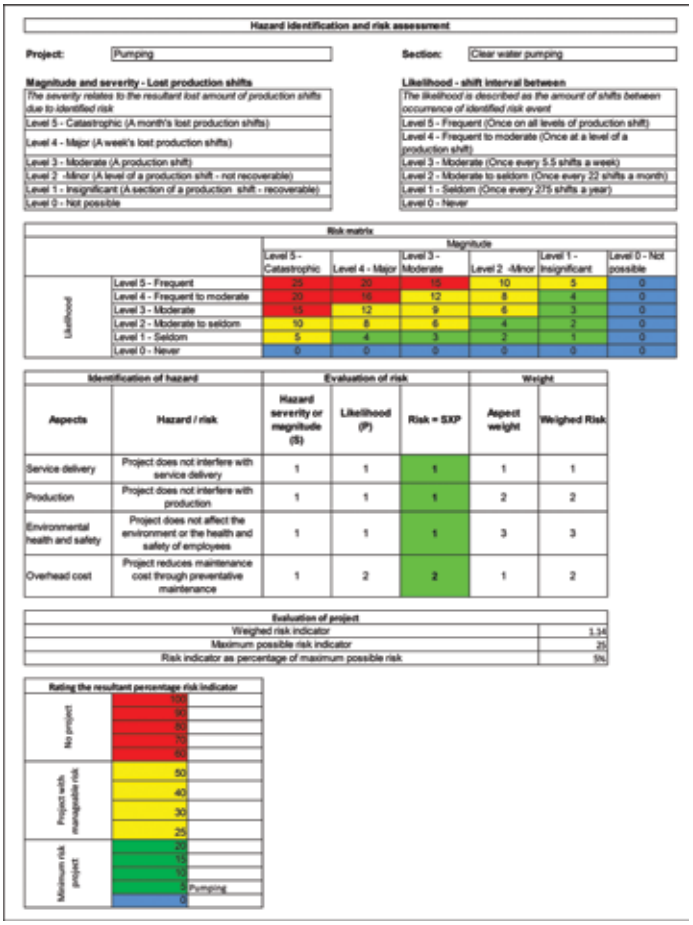
magnitude (scores a 1) and occurs seldom (scores a 1). The risk was quantified by multiplying the severity with the likelihood (1 x 1 = 1). Each aspect was given a weight. Health and safety is considered more important than an increase in overhead cost and as such has a weight of 3 versus a weight of 1.

The weighed risk was then determined by multiplying the risk with the aspect weight. This would then give a weighed risk of 1 for the Pumping LM project with regard to service delivery (1 x 1).

The weighed risk indicator was then determined by summing the weighed risks and dividing it with the total aspect weight (8/7 = 1,14).

The maximum possible score that could be achieved for a risk would be 5 x 5 = 25. The maximum value or score that the weighed risk indicator could be is (25 x 1 + 25 x 2 + 25 x 3 + 25 x 1)/7 = 25.

The risk is normalised to a percentage by being divided by the maximum possible value or score. For example 1,14/25 = 4,56 % which is rounded up to 5 %.



Hazard identification and risk assessment

Project: Pumping — Section: Clear water pumping

Magnitude and severity - Lost production shifts

The severity relates to the resultant lost amount of production shifts due to identified risk

- Level 5 - Catastrophic (A month's lost production shifts)
- Level 4 - Major (A week's lost production shifts)
- Level 3 - Moderate (A production shift)
- Level 2 - Minor (A level of a production shift - not recoverable)
- Level 1 - Insignificant (A section of a production shift - recoverable)
- Level 0 - Not possible

Likelihood - shift interval between

The likelihood is described as the amount of shifts between occurrence of identified risk event

- Level 5 - Frequent (Once on all levels of production shift)
- Level 4 - Frequent to moderate (Once at a level of a production shift)
- Level 3 - Moderate (Once every 5.5 shifts a week)
- Level 2 - Moderate to seldom (Once every 22 shifts a month)
- Level 1 - Seldom (Once every 275 shifts a year)
- Level 0 - Never

Risk matrix

Likelihood \ Magnitude	Level 5 - Catastrophic	Level 4 - Major	Level 3 - Moderate	Level 2 - Minor	Level 1 - Insignificant	Level 0 - Not possible
Level 5 - Frequent	25	20	15	10	5	0
Level 4 - Frequent to moderate	20	16	12	8	4	0
Level 3 - Moderate	15	12	9	6	3	0
Level 2 - Moderate to seldom	10	8	6	4	2	0
Level 1 - Seldom	5	4	3	2	1	0
Level 0 - Never	0	0	0	0	0	0

Identification of hazard		Evaluation of risk			Weight	
Aspects	Hazard / risk	Hazard severity or magnitude (S)	Likelihood (P)	Risk = SXP	Aspect weight	Weighed Risk
Service delivery	Project does not interfere with service delivery	1	1	1	1	1
Production	Project does not interfere with production	1	1	1	2	2
Environmental health and safety	Project does not affect the environment or the health and safety of employees	1	1	1	3	3
Overhead cost	Project reduces maintenance cost through preventative maintenance	1	2	2	1	2

Evaluation of project	
Weighed risk indicator	1,14
Maximum possible risk indicator	25
Risk indicator as percentage of maximum possible risk	5%

Rating the resultant percentage risk indicator

No project	100	
	90	
	80	
	70	
	60	
Project with manageable risk	50	
	40	
	30	
	25	
Minimum risk project	20	
	15	
	10	
	5	Pumping
	0	

Figure 2: Risk evaluation matrix for the Pumping LM project.

Other factors considered:

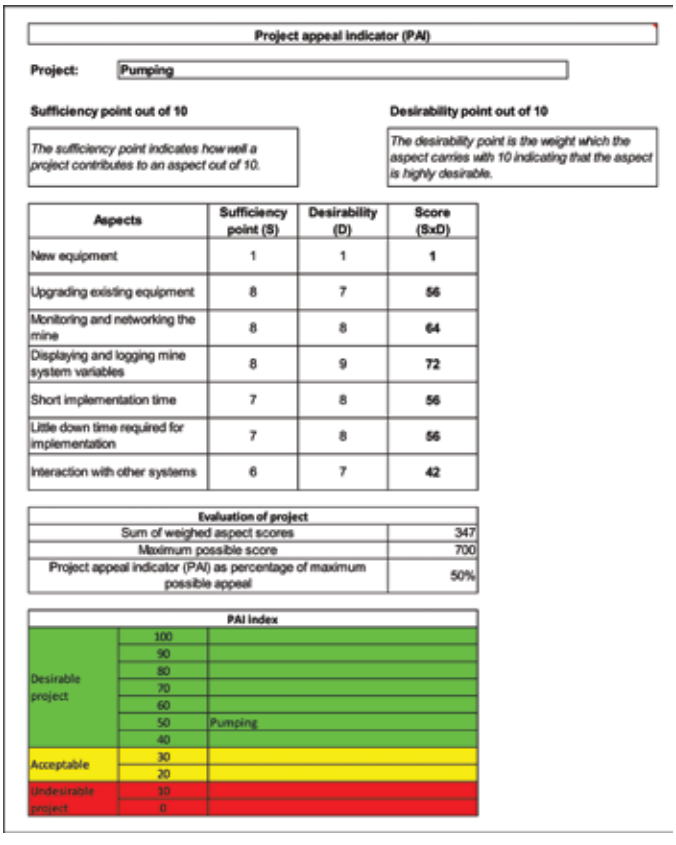
- o Introduction of new equipment
- o Upgrading of existing equipment
- o Expanding the mine's information network and monitoring capability
- o Displaying and logging of important mine system variables
- o Implementation time
- o Down time required for implementation
- o Interaction with other systems

These other factors were evaluated similarly to the aforementioned project risk for the simplified typical deep level mine. Each factor carried a weight as shown in *Figure 3*.

Displaying and logging mine system variables in this study is deemed to be desirable and has a high weight of 9. The projects were scored according to each factor and again the score was determined from consultation, literature, deductions and the authors' decades of hands-on experience in industry.

As shown in *Figure 3* the implementation of a Pumping LM project received a high score of 8 for displaying and logging important mine system variables as this project allows a mine to display the dam levels, pumps statuses and running hours for each pump and all the pumping stations throughout the mine. The score was then multiplied by the weight to determine the weighted score (8 x 9 = 72).The weighted scores were then summed to achieve a total score of 374. The other factors total score is referred to as the strategy's Project Appeal Indicator (PAI).

The PAI was also normalised to a percentage by being divided by the maximum possible value or score. As an example 347/700 = 49,57 % which was rounded up to 50 %.



Project appeal indicator (PAI)

Project: Pumping

Sufficiency point out of 10

The sufficiency point indicates how well a project contributes to an aspect out of 10.

Desirability point out of 10

The desirability point is the weight which the aspect carries with 10 indicating that the aspect is highly desirable.

Aspects	Sufficiency point (S)	Desirability (D)	Score (SxD)
New equipment	1	1	1
Upgrading existing equipment	8	7	56
Monitoring and networking the mine	8	8	64
Displaying and logging mine system variables	8	9	72
Short implementation time	7	8	56
Little down time required for implementation	7	8	56
Interaction with other systems	6	7	42

Evaluation of project	
Sum of weighed aspect scores	347
Maximum possible score	700
Project appeal indicator (PAI) as percentage of maximum possible appeal	50%

PAI index

Desirable project	100	
	90	
	80	
	70	
	60	
	50	Pumping
	40	
Acceptable	30	
	20	
Undesirable project	10	
	0	

Figure 3: PAI evaluation matrix for Pumping LM project.

Modular display module
PLICSLED for point level sensors

PLICSLED “See what it's about”

With the PLICSLED display module, the switch status of the sensor can be read from distance, even in strong sunlight.

The display module is mounted directly into a standard sensor housing. When compared to a separate display panel, this saves time and cost. The switch status can be displayed in two colors: red-green or yellow-green.

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Looking Forward VEGA

Figure 4 shows the results of the annual cost savings of all the projects. The water-supply optimisation strategy, which operates by reducing the amount of water circulated and chilled, has the highest annual saving.

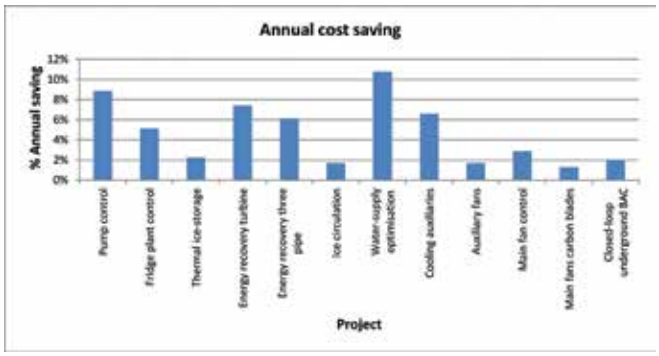

Figure 4: Yearly monetary saving.

The lowest annual saving comes from exchanging the main fan's steel blades with carbon fibre blades. This is due to the project not interacting or influencing any other system.

Figure 5 shows the results from the risk evaluation. The highest risk projects are the carbon fibre blades, ice and three-pipe projects. They introduce new chemicals to the mine's environmental health and safety structure. New equipment and technologies add to overhead running cost. As an example, if the main fan carbon fibre blades are designed or manufactured wrong, or hit with a blunt object it will break apart. There is instantaneously a reduction in service delivery of cool ventilation air. This negatively affects the health and safety of the employees underground. Border line production areas are brought to a halt and suspended with a reduction in ventilation and cooling.

These risks can be mitigated by ensuring the correct design. They can be mitigated by stringent manufacturing quality checks and controls. They can be mitigated by removing all possible blunt objects and having standby main fans available. Given this it is risks that are simply not there when compared to installing a VSD on a surface cooling auxiliary pump.

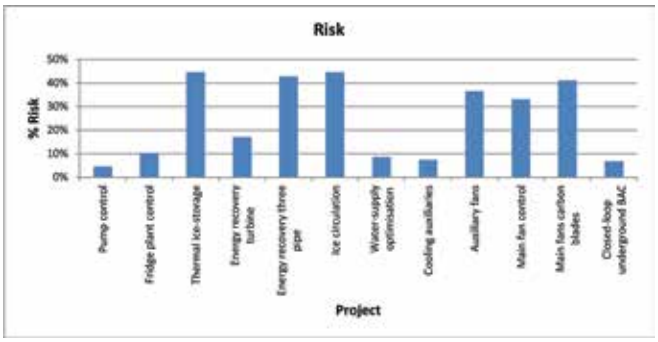

Figure 5: Risk evaluation of strategies.

The lowest risk projects are the pumping control, optimisation of cooling auxiliaries and water-supply optimisation projects. These systems do not pose a risk to production as they are removed from

production with sufficient buffers. Additionally they have negligible overhead costs since new equipment is kept to a minimum. *Figure 6* shows the PAI results for each strategy. Again it can be seen that the results for the pumping and water-supply optimisation projects are very favourable. This is due to their limited introduction of new equipment. These projects expand and upgrade the mine communication and information networks. They also have a short implementation time and require very little down time.

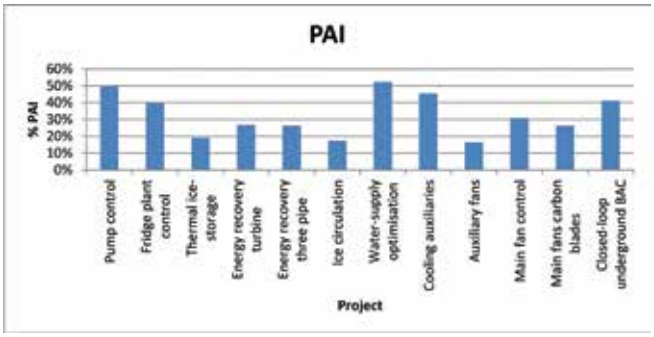

Figure 6: PAI evaluation of strategies.

However, since not all the evaluated projects can be implemented on a mine, there is a need to determine the best combination of projects.

Implementation of multiple technologies

Not all eleven projects should be implemented. The interactions between systems as well as clashes between projects were considered to determine the optimal project combination. Ice circulation project is not considered because this simplified typical deep level mine already has underground refrigeration. Thermal ice-storage project is omitted in favour of fridge plant control. This is done because an optimisation of cooling auxiliaries ES project is then also possible which will increase the total over-all monetary saving. *Table 3* summarises the best combination of projects.

Table 3: Best rated combination of projects.

Combination
Pump control
Fridge plant control
Turbine/three pipe
Water-supply optimisation
Cooling auxiliaries
Auxiliary fan
Main fan control
Main fan carbon blade
Closed-loop underground BAC

After an evaluation of individual projects has been done and the combination of strategies has been determined, there needs to be a sequence to implement the chosen combination.

Sequencing the implementation of projects

When first faced with determining the project sequence, it would be assumed that it is more economical to start with the biggest monetary saving and end with the smallest as shown in *Figure 6*. This would mean starting with the water-supply optimisation project and ending with the main fan carbon blades project.

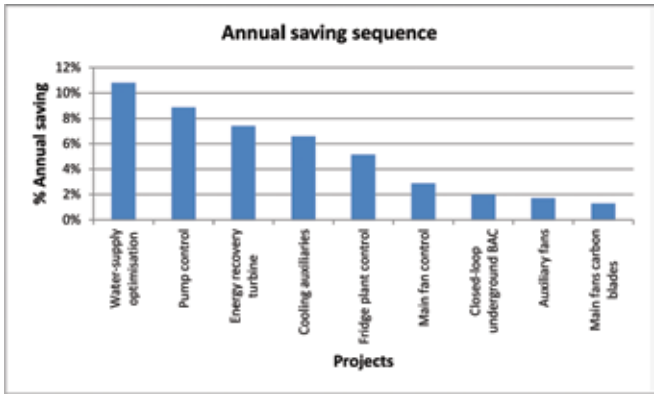

Figure 7: Monetarily sequenced strategies.

A more risk adverse sequence of strategies from lowest to highest risk is shown in *Figure 7*. This means starting with the pumping project and ending with the main fan carbon fibre blades project. It is a significantly different path although it ends with the same strategy.

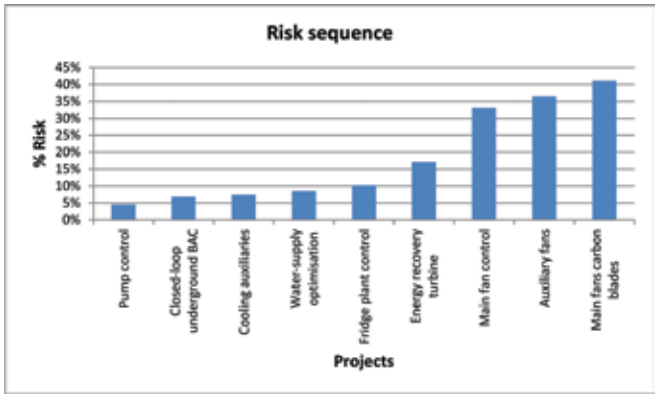

Figure 8: Risk averse sequenced strategies.

The other factors might also be considered in the decision to implement the proposed combination. Using the PAI as a guide this installation sequence would be as shown in *Figure 9*. This means starting with the water-supply optimisation project and ending with the auxiliary fan project.

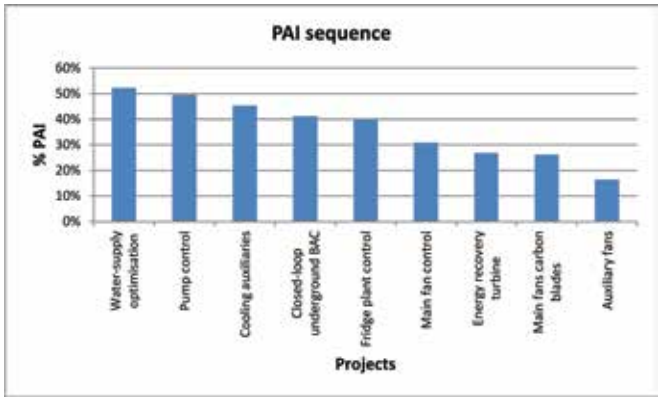

Figure 9: PAI sequenced strategies.

The savings from a water supply optimisation project is realised

on the pumping and refrigeration systems. Therefore, one needs to have information on the pumping and refrigeration systems before implementing a water-supply optimisation project.

The same applies to the optimisation of the cooling auxiliaries and turbines. The full potential would not be realised if the amount of water circulated was not first reduced with a water-supply optimisations project. Pumping supplies the fridge plant and therefore load management on the pumping system enhances the load management that can be done on the fridge plants.

With this, the sequence is thus to start with a pumping control LM project followed by a fridge plant control LM project. Once both plants' energy load is managed and recorded one can implement a water-supply optimisation project.

The optimisation of cooling auxiliaries has less monetary saving than an energy recovery turbine. However, it is more risk averse and desirable to first install a cooling auxiliary project before a turbine.

Furthermore, with the network infrastructure being installed on all the pumping-, refrigeration- and mining levels, one can easily obtain data and implement a closed loop underground BAC project.

With the knowledge gained on the ventilation system one can also start implementing fan projects such as replacing all the auxiliary fans with more efficient fans.

Therefore, the main extraction fan control should be implemented next. With this data the carbon fibre blade savings can also be calculated.

Thus all the projects have been combined and sequenced as shown in *Table 4* by looking at monitory savings, potential risks, PAI and the interaction and amalgamation relationship of the strategies.

This sequence is also validated and verified by the referenced dates of literature published on these strategies shown in *Table 4*.

Table 4: Sequenced combination results.

Sequence	Project	Publication	Citation
1	Pumping	2003	[6]
2	Fridge plant	2006	[7]
3	Water-supply optimisation	2011	[11]
4	Optimisation of cooling auxiliaries	2012	[12]
5	Energy-recovery turbine	20121	[10]
6	Closed-loop underground BAC	2013	[16]
7	Booster fans	20062	[13]
8	Main fans	2012	[14]
9	Main fan carbon blade	2013	[15]
1. This is a recent publication of an implemented energy-recovery system. Publications on turbines and their installations have been around since at least 1985 [13].			
2. This publication tests the idea of a booster fan project. There is no publication on a successful installation that realised an energy-saving.			

The sequenced combination is applied to the simplified mine simulation to determine the resultant energy and cost savings.

Most other evaluations only add the effect of each individual strategy. However, the result obtained from the simplified simulation also takes into account the interaction between systems and projects. It is therefore a more accurate reflection of the possible savings that are achievable on a mine cooling and ventilation system. An overhead centralised monitoring system can also be used to ascertain the overall effect of projects even though each system is implemented and operates on its own.

Results

The sequenced combination of cooperative projects was then implemented on a typical mine as a case study. Implementing all nine strategies in sequence allowed a17 MW reduction in the Eskom evening peak period and a132 GWh energy efficiency throughout the day as shown in *Figure 10*.

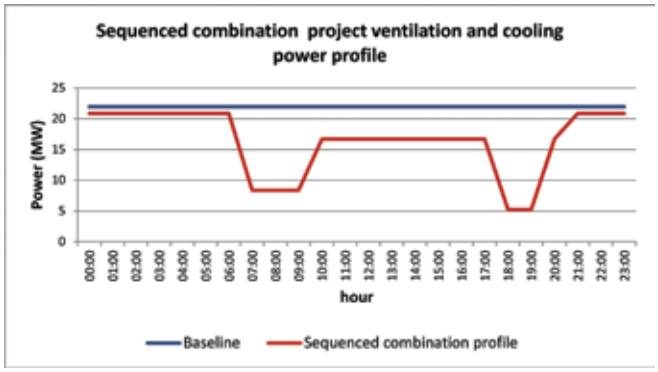

Figure 10: Resultant change in energy profile of simplified typical deep level mine for sequenced combination.

The implementation of the sequenced combination of strategies further resulted in an annual cost reduction of the mine ventilation and cooling system of R30 M. That is a saving of 38 % on the annual cost of the ventilation and cooling system, and 16 % on the annual costs for the entire mine for weekdays. *Figure 11* shows the change in the weekday cost profile.

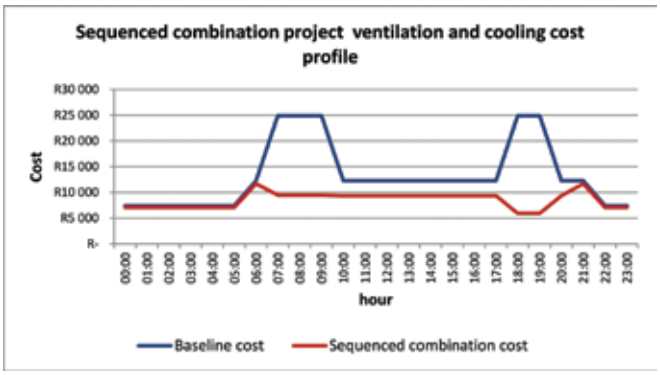

Figure 11: Resultant change in 24 hour operational cost of simplified typical deep level mine for sequenced combination.

An average project realises a 5 % annual saving on the annual ventilation and cooling cost. This 38 % saving shows that an integrated

- Mining is one of South Africa's largest electricity consumers.
- Deep level gold and platinum mines in South Africa require extensive cooling and ventilation.
- Cooling and ventilation consume 40% of a mine's electricity.

take note

project approach delivers results that are greater than current ad hoc and uncoordinated implementations of projects.

Conclusion

This study listed all the sections of a mine cooling and ventilation system as well as all the associated energy and cost saving strategies.

Each strategy was then analysed with regard to their yearly monetary savings, potential risks and other factors. The risk of each strategy was evaluated against service delivery, production, EHS, as well as overhead cost. Other factors (PAI) that were considered were the purchasing of new equipment, upgrading existing equipment, expanding the mine network and monitoring, implementation time, downtime and the interaction with other projects.

However, not all the projects could be implemented and the best combination of projects was determined. This combination was then sequenced by taking into account the factors mentioned above and looking at the project implementation steps. A simplified simulation was then used to determine the power usage of a mine's cooling and ventilation system. The annual cost was calculated using the simulation model and Eskom's tariff structure. These results showed that R30 M can be saved annually. In conclusion this study has shown that, by following the sequenced combination proposed, the maximum savings on all the systems will be realised.

Acknowledgement

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Dr Abrie Schutte is a registered professional engineer and holds a PhD in mechanical engineering from the North-West University. He is enrolled for post-doctoral studies with CRCED Pretoria, a division of North-West University. He is also a consultant to HVAC International. and TEMM International. Enquiries: Email aschutte@rems2.com

Prof Marius Kleingeld is a registered professional engineer and holds a PhD in mechanical engineering. He is a lecturer at the CRCED Pretoria, a division of North-West University. He is also a consultant to HVAC International and TEMM International.
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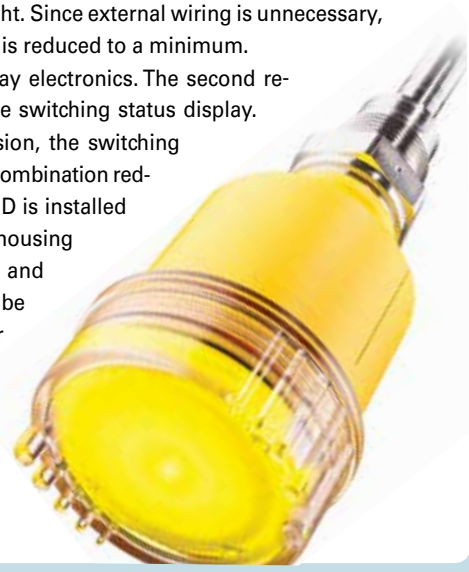
Power is supplied via the relay electronics. The second relay output is used to control the switching status display. Depending on the module version, the switching status is displayed in the colour combination red-green or yellow-green. PLICSLED is installed directly inside the plics sensor housing giving it protection from dust and water. The display module can be ordered directly with the sensor or, alternatively, as a separate unit for retrofitting.



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Reliable temperature measurement with new thermowell materials

Taking temperature measurements ranging from 800°C to 1 700 °C there are particularly high demands on the measuring technology used. Many materials can only withstand the heat and other process conditions for a limited period. While some processes involve corrosive gases, other processes can be abrasive.This is exacerbated by turbulence and other extreme conditions, which make things more difficult for the component parts of a thermometer, particularly the thermowell. A combination of corrosion and abrasion is often the root cause of thermowell failure.

At critical measuring points, measurements are either not taken continuously or the thermocouples must be replaced quite frequently.These measuring points increase the workload of the maintenance departments, drive up costs and often difficult to access. In recent years, materials research has provided us with many new materials, ranging from new metal alloys to robust ceramic substances. **Endress+Hauser** has examined and tested these new materials, and found it possible to use some to produce thermowells that withstand extreme process conditions far longer than previously experienced. Endress+Hauser has incorporated its research and testing results into the Omnigrad S TAF high-temperature sensor line. Given the extensive possibilities of combining the TAF11, TAF12S, TAF12D,TAF 12Tand TAF16 devices, the ideal thermocouple can be designed for every application.

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Climate change and the grid

By Dr LE Jones, Alstom Grid Inc

Today's unusual weather phenomena tell us that the climate is changing. While mitigation is important, experts agree that adaptation is necessary to adjust to the various effects of the planet's evolution. That includes adapting power grids.

Severe, atypical weather events are on the increase. Flooding, hurricanes, heat waves and extreme cold spells are becoming more frequent. According to the World Bank, global mean warming is 0,8 °C above pre-industrial levels, oceans are acidifying, sea levels are rising at 3,2 cm per decade and an exceptional number of extreme heat waves have occurred in the last 10 years. The United States National Oceanic and Atmospheric Administration believes that we have entered uncharted climate territory and that we must accelerate the pace of adaptation to achieve a more sustainable planet.

The potential impacts of a changing global climate on the power grid infrastructure are serious. The grid as we know it today was not designed for big temperature swings. So the electric network is affected by increasingly extreme temperatures that may degrade the equipment's thermal and physical properties and reduce its lifespan. As the Earth heats up, the resistivity of the soil can change and some underground devices could malfunction, leading to problems in the grid's protection systems. Equally, an excess of moisture in some regions could have a serious impact on the dielectric properties of underground equipment. The increase in severe weather events will affect major portions of the electricity networks in different ways. For example, we are already beginning to see an impact on load patterns. Peak loads might change or multiple peaks could occur within a day, resulting in erratic utilisation of energy resources. We saw the occurrences of multiple peaks in parts of the United States during the polar vortex earlier this year.

The solution? A smarter and resilient grid

A smarter, resilient grid could play a major role in adapting to climate change. It could do so in two fundamental ways –the physical approach and the cyber approach. The physical side involves the introduction of new technologies and materials into the grid infrastructure. For example, the application of nanotechnology can create new materials through the manipulation of their atomic structure with better physical properties, making them more robust and more efficient. Equipment made with graphene, a revolutionary and extremely hard material, can make it less vulnerable to extreme weather conditions. In this way, material science can make a significant contribution to grid resilience. So, too, can superconductors, which can not only push more electrons down the wires, but can be used to design better power

EF – Enhanced Fujita Scale (strength of tornado)
HVDC – High Voltage Direct Current.
ICT – Information and Communication Technology
IT – Information Technology
OECD – Office of Economic Cooperation and Development).
VVO – Volt VAr Optimisation

Abbreviations /Acronyms

electronics for HVDC. The grid's adaptation to climate change may also be enhanced by wireless sensor networks, enabling the real-time collection of data in the grid as well as its surroundings.

It's the information that counts

The second key element in a smarter grid is the leveraging of the huge volumes of data collected – the cyber approach. We're talking here about exabytes (one exabyte = one million terabytes or 1018 bytes) of data. The largest producers and consumers of power grid data are the hundreds of millions of sensors and controls embedded in smart devices installed in buildings, substations, generators, transformers and other equipment in the transmission and distribution networks. Then there are the expanding data from the increasing amount of variable renewable generation resources, demand response programmes, and distributed energy resources such as electric cars and energy storage. Grid operators today and more so in the future will have more access to external data sources such as weather agencies, etc. Extracting actionable information from this avalanche of data will help to identify and predict physical phenomena.

Operators will have to keep the lights on while coping with the uncertainty of climate change.

From reactive to predictive operation

This interdependence of the physical and cyber domains is undoubtedly one of the industry's salient challenges. But this coupling could also present opportunities for different ways to operate the grid when faced with severe weather events. Instead of the conventional reactive mode of operation, we are at the beginning of the new age of applying more predictive techniques. Operators will have to keep the lights on while coping with the uncertainty due to climate change.

Self-healing grid

In the case of the tornado that struck Oklahoma in May 2013, it is reported to have rapidly intensified to an EF-5 level tornado in less than half an hour. Grid operators need to be able to simulate such climate-related anomalies and run 'what if' scenarios to better anticipate how the grid reacts and what actions to take. Similarly, in wind farms across Denmark, the wind speed can go from 0 to maximum in 10 minutes. With integrated forecasting technology and ultra-fast computation, the control centre can calculate what will happen in the next five minutes. This capability enables a predictive mode of grid operation – and is indeed a requisite for what has become known as a self-healing grid – that anticipates events and responds to them to mitigate their negative impact on the network. This can help to make the system more resilient.

take note

- The potential impacts of a changing global climate on the power grid infrastructure are serious.
- A smarter, resilient grid could play a major role in adapting to climate change.
- It is predicted that global spending by utilities for smart grid IT systems will more than double in the next ten years.

In distribution systems, Volt VAr Optimisation (VVO) optimises power flow using real-time information and online system modelling. Probably one of the most valuable applications of predictive tools is in asset management. We are now entering what I call the age of 'hybridity'. For at least the next 30 years, power grids, especially in OECD countries, will consist of both old and new devices and equipment. While utilities will have to replace old assets, there are many assets with more than a decade left in their operational lifespan. Smart condition monitoring devices can be integrated into the grid and asset control rooms for analysis and improved grid operation. Interoperability of the old and new devices is a priority.

Conclusion

All this will require a major investment in Information and Communications Technology (ICT) solutions. A particular emphasis will be on advanced grid and asset analytics as well as decision-support systems to harness all the data. The new emerging operational paradigm will require the creation of information flows that allow operators to take appropriate action in real time – or perhaps rather ahead of time. Some applications already exist, but the effort will continue for five to 10 years to come. Navigant Research, a market research and consulting company with special expertise in the energy sector, forecasts that worldwide spending by utilities for smart grid IT systems will more than double in the next 10 years. As the climate changes, the electricity grid will adapt and become more resilient.

Dr Lawrence E Jones joined Alstom Grid Inc in 2000 and is currently Alstom's North America Vice President for Utility Innovations and Infrastructure Resilience and serves on the company's global business development team for Smart Grids and Smart Cities. He is a thought leader and practitioner with over twenty years of experience in the energy industry. His expertise includes the application of smarter technologies in the engineering and operations of cyber-physical infrastructures such as electric power grids and power markets. He also focuses on the integration of renewable energy and distributed energy resources, system resiliency, disruptive and innovative business and regulatory models, strategies for addressing challenges at the food-energy-water nexus, big data and advanced analytics for efficient power grids and markets. Enquiries: Email alstom-grid.press@alstom.com

Reducing spread of fire

South Africa's Minister of Environmental Affairs, Edna Molewa, witnessed (on 19 February 2015) a test to reduce the spread of fire in temporary structures in informal settlements (shack fires). The test was conducted by the Department's **Working on Fire (WoF)** and Eco-Furniture programmes, and other partners, at the Lanquedoc Sport Field in Stellenbosch. Structures were built from the new material and dwellings based on materials commonly used in informal settlements, they were then set alight in order to compare the speed in which they burned and the extent to which fire spreads from them. The project was developed through a process in which the DEA and its partners have been looking at the potential of using invasive alien biomass in the construction of temporary structures while the pressures of formal housing are being addressed. If the new dwelling design and composite fire-boarding prove to be effective, the use of woody invasive alien biomass could play a meaningful role in the reduction of loss of life, property and livelihoods of millions of South African citizens. This would mean that the ongoing clearing of alien invasive timber from water-catchment systems would create not only jobs, but contribute to protecting lives.

Enquiries: Email znqayi@environment.gov.za

Red tides on West Coast

The **Department of Environmental Affairs** has been monitoring the red tide in the West Coast inshore area which appears to be gone. The red tide is no longer covering a big area and there have been no further impacts on marine species. However, sampling of some of the areas is continuing to monitor the extent of the red tide and to look out for any further impact on marine species and the environment.

Water conditions started improving on 15 February 2015. There were no further walk outs or washing up of West Coast Rock Lobsters or dead animals. In the light of the annual walkouts and growing concern with the presence of Harmful Algal Blooms (HABs), also known as red tides, in the upwelling region of the west coast of southern Africa, the Department has proposed a research programme to assess and monitor the formation and impacts of HABs. The department hopes that this will complement existing efforts by the Department of Agriculture, Forestry and Fisheries.

Enquiries: Email znqayi@environment.gov.za

No quick fix to power crisis

Alwyn Smith, spokesman for the **South African Alternative Energy Association (SAAEA)**, says that any fix for South Africa's power crisis will take years.

"We have left it too late. There are few, if any, solutions that could be put in place to turn the situation around in the short term. To be fair, this is not just the fault of Eskom. Eskom has been warning for years that this would happen unless more budget was allocated for maintenance," says Smith.

He believes that widespread net metering could alleviate the load shedding headaches facing businesses and citizens, and could go some way toward easing pressure on the national grid. Net metering allows residential customers and businesses to install solar panels at their premises and store excess power within the grid, in return for 'power credits' when needed. Smith says that South Africa has been slow to move on creating an environment that allows for widespread net metering. He speculates that this is partly due to municipalities' reluctance to give up the profits they make on reselling Eskom power. "Net metering would relieve plenty of the current issues, but now the question is – how to implement it quickly? This is not the sort of thing you can implement overnight. You need the right policies and systems in place. Net metering could be widely adopted quite quickly, and it wouldn't cost the government a cent. And an independent 50 MW solar farm could be put in place in as little as eight or nine months," he points out.

Enquiries: Email alwyn@saaea.org

POWER-GEN Africa and DistribuTECH Africa Conference and Expo Cape Town International Conference Centre from 15 – 17 July 2015.

Pocket the sun's energy

Following the success of the Sungrid Group (In2Brands) 2014 'Switch to Portable Solar Power' campaign, this year sees the launch of Solsave, a global brand with local roots. Ranging from 1 000 – 3 000 Watt, it offers an answer to South Africa's energy crisis across home, office, outdoor and emergency use. "South Africa is looking for solutions," says Ryan Steytler, director of The **Sungrid Group (In2Brands)**. "Whilst we are passionate about portable solar power, consumers also want the comfort of something familiar." The Solsave range comes with both on- and off-grid capability. Solsave offers consumers a full range of alternative energy choices comprising both smaller and heavier portable off-grid power options. Its flagship offering, the Solsave my-powa, a solar power bank making use of the latest Sun Power Cell (SPC) technology, is able to quickly generate power with a world record efficiency panel. A mere 10 hours of direct sunlight provides enough power to charge all essential devices including phone, tablet, camera, MP3 player, eReader, GPS, action cameras and smart watches. "But the real beauty is that for those who choose, Solsave's my-powa can also be charged via a conventional wall plug (USB wall charger) for maximum convenience," says Steytler.

Enquiries: Talana Cole. Tel. 021 447 6849 or email talana@in2brands.co.za

Coega - working towards clean, safe air

Earlier last year, the **Coega Development Corporation (CDC)** identified the need to ensure that the effect of emissions from tenants' activities within the IDZ does not exceed the official ambient air quality standards, or pose a health and/or environmental risk to the region.

Even though the CDC has established air quality monitoring stations on its 11 500 ha land – which encompasses 14 sector-orientated sub-zones – it is making use of the air dispersion model to manage air quality and ensure compliance with National Environmental Management: Air Quality Act (AQA) No 39 of 2004.

A national framework for the AQA is required to achieve objectives and all state organs must give effect to it when acting in terms of the AQA. The norms and standards of the framework are for: Ambient air quality; the control of emissions from source; air quality monitoring; air quality management planning; and air quality information management.

Andrea Shirley, environmental manager at the CDC, said, "A suitable modelling process will give the CDC the ability to determine the effect of proposed activities to assist decision making on the desirability of proposed investors. This will allow the screening of prospective investors to determine the effects of their air emissions on the ambient air quality in the IDZ and surrounding areas."

Shirley adds: "As Coega IDZ landlords we have to ensure that the developers do not exceed pollution levels set nationally. If our tenants are not compliant, we are not compliant with the environmental legislation."

Enquiries: Dr Ayanda Vilakazi. Tel. 041 403 0464 or email ayanda.vilakazi@coega.co.za

Andrea Shirley, Coega Development Corporation's environmental manager.

Solar power from energy-harvesting trees

Scientists at **VTT Technical Research Centre of Finland** have developed a prototype of a tree that harvests solar energy from its surroundings - whether indoors or outdoors - stores it and turns it into electricity to power small devices such as mobile phones, humidifiers, thermometers and LED light bulbs. The technology can also be used to harvest kinetic energy from the environment. The 'leaves' of the tree are flexible, patterned solar panels made using a technique developed by VTT on a printing process. The leaves form an electronic system complete with wiring that conduct energy into a converter that feeds electricity to devices such as mobile phones or sensors analysing the environment. The tree trunk is made with 3D technology by exploiting wood-based biomaterials VTT has developed. VTT's technologies create endless opportunities for applications involving different kinds of electronics regarding lighting and energy harvesting, for example. The more solar panels there are in a tree, the more energy it can harvest.

Enquiries: Matti Tähtinen. Email matti.tahtinen@vtt.fi

Watch the video:http://youtu.be/_QswunfBC8U

First flight into the wild for Cape Vultures

Conservation history was made on 15 February 2015 with the release of ten captive bred parent-raised Cape Vultures at VulPro. These chicks took their first flight into the wild to join the Magaliesberg's Cape Vultures, marking the initiation of a population recovery plan which has taken years of preparation.

Seven captive bred Cape Vultures from **VulPro** and three from the National Zoological Gardens were released into VulPro's open-top enclosure, located adjacent to the rehabilitation enclosure in which they are currently housed. Moving birds to the open-top enclosure allows them to 'release' themselves when they feel ready to leave. The birds can either remain inside the safety of this enclosure or join the wild vultures feeding at the vulture restaurant adjacent to the captive breeding enclosure where the VulPro vultures were raised. Each vulture is fitted with a tracking device on to its back to monitor their movements with locality readings, altitude, speed, temperature and direction every 15 minutes. In addition, each bird is fitted with wing tags on both wings for visual re-sightings. These tags have been especially designed in Spain and are far superior to the current tags used in South Africa. They can be read from both the top and underneath surfaces of the birds' wings and do not fade as the writing has been cut out instead of laser printed. Vulpro is appealing to all members of the public to please report tagged re-sightings as this data is extremely important to the success of this release project.

Enquiries: Kerri Wolter. Email kerri.wolter@gmail.com

VulPro, a vulture conservation programme in South Africa's North-West Province's Magaliesberg Mountains, is located within 100 km of two active and one extinct Cape Vulture breeding colonies.

An entire generation at risk

Consulting Engineers South Africa's (CESA) President, Abe Thela, recently presented his presidential message for the year at a function held in Johannesburg. With the theme of 'Meeting Socio-Economic Challenges through Sustained Infrastructure Investment' Thela stated that in 2015 CESA will focus on the role infrastructure plays in the socio-economic development of our country and how this role can be enhanced through an increase in infrastructure investment and skills development.

Too few employed

The National Planning Commission identified the two most pressing challenges facing the country as being:

- Too few South Africans are employed and that the quality of education for poor black South Africans is sub-standard
- The unemployment rate is estimated at 25,4%; 50 % of unemployed South Africans are youths between the ages of 15 and 24 years. This figure escalates to 63 % if the discouraged young job-seekers are added to the statistics.

Increasing infrastructure investment

According to the NDP South Africa will need to spend at least 30 % of its GDP on infrastructure development to allow infrastructure to have a meaningful contribution in eradicating poverty, halving the unemployment rate and contributing to economic growth to the desired level of between 5 and 7 % per annum by 2030.

In order for South Africa to address its socio economic challenges, both public and private sectors will have to increase their spending on infrastructure with the public sector needing to increase more.

Leveraging private sector resources

The use of the Public-Private Partnerships (PPPs) in the financing, design, building and operation of infrastructure has emerged as the most important model employed by governments around the world to close the infrastructure gap. South Africa has not yet realised the full potential of this model of infrastructure delivery. Many opportunities exist in various economic sectors such as renewable energy, transportation, water, alternative energy sources, education, etc where the PPP model can be used to maintain the momentum of infrastructure development in the country.

Addressing inefficiencies in the procurement system

Inefficiencies in the way public-sector infrastructure projects are implemented needs to be addressed. These rob South Africa of multiple billions of Rand annually, which could be effectively used to fund the much-needed increase in infrastructure investment

Improving investment credit rating

In November 2014 Moody's Rating Agency downgraded South Africa's 'investment grade' credit rating to Baa2 from Baa1 and adjusted the outlook to stable from negative. It is crucial for the country to improve its investment grade rating to continue to access credit from both local and foreign lenders at favourable interest-rates. Unfavourably high interest-rates on loans reduce the value of the loans and accordingly the amount spent on infrastructure.

Human capital development

The increase in infrastructure investment will require more engineers, technicians and artisans to implement new infrastructure projects and maintain the existing infrastructure. The availability of skills is one of the elements that investors consider with the level of skills determining the country's productivity and competitiveness. The concerns are: Poor quality of basic education including maths and science; youth unemployed and unemployable; structure of the education system; youth with qualifications but without experience.

Thela believes that, "Failure to tackle these challenges decisively with a systematic approach will deprive a whole generation of opportunities to develop their potential, escape poverty and support the country's trajectory toward inclusive growth and economic transformation.

Enquiries: Wally Mayne (CEO), Consulting Engineers South Africa (CESA). Tel. 011 463 2022 or email wally@cesa.co.za or Dennis Ndaba, CESA Media Liaison. Tel. 011 463 2022 or email dennis@cesa.co.za

Dennis Ndaba (CESA media liaison), Olu Soluade (CESA board member), Abe Thela (CESA President) and Wallace Mayne (CESA chief executive officer).

New remote, simultaneous, recordable wireless test tool system

The **Comtest Group**, Fluke's authorised Test and Measurement distributor for South and southern Africa, has introduced Fluke CNX, a customisable, troubleshooting tool-set of wireless test tools that work together, recording live measurements remotely and simultaneously on a single screen. CNX Modules measure ac voltage, temperature and ac current with a standard clamp or flex clamp. Possible applications include:

- Detection of power interruptions
- Single phase measurement
- Determining current imbalance
- Measurement of incoming current

A wireless multimeter displays readings from up to three wireless modules, plus the meter measurement at the same time, on the same screen, from as far as 20 metres away. To get a holistic overview of the situation, readings from 10 tools measurements can be reviewed simultaneously on PC View. Users are able to mix and match the wireless-enabled modules to suit their unique measurement needs.

The CNX system can record up to 65,000 sets of min/max/avg readings in either single or multiple logging sessions. CNX isolates intermittent events or records signal fluctuations automatically, using the module's log function. Measurements can be viewed in a location separate from the point of measurement, for safety purposes, as well as be viewed repeatedly from either remote locations or on-site.

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

Crane motor protection

Hard-working crane motors are designed for specific duty cycles, generally of short duration and in harsh environments. **NewElec**'s 330M crane motor protection relay is uniquely designed for each motor, providing overload, phase loss and phase unbalance protection. A motor thermal indicator meter can be fitted inside the crane operator's cabin as a working aid to ensure that the crane is never operated beyond its loading limits. The protection relay is selected to suit the CDF of the protected motor and provides accurate overload and unbalance protection on full RMS loading. Latched trip LEDs indicate overload and unbalance detection and trip, with a separate trip and thermal lock-out period in process indication. Available for chassis or flush door mount, the relay has a test facility and may be fitted with a manual or automatic reset facility. A thermal trip state indicator is also available as an extra option.

Enquiries: Email sales@newelec.co.za

Anti-rust coating seals in savings

The easy-to-apply and environmentally-friendly RustPrufe corrosion protection solution for non-porous surfaces eliminates the need to repair damage to steel surfaces occurring during extended storage periods or shipping and handling. The solution is ideal for industrial and mining applications, and is available through wear control specialist, **Filter Focus**. Chief operations officer Craig FitzGerald notes that RustPrufe is a painted or sprayed-on acrylic polymer emulsion that dries to form a seamless, skin-tight weather and UV-resistant protective barrier. "Items such as valves, gears, shafts, and motors are often subjected to harsh climatic conditions, and RustPrufe is the most convenient, cost-effective and user-friendly option to ensure that these costly components are not damaged in transit," he explains. FitzGerald points out that the components do not have to be sanded down or rust treated. "Upon application, the product is peeled off by hand to reveal a clean and rust-free surface. As a result, cost savings during routine maintenance and repair shutdowns are tremendous."

Unlike traditional tape, wax and oil coatings that must be scraped off and cleaned with solvents, RustPrufe does not leave behind a residue. It is also highly-durable and, should tears or perforations appear, they can be closed by applying the coating to the exposed area with a paintbrush.

Enquiries: Craig FitzGerald. Tel. 011 315 9939 or email cfitz@filterfocus.co.za

Bizz Buzz

Mecosa moves offices

Mecosa has moved to OMSA House, corner Rabie and Aimee Streets, Fontainebleau, Randburg.

Enquiries: Henning Springer. Tel. 011 257-6100 or email measure@mecosa.co.za

Master Power Technologies invests in Kenya

As part of its plan for growth in Africa, **Master Power Technologies**, power solution and data centre specialist, has opened an office in Kenya in order to better service East Africa. Situated in Nairobi this forms yet another step in the expansion of Master Power's presence in the region so that clients can have easy access to the quality products and technical expertise Master Power has to offer. Offices in Kitwe and Lusaka in Zambia were recently opened with further African countries earmarked to benefit from a direct Master Power presence. The Kenyan team is being led by Babeksingh Khalsa who is the regional manager for East Africa.

Enquiries: Neill Schreiber. Tel. 011 792 7230 or email neill@kva.co.za

BMG acquires Klep Valves

BMG – Bearing Man Group - part of Invicta Holdings, has extended its operations in the fluid technology sector, with the recent acquisition of Klep Valves. "This strategic acquisition follows an 18 month period where Klep Valves supported BMG in our expansion into the dynamic valves sector," says Gavin Pelser, managing director, BMG. Klep Valves, which forms part of BMG's Fluid Technology division, will retain its manufacturing facility in Krugersdorp under the BMG banner.

Enquiries: Veronique van Niekerk. Tel. 031 576 6221 or email veroniquev@bmgworld.net

1 000th TPKL fluid coupling drive

Drive systems specialist **Voith** has celebrated the manufacture of its 1 000th TPKL fluid coupling, which is currently being shipped to China for use on a 6,4 MW underground belt conveyor drive at a coal mine.

The 3 160 m belt conveyor is designed for demanding workloads, and will transport coal uphill at a 14° angle. It is driven by four 1 600 kW motors, with a planned capacity of 4 000 tons per hour.

German-based Voith began production of the TPKL range in 1997 for demanding belt conveyor applications in mining. The coupling provides excellent torque limitation for a smooth start-up of the belt conveyor, while allowing active load sharing with multi-motor drives.

Given its rugged design and proven performance, the TPKL fluid coupling is ideally-suited to the harsh African mining sector, which continues to experience substantial growth year-on-year.

The TPKL is rich in benefits that ultimately speak to the key business drivers of any major operation and this is where Voith delivers exceptional value.

These business drivers include measures such as safety, availability, reliability, production rates and reduced total cost of operation. Further peace of mind comes from the fact that we have a qualified service team that can provide on-site support to our customers around the clock," says Grant Robinson – Voith vice president for EMEA Division – Mining and Metals Southern Africa.

Founded in 1867, Voith employs more than 39,000 people, generates € 5.3 billion in sales, operates in about 50 countries around the world and is today one of the largest family-owned companies in Europe.

Enquiries: Email Terry.Mcintosh@voith.com

PMPT enclosure solution

NewElec's Planar Modular Production Technology (PMPT) enclosure manufacturing facility, based at its head office in Pretoria, provides the ideal solution for producing fast, bespoke, plastic housings for electronic components. The process, with no need for tools or moulds, is cost effective. Prototyping and small to medium runs are all possible. NewElec's technical consultant is in regular contact with the client to ensure immediate reaction to any alterations during the process. This results in a perfectly designed product which meets production deadline and estimated cost factors.

The basis of the production is the specially developed PMPT. Using computer-controlled manufacturing equipment, the plastic sheets (ABS, PS, acrylic etc.) are machined and chemically welded. For these exclusively milled enclosures, all housing elements are completed with either holes, slits, push-outs, depressions (e.g. keypads) or fasteners as required. All enclosures are delivered ready to install the relevant components with no need for adjustments.

Enquiries: Email sales@newelec.co.za

Power crisis negatively affecting precious metals sector

Load shedding and the impact of the ongoing power crisis on South Africa's mining and metal extracting sectors featured high on the agenda during the **2015 Africa Mining Indaba**. Industry leaders, including periphery players such as precious metal refiners, are worried and are hoping for a sustainable solution.

As South Africans were subjected to another week of load shedding and insecure energy supply, the 20th Investing in Africa Mining Indaba opened its doors to over 7 000 business leaders, investors, mining experts, and politicians from all corners of the planet.

Bernard Stern, chief executive officer and co-founder of Metal Concentrators (MetCon), South Africa's largest independent precious metal refinery, said that various speakers voiced their worries with regards to Africa's overall energy shortages and the impact of this on mining activities.

Figures by the World Bank for instance showed that 1 to 3 Gigawatts (GW) of electricity is installed in Africa each year. Stern says that this is a fraction of the 6 – 7 GW of newly installed power capacity the continent needs per annum in order to achieve universal access to electricity by the year 2030.

"Investors are worried, and a big concern among them has to do with power," said Credit Suisse mining analyst Justin Froneman during the Mining Indaba's first day. "There is a dire need to grow mining production across Africa, but this requires more energy. The question is where this power base comes from."

The situation in South Africa particularly, was a hot discussion topic during the event. Last week Eskom confessed how 37 % of its installed generating capacity of 42.000 MW was offline last Thursday. This resulted in rolling blackouts across the country. "Over the past years South Africa's natural resource output has dropped. Gold was no exception," says Stern. "According to recent statistics by the Chamber of Mines, our country's gold production fell by over 50 % over the last eight years, from 226 105 kg of fine gold in 2007 to 146 473 kg in 2013."

Whilst there are many reasons to which this decline can be attributed, energy insecurity is undoubtedly one of the most important culprits. "In January 2008 alone, the month which heralded the start of our power crisis, gold production in South Africa fell by 16,5 %," Stern said. "South Africa's gold output drop for the entire first quarter of 2008 declined by 17 % compared to the same period the year before. This can be directly attributed to our energy problems."

Whilst load shedding slowly subsided and stayed away for a while, it reared its ugly head last month. "It is important to realise that the energy crisis has never gone away, and that it won't go away anytime soon," Stern said.

He added that although the energy crisis has hit gold producers and other mining companies in particular, periphery players are equally concerned. "We need power, whether it is to produce gold, refine it or to turn it into for instance jewellery, Kruger Rands or Minted gold bars," he said. "During the past few months we have had at least ten incidents of load shedding. Our timeous investment into a diesel generator has rescued our productivity, albeit at a substantial cost. It is crucial for Eskom and the Department of Energy to find a sustainable solution to ensure the future of gold mining and the subsequent beneficiation of our precious metals. South Africa's natural resource industry as well as upstream and downstream operations are massive drivers of the economy and important job creators too. If mining has a hard time, everyone else has a hard time too."

The nuclear deal with Russia might be controversial, but is good news in terms of energy security, Stern says, explaining that it will, in the long run provide South Africa with a stable supply of energy. "The problem is that it will take many years before these new power plants will start pumping energy into the energy grid," he stressed. "We need something in the interim to keep our country's economy going."

Enquiries: Tel. 021 413 7500 or email kisha@tincan.co.za

PneuDrive Challenge 2014 – prizegiving

Prizegiving for the 2014 engineering design competition, sponsored by SEW-Eurodrive and Pneumax, took place at the Modderfontein premises of 'Set Point Group' on 27 January 2015. The PneuDrive Challenge provides a learning platform that allows mechanical, electronic and mechatronic engineering students to participate in an experience that attempts to combine academic potential and the real needs of business. It aims to give students one tool, one new idea, one new experience that will turn around their perceptions and understanding of how they can use drive and pneumatic engineering principles to influence the warehousing and logistics industry. We met the winners, runners up and other participants.

First place
Stellenbosch University – MOVIPAL

Jos Van der Westhuizen
Stefan Nel
Landolf Theron
Dr Cobus Muller (Lecturer)

Second place
Nelson Mandela Metropolitan University – TetraStack

Adriane Bestic
Shuldham Peard
Christopher Sephton

Third place
WITS University – The Out-of-the-Box-Palletiser

Eitan Kassuto
Gareth Krisch

PneuDrive Challenge 2014 – prizegiving (continued)

Wits University (entrants)

Nicholas Stiekema
Lior Sinai

Tshwane University of Technology (entrants)

Sias Ernard Bouwer
Pria Reddy
Nelson Martins

'Schneider is On'

In 2014, Schneider Electric's company programme 'Connect' reached its conclusion. It achieved strong service growth and high supply chain efficiency. Additionally, the technology portfolio was strengthened and capabilities in software, targeted segments and key geographies enhanced. The new company programme for 2015 – 2020 'Schneider is On' – was launched at the company's Investor Day in February.

* * *

Publication editors were given an opportunity to meet top executives at Schneider Electric's new state-of-the-art building – Midrand Schneider Electric Campus (MSEC) – on 10 February 2015.

Schneider Electric: Country president: Southern Africa, Eric Leger; chairman and chief executive officer, Jean-Pascal Tricoire; and senior vice-president for Africa and the Caribbean, Mohamed Saad.

CLIPBOARD APPOINTMENTS

ifm electronic, head office, Centurion

Francois Gey Van Pittius, sales manager

Lourika Wiesner, promoted to finance coordinator

Cornel Swart, field sales engineer

Albert Louw, product specialist – mobile control systems

Hytec Group

Roland Keller, deputy chief executive officer

Andrew Castle, chief finance officer

Eaton – Power Quality Division, Johannesburg

Michelle Hart, power quality manager

Gina De Abreu, distribution manager, IT division

Aurecon

Giam Swiegers, global chief executive officer

SEW Eurodrive

Francois Sieberhagen, Port Elizabeth branch manager

Experian SA

Michelle Beetar, managing director

Legrand

Shavahn Fareed, sales and business developer, KwaZulu-Natal

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Practices in Lightning Safety and Lightning Protection of Structures and Systems

27 March 2015, Centurion, Gauteng, South Africa

Enquiries: Tel. 012 663 4804 or email learning@gafrica.com

• • •

Domestic Use of Energy (DUE) – Towards sustainable energy solutions for the developing world

30 March – 1 April 2015, Cape University of Technology

Enquiries: Email due@cput.ac.za

• • •

Hygienic design of food processing plants

21 – 22 April 2015 (Johannesburg)

Enquiries: Email andrew.murray@mweb.co.za

Africa Automation Fair 2015

5 – 7 May 2015, The Dome, Northriding, Johannesburg

Enquiries: www.africaautomationfair.com

• • •

15th annual African Utility Week and Clean Power Africa conference

12 - 14 May 2015, International Convention Centre, Cape Town

Enquiries: Email nevenka.ristic@spintelligent.com

• • •

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20 – 22 May 2015,

Gallagher Convention Centre,

Midrand, Johannesburg

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