03/2017

ELECTRICITY + CONTROL

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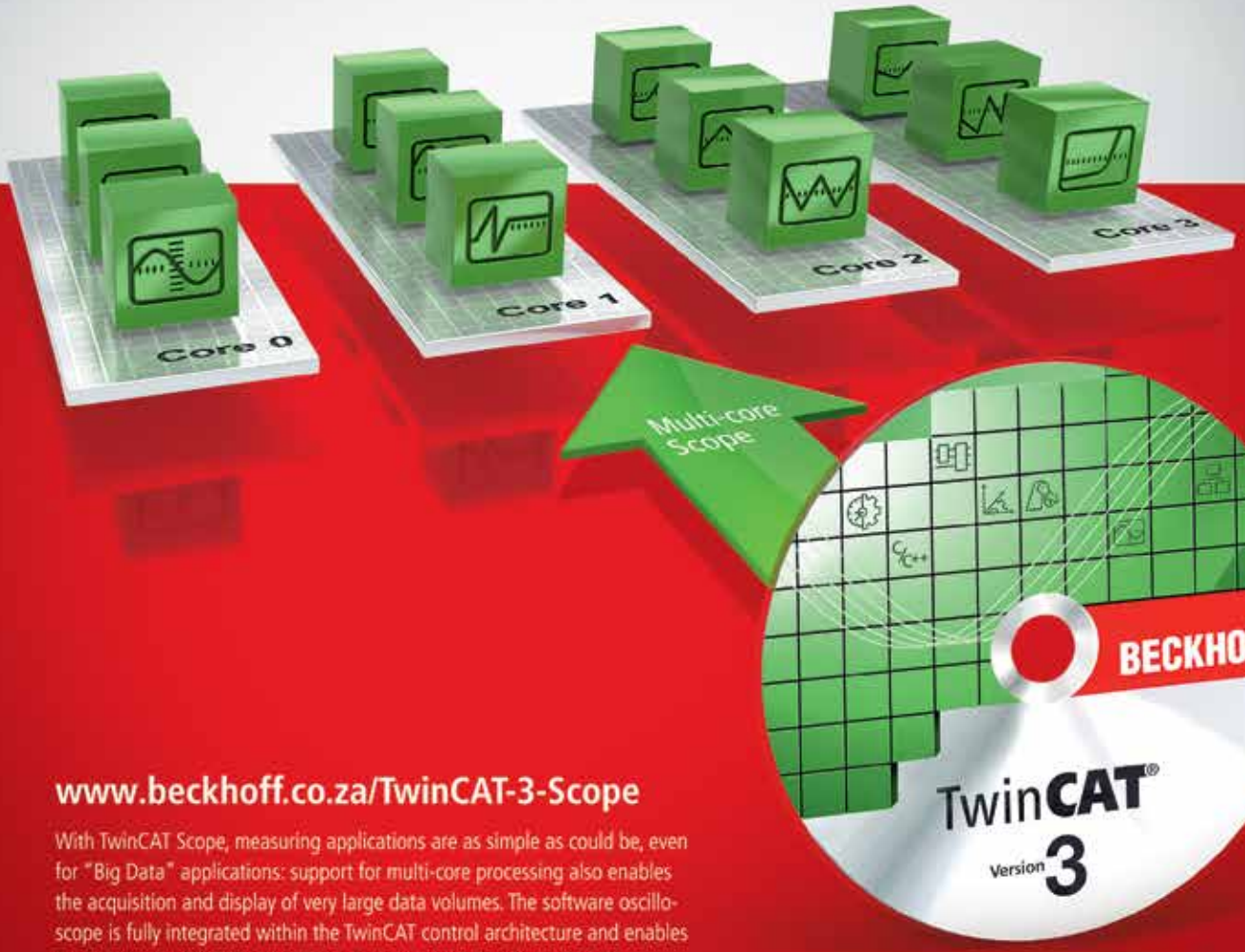
FEATURES:

- Control systems + automation
- Hazardous areas + safety
- Plant maintenance, test + measurement
- Temperature measurement
- Drives, motors + switchgear

CROWN PUBLICATIONS

Multi-core oscilloscope for Big Data: TwinCAT 3 Scope.



www.beckhoff.co.za/TwinCAT-3-Scope

With TwinCAT Scope, measuring applications are as simple as could be, even for "Big Data" applications: support for multi-core processing also enables the acquisition and display of very large data volumes. The software oscilloscope is fully integrated within the TwinCAT control architecture and enables the simple graphical display of signal curves using the charting tool.

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New Automation Technology **BECKHOFF**

I have just spent a few days in the midst of a tropical storm. Classic stuff: strong winds in one direction; lots of rain – then clam. Strong winds in the opposite direction; lots of rain. How quickly it all changed.

The area I was in had been as dry as can be before the storm. And the storm was wonderful – notwithstanding the havoc it wreaked in other areas.

The point I pondered was how rapidly things can change. One day the world has a certain meaning; the next it is different.

The State of the Nation Address (SONA) was, to me, an event that could have made such change happen – but it did not live up to that: Not in the sense that remarkable things were not said (some truly remarkable things were said); but in the sense that no one expected anything different. There was no surprise; no 'ah-ha' moment that could have filled the nation with a sense of opportunity and excitement.

We seem to miss some incredible opportunities – and our focus (as individuals, and industry, and indeed as a nation) seems to be on the short term and (presumably) issues that have a very local or personal flavour; rather than those of the State and the Nation. And the Economy.

There is nothing wrong with any of that, of course. It is just that the big picture is far more likely to produce a better outcome for everybody.

In this regard, I again reflect on the massive opportunities that this continent offers – and the fact that some pundits predict that both Nigeria and South Africa will be in the top thirty international economies in the year 2050. Probably not a bad place to be.

The world then, will be very different. Now that does not just happen – but it is opportune for all of us to reflect on what it is we can do to be part of the ongoing emergence of this Continent.

It is equally incumbent on lawmakers to look that far ahead, and try to predict what it is that we need to do to reach that goal.

My suspicion is that the energy (in the traditional big-grid as well as the micro-grid and off-grid sense) automation, mechanisation, beneficiation, and some others will see many elements of African industry leap-frogging the rest of the world.

Can it be done? Well of course it can. The key issue has always been the investment in existing infrastructure as an impediment to the Will to change – and we have some of that; but generally this is the Continent where massive (unparalleled) urbanisation will see the emergence of entrepreneurs and opportunities to invest in a brand new kit – optimising process efficiency and establishing what could well become international benchmarks in a variety of industries.

Why not?

My sense, in particular after watching a bit of the SONA, is how little governments really do in terms of game-changing ideas and opportunities. It is the common people that make the change. To be blunt, it is all of us, in industry, that can (dare we say, in spite of the assistance of law makers) actually make a difference, revolutionise our industry – and effectively shoot the lights out.

I suspect we are nearing a state when this momentum will build – and it is private industry that engages to carve out the future success of this Continent.

I look forward to seeing that happen.

Ian

Ian Jandrell

Pr Eng, BSc (Eng) GDE PhD,
FSAIEE SMIEEE

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Cover

To mitigate problems such as higher utility bills, low power factor and harmonic distortion **Schneider**'s PFC solutions can assist in lowering utility power bills by 5 to 10%. *Read more on page 13.*

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Pumping Station Optimisation

Saves Energy, Reduces Leaks, Reduces TCO

Detlef Koffke, Mitsubishi Electric Europe B.V., Factory Automation

Innovative software-driven process optimisation upgrades the water treatment and supply system in Samara, Russia.

An upgrade of the water treatment and water supply system in Samara, Russia, has seen the implementation of innovative software-driven process optimisation built on Mitsubishi Electric's (further referred to as 'the company') MAPS (Mitsubishi Adroit Process Software) SCADA. The optimisation and control solution implemented across 37 boosting pumping stations has improved operational efficiencies, reduced leaks and reduced Total Cost of Ownership (TCO).

Samara is the sixth largest city in Russia. Situated in the south-eastern part of Russia, it is home to a population in excess of a million people, and is an important social, political, economic, industrial and cultural centre. Water treatment and supply services, as well as wastewater treatment services fall under the provenance of Samara Municipal Systems. In 2015 the company began a huge refurbishment programme on 37 boosting pump stations. While replacing obsolete or worn-out control equipment with modern, energy-efficient products was an important aspect of the upgrade, the primary focus was on true optimisation of the water supply system.

Goal

The goal of this optimisation was to highlight hidden operational inefficiencies, and enable excessive water pressure at the consumer side to be eliminated – while ensuring maximum efficiency of pump operation and enabling optimal pump selection. To achieve this, Samara Municipal Services implemented Aquatoria, a software solution (further referred to as 'the software solution') developed especially for the water industry and built on the MAPS SCADA package.

Suite of integrated modules

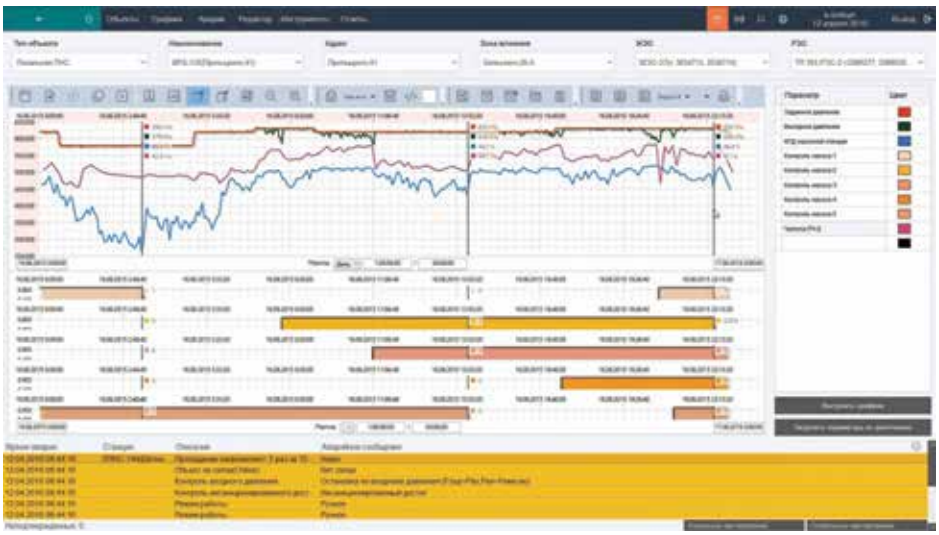
Delivering a suite of integrated modules for MAPS that are dedicated to water supply control system optimisation, the software solution provides application configuration to reduce TCO of the control system, adaptive control to save energy, analytical reports to help reduce leaks, a pump selection tool to drive energy savings and increase pump lifetime, a OEE module and a process analysis tool with a visual process monitor to save energy and reduce leaks.

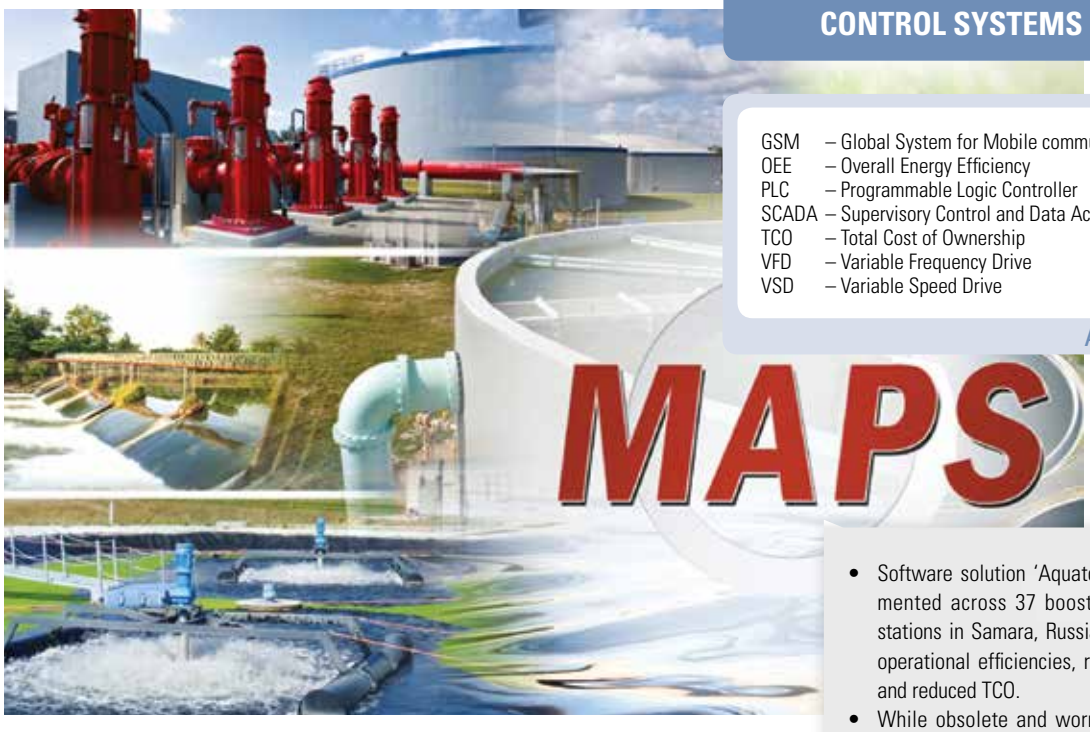
Excessive water pressure

Having refurbished the 37 pumping stations to put the various pumps under the control of Variable Speed Drives (VSDs), implementation of the software solution was carried out to optimise the processes. A particular problem that had been highlighted was excessive water pressure at the consumer side. This impacted on energy consumption, but the high water pressure also meant the supply system was prone to considerable water loss and leakage.

VSDs make pressure decrease possible

Eliminating the need for individual pressure meters all over the city to measure consumer side water pressure and ensure that it does not exceed upper limits, the software solution provides virtual pressure meter software algorithms to optimise pressure. With the VSDs in the pumping station cabinets enabling effective pressure adjustment, the solution made further pressure decrease possible. This helped to reduce the likelihood of leaks, unsustainable water usage and energy consumption, while maintaining even flow and pressure during times of high demand. Further optimisation was gained using the software solution by engaging the pump efficiency monitoring algorithm. This estimates the efficiency of VFD driven pumps, and switches off pumps when their efficiency drops below pre-set levels, further improving energy efficiency.





GSM – Global System for Mobile communications
OEE – Overall Energy Efficiency
PLC – Programmable Logic Controller
SCADA – Supervisory Control and Data Acquisition
TCO – Total Cost of Ownership
VFD – Variable Frequency Drive
VSD – Variable Speed Drive

Abbreviations/Acronyms

take note

- Software solution 'Aquatoria' – implemented across 37 boosting pumping stations in Samara, Russia – improved operational efficiencies, reduced leaks and reduced TCO.
- While obsolete and worn out control equipment was replaced, the focus was on the optimisation of the water supply system.
- The impressive results included a decrease of 51% in total power consumption and an 8% reduction in emergency call-outs.

Improved SCADA implementation

Addressing the shortcomings of traditional PLC-SCADA integration tools, MAPS has been designed to offer value throughout the design, engineering and operational phases of a project. Providing a standards-based approach to projects for simpler implementation, it also integrates a number of program modules specifically tailored to the water industry. Important for Samara Municipal Systems had been that the software solution could be easily integrated and adapted by local systems integrators. This offers assurance of simple operations and maintenance through the lifecycle of the plant, with significantly reduced reliance on outside engineering support.

> *This software solution identifies inefficient operation of equipment and highlights impending equipment failure.*

The software solution makes it easy for operators to edit the parameters and configuration of installed pumping- and other control equipment, reducing training requirements.

An optimisation software module is used to control the pressure in the water distribution system the software solution identifies inefficient operation of equipment and highlights impending equipment failure, giving staff time to rectify issues before they become real problems. An interactive map view helps engineers to respond quickly and efficiently when operational problems are highlighted at remote locations.

Operational data

Water supply and treatment plants generate more operational data than can be manually analysed for plant optimisation. The software solution performs continuous data analysis in the background, generating meaningful analytical reports and alerting staff when process performance begins to drift significantly from operational norms.

Asset monitoring and diagnostics

Finally, an asset monitoring and diagnostics module with GSM communications simplifies maintenance of complex distributed systems. Data collected within the company's FX3U PLC is time-stamped and then transmitted over GSM telemetry protocol. The GSM communications also makes remote access of the PLC possible, enabling deep diagnostics to be performed through the company's GX Works software.

Conclusion

With the upgrade complete, the performance and energy consumption of the 37 pumping stations were monitored closely over the first four months of 2016 to see the effectiveness of the VSD installation in combination with the implementation of the adaptive control algorithm. Total power consumption was reduced by 631 660 kW in 2016, a decrease of over 51%. Also notable was the fact that reducing the outlet pressure led to an 8% fall in emergency call-outs while improving overall operational effectiveness thanks to the full and reliable information on the process parameters.

Beyond decreasing overall energy consumption, implementation of the software solution has created preconditions for business process optimisation. Samara Municipal Systems can now make the most efficient use of its workforce and provide effective evaluation of operations based on 'water supply per person' considerations. These criteria are based on both energy efficiency data and water leakage information, and reflect the complex approach to efficiency estimation.

Detlef Koffke is Manager for the Water Industry Sector at Mitsubishi Electric Europe BV Factory Automation – European Business Group. Detlef has worked for Mitsubishi Electric in various positions including Marketing, Indirect Sales and Key Accounts since 1988. This, with his experience from previous roles in other global companies, has allowed him to gain a considerable understanding and comprehensive knowledge of the water and waste water industry sector. In his current role Detlef focuses on introducing innovative solutions and services for the water industry developed by Mitsubishi Electric. Enquiries: Adroit Technologies. Email SamanthaB@adroit.co.za

Dozens of frame profiles and mortise and tenon joints that differ in shape, size and execution can be manufactured with the CNC-800A3.

Automated Manufacturing of Mortise and Tenon Joints

Information provided by Beckhoff

Control platform solution in the automatic manufacturing of mortise and tenon joints.

The mortise and tenon joint represents a stable wood joining technique and forms the core of classic furniture manufacturing and a legacy of centuries-old Chinese craftsmanship. Although it is both extremely stable and aesthetically pleasing, this type of joint is complex to manufacture and cannot compete in terms of price with industrially manufactured furniture. Based in the city of Nantong, China, Nantong Guoquan Woodworking Machinery Manufacturing has found a solution in Beckhoff CNC: the PC- and EtherCAT-based control platform controls the automatic manufacturing of mortise and tenon joints and provides a bright future for the traditional wood joining technique.

Mortise and tenon joints can be used to manufacture stable framework constructions that serve as the basic 'skeleton' in traditional joinery, for example in the manufacture of solid-wood furniture, windows or doors. A mortise is milled in the frame piece, and the mating part is given a tenon, which fits precisely inside the mortise. The result is an extremely stable wood joint that is capable of bearing heavy loads and ideally accommodates the properties of the wood, for example, shrinkage in dry conditions. In modern mass-production of furniture, this craftsman's technique has for the most part been displaced by board construction methods and machine-manufactured connections such as dowels, screws or adhesives. However, more customers today value the durability and aesthetics of solid-wood furniture made using more traditional methods.

In order to serve this market niche, Nantong Guoquan Woodworking Machinery Manufacturing has developed the CNC-800A3 machines, fully-optimised for the automated manufacturing of mortise and tenon joints. The basis for the control platform is the TwinCAT NC I software. The geometries of the mortise and tenon joint to be processed are programmed via G-code, which is automatically generated by the CAD/CAM software. This makes the operation much simpler and more flexible. Dozens of frame profiles and mortise and tenon joints that differ in shape size and execution can be produced quickly and with high precision.

The frame pieces are fixed on the machine and machined through three-dimensional interpolation of the X and Y axes and the Z-motion of the machining spindle. The machining accuracy is within 0,1 mm. Li Jiawang, electrical engineer at Nantong Guoquan Woodworking Machinery, says: "We chose the TwinCAT NC I software from Beckhoff because it can execute various programs for non-standard tenons, which has greatly simplified our development. We can react quickly to individual customer needs. Such flexibility was impossible with our previous PLC."

> *'The software-based CNC controller from Beckhoff has taken us to the pole position in the woodworking industry'.*

Embedded PC as a compact and powerful control platform

The CX5120 controller with TwinCAT NC I can not only execute interpolation movements, it can also control the positioning drives for the feeding or discharging of the materials. Apart from the execution of PLC and motion control, the performance of the 1,46 GHz IntelR Atom processor also enables the operation of the visualisation (HMI) and CAD/CAM software on one device. In addition, customer-specific applications such as viewing programs run on the same platform.

Optimised vertical communication

"Many Chinese furniture manufacturers see the advantages of the central management of production data. For example, CAD files can be downloaded directly from a central company platforms to the machine," Li Jiawang stresses and adds: "In view of the various interface standards of the MES or ERP systems and different requirements for

CAD	– Computer Aided Design
CAM	– Computer Aided Manufacturing
CNC	– Computer Numerical Control
ERP	– Enterprise Resource Planning
HMI	– Human Machine Interface
MES	– Manufacturing Execution Systems
PC	– Personal Computer
PLC	– Programmable Logic Controller

Abbreviations/Acronyms

The classic mortise and tenon joints used in the manufacturing of solid-wood furniture, windows and doors can be produced economically and with a precise fit by the CNC machines from Nantong Guoquan Woodworking Machinery.

View inside the control cabinet of the CNC-800A3 with the CX5120 Embedded PC as the central control platform.

data acquisition from individual companies, we have developed a database on the basis of Visual Basic .NET, in which all necessary machine states and production data are saved. Through the standardised connection of the customers' MES/ERP platforms to these databases, customers have the option to transfer any data across company hierarchies from and to the machine by means of simple reading or writing access. A further advantage of the PC-based machine control platform is the possibility of remote maintenance. With remote diagnostics and maintenance, service technicians no longer have to visit the customer on-site, which saves valuable time and labour costs."

Conclusion

Chen Guoquan, chairman of the board of directors at Nantong Guoquan Woodworking Machinery Manufacturing Co., Ltd. explains: "The software-based CNC controller from Beckhoff has taken us to the pole position in the woodworking industry. We are continually developing new machine models and are convinced that we will experience strong growth in the sales of CNC machines with Beckhoff platforms in 2016."

take note

- The Mortise and Tenon joint is complex to manufacture.
- Making use of the 'Beckhoff' CNC: the PC and Ether-CAT control platform using TwinCAT NCI software has simplified the process.
- The software can execute various programs for non-standard Tenons.

Enquiries: Beckhoff Automation.
Email kennethm@beckhoff.com

The **Smart Factory** is Here

Insights from the experts at Banner Engineering; supplied by RET Automation Controls

Smart factories are an important part of the Internet of Things (IoT).

The term IoT describes the technologies that connect objects- from consumer electronics to industrial components to the internet. Meanwhile, the Industrial Internet of Things (or IIoT) refers specifically to the impact of this innovation on industrial applications. IoT/IIoT technologies together create 'smart' networks. For example, the wireless technologies of a smart home connect homeowners to almost anything in the house from their garage door to their refrigerator and allow remote access via smart phone.

Similarly, a smart factory provides plant managers with remote access to wirelessly-connected machines as well as access to a wealth of data on the operation of those machines by automating the communication between industrial automation equipment and systems. Data availability is one of the hallmarks of IIoT because it allows businesses to leverage data more meaningfully, including enabling predictive maintenance for machines.

Top capabilities of Smart Factories

Three key capabilities of smart factories are: Remote Monitoring, Predictive Maintenance, and Process Optimisation:

Remote Monitoring

Visibility into the operational status of machine components (both historically and in real-time) allows plant managers to remotely monitor and diagnose systems quickly as well as identify and resolve problems before the impact on machine availability and productivity compounds.

For example, tower lights with wireless communication allow operators to remotely monitor machine performance without lengthy and expensive cable runs. The lights indicate machine status visually while updates are also transmitted over a secure wireless network to a remote device, triggering an action or prompting a response from an operator at a workstation away from the machine. The data logged by these devices can also be used in OEE (Overall Equipment Effectiveness) calculations. Not only can operators respond to alerts quickly as they occur, but historical data can be used to track machine uptime, production volume, rejected parts, and other key metrics.

Predictive Maintenance

Predictive analytics allows for more accurate planning of machine maintenance, which can help reduce machine downtime, increase Mean Time Between Failures (MTBFs), and reduce costs of un-

OEE – Overall Equipment Effectiveness
MTBF – Mean Time Between Failures
IoT – Internet of Things
IIoT – Industrial Internet of Things

Abbreviations/Acronyms

necessary preventative maintenance and spare parts inventory. With predictive maintenance, much of the guesswork is removed because maintenance decisions can be made based on the historical and real-time data from the machine itself. For example, wireless vibration and temperature sensors like the QM42VT Series from Banner can detect signs of misaligned, loose or worn parts on a machine.

The wireless sensors then transmit that information to a wireless controller that makes data available immediately (via text or email alerts) and for long term analysis.

By monitoring machine components in real-time for increases in vibration and temperature, problems can be detected and resolved before they become too severe and cause additional damage or result in unplanned downtime. Over time, the historical data creates a valuable machine performance log that can be used to make more informed maintenance decisions down the line.

> *IoT and IIoT technologies – together – create 'smart' networks.*

Process Optimisation

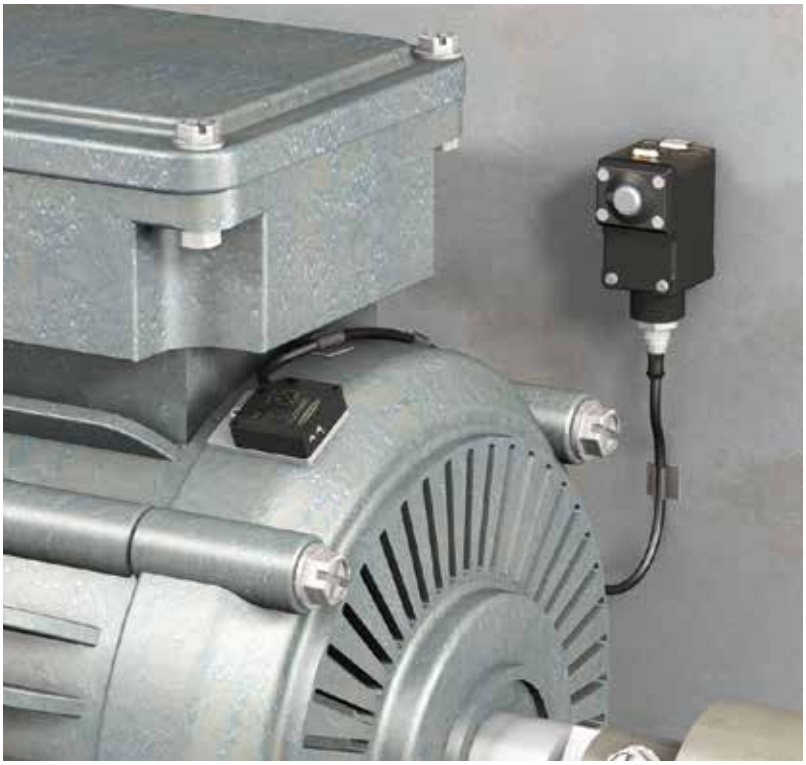
The interconnectivity afforded by IIoT technologies enables seamless communication among machines, components, and people. This interconnectivity allows for data-driven process optimisation—increasing efficiency and productivity. For example, a wireless notification system can be used to alert managers and technicians that they are needed on the line, reducing the need for technicians and managers to constantly check each production line and for workers to leave their workstations when they need assistance.

A system like this could be set up so that an operator pushes a button or flips a switch to alert the manager or technician that he or she is needed on the production line. A tower light connected to the gateway's outputs would then indicate which production line needs a manager's attention, and colours could be assigned to indicate the need for a technician (yellow) or manager (red).

By utilising a wireless network of connected devices to streamline communications, managers, technicians, and line workers are able to use their time more efficiently and productively. Similarly, a wireless solution can be used in pick-to-light and call for parts applications.

Conclusion

Overall, the capabilities afforded by IIoT mean that these technologies are not just short-term investments or solutions to immediate problems; rather, they enable continuous improvement by providing companies with the ability to solve new problems as they arise – compounding the value of the investment over time.



take note

- A smart factory provides plant managers with remote access to wirelessly-connected machines.
- A smart factory enables access to a wealth of data on the operation of the machines by automating the communication between the industrial automation equipment and systems.
- Data availability is one of the hallmarks of IIoT – allowing businesses to leverage data meaningfully and enabling predictive maintenance for machines.

Enquiries: RET Automation Controls. Brandon Topham.
Email brandon.topham@retautomation.com

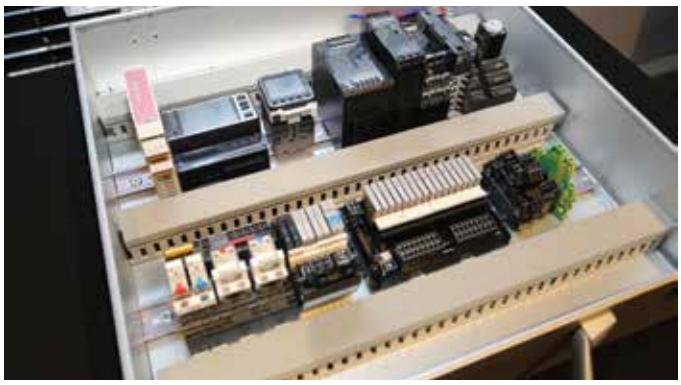
Compact, unified Factory Automation range

A smaller, standard component height across all of **Omron**'s family of Factory Automation (FA) control devices allows for standardised wiring ducts and component placement, thereby optimising space. A standardised, unified design also means design simplicity for panel builders. The complete Omron portfolio has been redesigned into 600 different FA devices, across 18 different product categories, all built to a common design platform. In addition, the new FA devices are also built with Omron's proprietary Push-In Plus wiring technology. Moving to a uniform design avoids the dead space that results from specifying components of differing height, and also reduces the design work required.

Most importantly, the 'hot spots' that build up in small spaces in the panel are greatly reduced, which can impact component reliability.

"The lifetime of an electronic component, like a power supply containing an electrolytic capacitor, may be halved for every 10°C rise in temperature, as in accordance with Arrhenius' Law," explains Lars de Bruin, Marketing Manager, Panel Solutions, EMEA.

Omron's complete new range of compact in-panel components includes electromechanical and solid state relays, I/O relay terminals, terminal blocks, temperature controllers, timers, measuring and monitoring relays, power monitors and (uninterruptible) power supplies.



These products also offer features such as LED status indicators, simple front wiring and Push-In Plus terminals, all helping panel designers to optimise panel layouts, without impacting issues such as usability or maintenance.

Double DIN-rail fixation, both at the top and bottom, allows customers to remove the product from the DIN-rail in a straight move, which is highly convenient in case of replacement/ refurbishment.

Enquiries: Omron Electronics. Tel. +27 (0)11 579 2600 or email info.sa@eu.omron.com

3D inspection technology strengthens digital offering

ABB announced today that it has acquired the Spanish start-up company NUB3D, innovator of digital, 3D inspection and quality-control solutions. The acquisition expands the group's portfolio of ABB Ability solutions that connect customers to the industrial Internet of Things. ABB Ability builds on the intelligent cloud, using connected devices to generate actionable digital information for a broad range of customers. The two companies have agreed not to disclose the value of the transaction.

NUB3D is a privately owned company headquartered in Barcelona. It supplies 3D white-light scanning sensor technologies, using digital scans to optimise inspection and quality assurance in manufacturing. The sensors can detect defects on a manufactured part with an extremely high level of accuracy.

By combining NUB3D's proven world-class competence in 3D vision and metrology with ABB's brand, worldwide reach, and offering and customer support, ABB will be able to create automated turnkey inspection and quality-control systems for automotive original equipment manufacturers, aerospace companies and customers in other sectors such as metals and plastics.

The technology represents the future of flexible manufacturing, enabling a high level of automation with advanced data analysis that can be used to optimise production processes. NUB3D will become part of the Robotics business of ABB's Robotics and Motion division and the new global application centre for 3D metrology in ABB.

Enquiries: Shivani Chetram. Tel.+27 (0)10 202 5090 or email shivani.chetram@za.abb.com

Safety light curtains and grids

In all applications with dangerous areas requiring finger, hand and operator protection, the small and powerful safety light curtains and light grids from **ifm** are the first choice. The main differences of the versions from the OY series are the resolution and the protected area height. Various functions such as range and restart are configured directly on the unit, no PC required. A t-slot on the back allows simple and reliable mounting using the supplied mounting material. The various accessories make low-cost and efficient use easier. The OY type curtain comes in a very small housing being 28 mm x 30 mm in size and can be installed without dead band. Selectable ranges are available from up to 20 m for light curtains and up to 60 m for light grids with easy tried-and-tested M12 connection.

Applications include:

Hand and finger protection – for light curtains type OYxxxS, an effective protection is reached by the small distances between light beams starting with 14 mm. Typical applications are presses, pick-and-place machines or handling machines. For hygienic areas, versions with protection rating IP 69K is required.

Blanking – blanking suppresses individual light beams or up to three neighbouring light beams. Floating blanking even allows different beams to be suppressed

Muting – The temporary automatic muting function allows feeding or products to the dangerous area. Part numbers: OYxxxS; muting relay: G2001S

Safety in hygienic material resistance in cleaning processes with steam and high-pressure cleaners is reached by the enclosure of the safety light grid in a protective tube IP 69K with integrated heating protection against fogging. Part number: OY4xxS

Enquiries: Tel: +27 12 450 0400 or email info.za@ifm.com

Next step in photoelectric sensing

The OID with time of flight technology (PMD – Photonic Mixer Device) combines the following advantages: long range, reliable background suppression, visible laser light and high excess gain. In the same price range as standard sensors, it is a clever alternative. The switch point can be set easily by turning the setting ring (easy turn). A scale shows the distance set. The switch point can thus be set before installation. As an alternative the version without setting ring, settable IO-Link features the high protection rating IP69 K. Reliable detection of polished, matt, dark or light objects independent of the colour. The unit allows any angle of incidence and thus flexibility of mounting. This simplifies installation and saves costs. Some applications for these sensors include detection of yoghurt pots and position detection of workpiece carriers in series connections.

Enquiries: Email info.za@ifm.com

Automatic transfer switch controller for motorised switches

Control Applications is now marketing a new ATS changeover system, the ELNet CO which features an advanced, user-friendly, interface – the signature of all ELNet products. As its name suggests, this ATS controller is designed for changeover between two power sources, in most cases: the electric utility and local generator.

Featuring a built-in voltmeter, it eliminates the need for no-voltage and delay relays, selectors, control relays and naturally volt-meters. Featuring Alarm and Event History Logging of up to 1 000 alarms/ events and full open protocol communication, supporting Modbus and BACnet via a RS485 port it is the ultimate changeover solution for BMS integration.

Other features include Double Interlock Protection, preventing simultaneous activation of both power systems, and a menu-driven graphic display (320 x 240 mm). All operational parameters are adjustable and as a bonus feature you may find Self-Check Mode, enabling auto-confirmation of proper wiring installation.

Enquiries: Control Applications (Israel). Tel +972 3 6474998 or email export1@ddc.co.il

Multifunctional display – speed, time, counter

The multifunction display shows various measured values in industrial automation. It uses the principle of interval measurement to processes input pulses. The scaling factor allows (rotational) speed and processing time, etc. to be calculated, displayed and converted into an analogue signal. The unit can also act as a counter or an industrial timer.

Five different operating modes, optional analogue and switching outputs as well as the convenient display make the multifunctional evaluation system fit for various applications in industrial automation.

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

Optical data transmission

The Leuze DDLS 500 optical data transmission photoelectric sensor is so much more than an optical sensor. This innovative sensing device offers many more features that make it both efficient and simple to use. Through continuous monitoring of the receiving level, the user can be alerted to an impending failure in good time. Available from leading sensor solutions supplier, Countapulse Controls, the Leuze DDLS 500 enables the transparent, contact- and wear free transmission of data over distances of up to 120 metres in 100 Mbit/s real-time. This is achieved by using an invisible infrared laser which communicates bi-directionally between devices.

The sensor is ideal for all applications where data needs to be transmitted without cables, and more importantly without interference. It is favoured for applications where mechanical systems are pushed to their technical limitations.

To permit fast visual control, the Leuze DDLS 500 has an LED display that is clearly visible from a distance of 200 metres. All relevant information is precisely depicted on the control panel. The device's patented single hand adjustment process and integrated mounting plate with alignment screws enables easy mounting by just one person. This makes it easy to install, and the aid of an integrated laser alignment and level facilitates rapid alignment, even over longer paths.

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

Schneider Electric's VarSet

The answer to efficient Power Factor Correction and Reactive Power Compensation

Schneider Electric's range of VarSet Low Voltage (LV) Capacitor Banks form part of the company's Power Factor Correction (PFC) solutions that modify and control the reactive power, and reduce overall kVA demand.

To mitigate problems such as higher utility bills, low power factor and harmonic distortion Schneider's PFC solutions can assist in lowering utility power bills by 5 to 10%. These solutions ensure the efficient measurement of how effectively an electrical current is being converted into useful work output, therefore, assisting facilities reduce their utility power bills.

Schneider's complete range of VarSet Easy LV Capacitor Banks for fixed and automatic compensation assist in balancing for reactive power and harmonic distortion. This provides for an easy and efficient solution to quickly maintain a facility's Power Factor (PF) at an ideal level for maximum system efficiency.

As a result of PFC and Reactive Power Compensation solutions, facilities in the retail and healthcare space, office buildings, hotels, pumping stations, small packaging as well as small industrial facilities can benefit from tangible Return On Investments (ROIs).

These include reduced capital expenses of up to 30% owing to optimised electrical system capacity. Further ROIs include the reduction in losses of transformers and conductors and optimised energy consumption which helps in reducing CO_2 emissions.

The VerSet De-tuned Automatic Capacitor Banks form part of an anti-resonant PFC system that help in providing PFC in electrical distribution networks where moderate harmonic content exists.

Schneider's VarSet Standard Automatic LV Capacitator Banks are ideally suited for PFC in applications where plant loading is constantly changing. This makes it flexible and effective reactive power compensation system in low-voltage networks where current and voltage harmonic distortion levels are minimal.

Forming part of Schneider's PFC and Improvement is also the VarSet Fixed PFC Capacitator which is ideally suited for application where the load does not change. The Fixed Correction Capacitator is also ideal for situations where the capacitor is switched with the load, such as the load side of a motor starter.

VarSet provides the features and capabilities needed for Power Factor Correction and Improvement. Users can select from a full range of standard, pre-configured capacitor banks, or alternatively build a custom solution by mixing available options to fulfil their unique requirements. Schneider Electric's VarSet range of LV Capacitor Banks are fully type tested in compliance with IEC/EN 61439-1 and 2; and IEC 61921 standards.

Schneider Electric continues developing solutions aimed at helping facilities improve efficiency and productivity by holding the value of Innovation At Every Level to ensure that Life Is On!

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Life Is On | Schneider Electric

Risk of **Prioritising Security** Over Fire Safety

Michael van Niekerk, ASP Fire

What can be done to prevent fires from causing damage to vital assets in our communities?

We tend to focus on protecting properties from theft or vandalism, ignoring the equally important area of fire safety, where electrical fires are the most common sources of outbreaks. Fire poses a constant threat to every building within South Africa and it usually strikes without warning, often with devastating consequences to property, equipment and to life. A fire has no regard for high fences or walls and it is immune to burglar alarms and 24-hour security guards.

Property security versus protection from fire

This focus on securing property, equipment and inventory has resulted in a vulnerability to fire, partially due to a lack of knowledge of the fire hazards and risks within our living and working environments, and due to a lack of money to spend on fire protection equipment as funds are diverted to seemingly more important issues. The infrastructure within South Africa is ageing and equipment failure, particularly in the electricity distribution system, can result in large fires that cause significant damage to the substations with a negative knock on effect on businesses and our homes. Stories of explosions or fires at substations in the media are evidence of this real threat.

> *Substation fires take several hours – and require thousands of litres of water – to extinguish.*

Substation fires

Substation fires that are attended to by the fire department usually take several hours and require thousands of litres of water to extinguish, which is an added reason to prevent fires in the current drought.

The risk of a fire in the electrical infrastructure within the Bedfordview and Edenvale areas of Johannesburg can be mitigated through effective preventative maintenance and through the application of modern automatic fire protection technologies. There has been recent development in misting fire protection systems, where the effectiveness of water is multiplied a thousand fold by creating water mist droplets with the same diameter as human hair. These mist droplets evaporate simultaneously into a cloud of steam when they come into contact with a fire, rapidly cooling it to below the temperature that it can survive at. Automatic heat detection tubes designed to react at 100 C activate the water mist system to extinguish the impending fire within seconds before it is able to cause any real damage or grow out of control.

Standalone, automatic water mist system

A standalone, automatic water mist system is cheaper and easier to install than a conventional sprinkler or spray system and it doesn't need the hundreds of thousands litres of water, or many metres of pipework required by a conventional system to put out a fire. The adage that prevention is better than cure is applicable more than ever in the current economic and weather climate. A great deal of money can be saved by taking proactive steps to protect critical elements of community infrastructure from fire damage and by doing so, keeping the proverbial lights on at home. Standalone water mist systems can also be installed in businesses to protect specific risks, where the funds required for a sprinkler system to protect the whole building with the associated water tanks and pumps are simply not available.

Conclusion

As an accredited fire-risk management and support provider, the company that the author represents, provides a holistic, proactive and preventative total solutions approach to fire safety. The consultancy designs integrated fire-risk assessments, as well as providing training and advice on the installation and maintenance of fire detection and suppression systems that meet all necessary regulations and standards. The company provides fire risk consulting and rational design, as well as fire suppression and detection solutions for both home and industrial markets. This is not a one-size-fits-all approach. The solutions are specifically customised and tailored according to every client's requirements.

take note

- Equipment failure in the electrical distribution system in South Africa's ageing infrastructure could result in large fires.
- This risk could be mitigated through effective preventive maintenance and the application of modern automatic fire protection technologies.
- The 'automatic water mist system' is one of the new developments.

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Optimum communications

KOBOLD, represented locally by **Instrotech**, has on offer an extensive range of diaphragm seals specifically for such purposes. They are tailor-made to meet industrial requirements, and are available with all industry-standard connection types and fit perfectly with Kobold pressure gauges. In each case, an appropriate solution can be chosen from a wide range of designs, shapes and materials.

KOBOLD diaphragm seals allow measurements to be taken even with aggressive, highly viscous, solidifying or crystallising process media. They also protect the measuring devices against high temperature and pressure fluctuations, pressure peaks or vibrations.

Depending on the design, they can be used for measurements at process temperatures of up to 350°C and 1 600 bar. The use of diaphragm seals is also recommended where there are special hygiene requirements and where specific media-appropriate materials are required. Kobold's specifically-engineered and practice-oriented diaphragm seal system components, make 'dead-zone-free' assembly an easily achievable goal. As the capillary tubes can be several meters long, the measuring devices can now be placed at a safer distance from harsh industrial environments.

Typical applications are in media enriched with solids, crystallising/ polymerising/ HMh viscosity/ corrosive/ toxic and environmentally hazardous measured media, as well as very low or high measured temperature media; hygienic requirements for the food and pharmaceutical sector and batch changing without product residues in the measuring system.

Enquiries: Instrotech on 010 595 1831 or sales@instrotech.co.za

Latest safety-helmet suspensions offer improved comfort

The latest suspensions can be ordered pre-fitted on any MSA V-Gard helmet, or as spares. "We have made it painless for our customers to standardise on these new suspensions as there is no change in part numbers for complete helmet assemblies. MSA Fas-Trac III is the answer to all of your safety-helmet requirements," Suraksha Mohun, Product Marketing Manager, **MSA Africa**, comments.

In addition, two different sweatband options are available, depending on application or preference. These are PVC perforated wipeable or sweat-wicking replaceable foam, which is machine washable. The foam sweatband is made from breathable fabric for direct air permeation. MSA Fas-Trac III boasts the largest sweatband surface area on any safety helmet, which improves perspiration absorption by covering more of the headband and the wearer's forehead.

"Extensive customer research has revealed that the MSA Fas-Trac III wheel-ratchet suspension is preferred by most users over what they are currently wearing," Mohun comments. This is due to the main benefits of improved helmet comfort, retention, and stability, with the added advantage of easy single-handed adjustment. MSA Fas-Trac III suspensions are available for all V-Gard industrial safety helmets from MSA Africa. The premium MSA Fas-Trac III suspension also comes with a lower nape strap than any other protection helmet suspension, which improves balance and means that the safety helmet stays on when the wearer leans over. Separating the ratchet from the neck also allows the comfort pad to cradle the wearer's head, increasing air flow.

Enquiries: Tel. +27 (0) 11 610 2719 or email suraksha.mohun@msasafety.com

Suraksha Mohun, Product Marketing Manager, MSA Africa.

Evolution of MV Power Cables and Accessories up to 36 kV: *Part 2*

Patrick O'Halloran, City Power Johannesburg

Continuing the discussion on the evolution of MV power cables over the last century, some pros and cons of all the different types of insulation materials used for MV power cables, and recommendations to ensure improved reliability of MV cable systems.

To prevent theft of cables in South Africa, suppliers are putting in special markers with serial numbers. With the inclusion of these serial numbers, end users are able to identify cable ownership. Furthermore, end-users are also utilising these serial numbers for their asset register.

Table 1 summarises the key differences between PILC and XLPE insulated MV power cables.

Table 1: Comparison between PILC and XLPE MV power cables.

Cable Construction	PILC-Insulated cable	XLPE-Insulated Cable
Conductors (either Copper or Aluminium)	Usually shaped conductor, but may be circular / oval	Only circular
Insulation	Wrapped impregnated paper insulation	'Solid' extruded dielectric XLPE insulation
Screen	Belted collectively or individually screened (Wrapped metallised paper tapes)	Always Individually screened (Extruded semi-conductive semicon with either copper tapes or copper wires)
Metallic sheath	Essential, typically lead	Optional, either lead or Al
Bedding layer	Extruded or Fibrous (if armoured)	Extruded bedding (if armoured)
Armouring	DSTA/ SWA/ AWA (optional)	SWA/ AWA (optional)
Outer sheath	Extruded (PVC/PE) / Fibrous	Extruded (PVC/PE)
Continuous operating temperatures	70°C	90°C
Short circuit temperatures	160°C	250°C
Longitudinally water blocked	No, normally only radially due to metallic layer	Yes, if specified, since it is a special requirement in SANS 1339
PD free design	No	Yes
Diagnostic testing possible	Tan Delta diagnostic, which is a measurement of the overall circuit condition.	Tan Delta and Partial discharge diagnostic possible.
	Pre-failure faults can't be located without breaking down the insulation system by applying a high voltage source	Pre-failure faults can be located without breaking down the insulation system Jointer errors can be identified before energising the cable

Other factors influencing cable technologies

With the improvements in insulation mediums and cable terminations, MV switchgear has drastically reduced in actual size. This means that the sizes of cable boxes have been reduced and special bushings have been introduced to accommodate the new cable terminations.

Things get really exciting on site if the wrong equipment has been specified and purchased. Typically, most equipment has long lead times, and instead of stopping the project, people make plans onsite to terminate the cable into the switchgear that is supplied on site. From day one therefore, the installation is wrong, and premature failures can be expected. These failures can be costly to repair, could involve replacement of the switchgear, and in addition staff or the public could be injured or killed from any resulting explosion.

Figure 7: Compound filled cable boxes.

Figure 7 shows very old compound filled cable boxes. These were designed for PILC belted, unscrewed MV power cable, and they were filled with hot pouring compound. This ensured that there was no PD in the critical crutch of a PILC belted unscrewed MV power cable as all air was removed in the critical areas.

Due to a variety of reasons these compound filled terminations are no longer preferred and most end users prefer to install convention dry type terminations. These are referred to as either Heat Shrink, or cold applied products.

MV – Medium Voltage
PD – Partial Discharge
PILC – Paper Insulated Lead Covered
XLPE – Cross Linked Polyethylene

Abbreviations/Acronyms

Cable termination beginnings (early 1900 – 1950s)

In the early days, electrical equipment, such as switchgear and transformers were designed to have compound filled metal cable boxes. This way of terminating cables was technically good, except it was very difficult and hazardous to field staff. The MV paper insulated (PILC) cables at that time had a belted construction and used wiped earth connections.

Compound filled cable boxes are designed to exclude air, so that creepage was not a major consideration when designing the cable bushing. This explains why the bushings of compound filled cable boxes are small when compared with the air filled cable box bushings found in metal clad switchgear, and outdoor transformers.

Compound boxes were filled with many different compounds, but a hot pouring compound was mainly used. This hot pouring compound was difficult to manage and gave off harmful fumes when being heated up, prior to pouring. Compound filled boxes where made of metal housing, with porcelain bushings where the cables exited the compound box. Some drawbacks of compound filled cable boxes are:

- Compound top-up is required to ensure proper insulation (no air voids)
- Long installation times
- Cable box failures cause major damage when they ruptured (hot burning compound could be expelled)

New technology cold pouring compounds are available. These are environmentally friendly and safe to install.

The new third generation XLPE-insulated MV power cables are reliable.

Air insulated MV cable terminations (1950 – 2000s)

With the introduction of tapes, heat shrink and later cold shrink terminations, over time compound filled boxes have been replaced with air insulated terminations. This type of MV cable termination is used by 95% of our South African market.

Screened paper insulated cables were introduced to control the electrical stresses with in the cable designs, especially where increased voltage cable ratings were required. Belted design paper insulated cables are currently limited to 12 kV. Screened paper insulated cables are normally rated up to, and including 36 kV, as per SANS 97. The screened cable design provides improved MV cable termination performance, especially in the crutch where, in belted cables the crutch is a high stress area.

The belted design of paper-insulated cable is more likely to have crutch failures than the improved screen design paper insulated cable, where the complete crutch area is screened. This is because of the permittivity properties of the materials, and the introduction of air between the unscreened insulated conductors. International market trends (which are mainly 24 kV rated systems) produce smaller and smaller switchgear. This in turn leads to reduced busbar clearances and cable boxes.

Air was the first insulating medium for busbars. It was replaced with oil, and then with the introduction of SF6 insulation, busbar clearances could be reduced tremendously. This allowed the cable box sizes to be reduced. Switchgear sizes have reduced with the introduction of new insulating technologies. Along with the reduced sizes of cables boxes, came the reduced clearances between phases and phase to earth. This reduction in of clearances required new designs of MV cable terminations.

When switchgear manufacturers designed smaller air-filled cable boxes, with reduced clearances, MV cable accessory manufactures then had to redesign the bushings and MV cable terminations, in order to make the cable box and cable termination compatible with these reduced clearance requirements.

In South Africa we have standardised on a 'type C' 630 A bushing with M16 thread. This 'Type C' bushing is found on all the new SF6 insulated switchgear, which currently is only used by City Power, Eskom and similar utilities and industries.

The 'Type C' bushing allowed end users to move away from traditional putty and tape shrouds to factory made fully insulated shrouds. These shrouds are installed the same way every time, and in addition ensure that cables are terminated correctly on Type C bushings. This is a product which is designed to be used on our South African PILC cable systems.

PILC cables, which are susceptible to moisture ingress causing insulation breakdown, hence users are being forced to find alternative new cable designs. With the introduction of screened XLPE cables, MV terminations have also evolved.

It was decided internationally to standardise the cable interface and introduce screened cable terminations. Screened MV cable terminations should preferably only be used on MV XLPE cables and when installed, this eliminates the problems of creepage, tracking and erosion, and clearances experienced by most air insulated MV cable terminations. The terminology 'Screened' means earthed. Once a cable termination is completely screened it can be completely submerged in water without any flashover.

Screened connectors are required when connecting to new 24 and 36 kV compact switchgear.

International Utilities have moved away from 3 core cables, and utilise single core XLPE insulated cables. This is not an easy change to make, as all electrical aspects of the network must be reviewed and staff need to be trained on how to install and terminate single

core XLPE insulated cables. Our South African market mainly uses 3 core cable designs for a number of reasons.

The design of the screened connector controls the electrical stress from the XLPE cable through the 'Type C' bushing, and into the switchgear. Because the surface of the cable and the screened connector are screened, there is no leakage current along the surface of the screened connectors. With these screened connectors installed in the cable box, the size of the cable box and all electrical clearances can be drastically reduced. The life expectancy of screened MV cable terminations is double the expected life expectancy of unscreened cable terminations, especially with reduced clearances inside new reduced cable boxes.

In an effort to eliminate failures from occurring in the MV cable compartment, the following two national standards have been published;

- SANS 876 - Cable terminations and live conductors within air-filled enclosures (insulation coordination) for rated ac voltages from 7,2 kV and up to and including 36 kV
- SANS 1332 - Accessories for medium-voltage power cables (3,8/6,6 kV to 19/33 kV)

These two standards are not yet compulsory, so it is up to the end-user to specify them when purchasing any MV switchgear and MV cable accessories. All MV cable accessories should comply with the requirements of SANS 1332.

With the introduction of air in the cable boxes, we have to consider the following:

- Creepage distances
- Tracking and erosion
- Clearances (Phase to Phase and Phase to Earth)

The above three technical considerations must be correct if an air filled termination is to last in excess of 30 years. If adequate creepage, tracking and erosion properties and air clearances are not provided, then the MV cable termination will fail prematurely. Failure of MV cable terminations is dangerous and can lead to long power interruptions.

SANS 876 has been developed to address the challenges which have been identified. This standard is critical to understanding and to correctly specifying when ordering new switchgear in order to accommodate the cable technology that will be installed.

In SANS 876 the following type of terminations are specified:

- Type 1 termination - lugs connected onto bushings or post insulators, uninsulated (bare) at the terminal fixing point, see *Figure 6*
- Type 2 termination - lugs connected onto bushings or post insulators with a shrouded (unscreened) insulation termination, see *Figure 9*
- Type 3 termination - unscreened separable connector terminations, see *Figure 10*
- Type 4 termination - screened separable connector terminations – outside cone, see *Figure 11* and
- Type 5 termination - screened separable connector terminations – inside cone, see *Figure 12*

All critical dimensions and definitions are given in SANS 876.

Type 1 Bare termination (Air insulated)

In a Type 1 termination, the interfaces are bare and:

- Cable cores terminated with stress control appropriate to the cable design and voltage
- Air being the sole insulation medium for the terminal connections
- The minimum distance from any live bare metal (e.g. bushing, post insulator, live conductor, lug, fitting etc.) to an adjacent phase or to earth determined by the impulse withstand voltage requirement

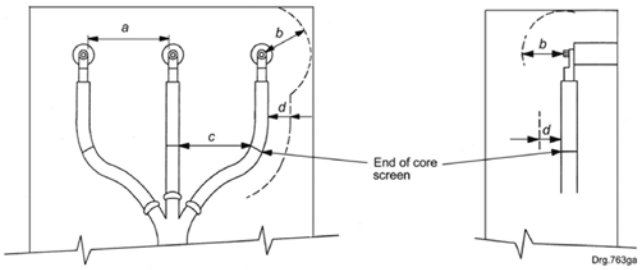


Figure 8: Bare termination air-insulated (Type 1).

Type 2 – shrouded termination.

In a Type 2 termination, the interfaces are shrouded with unscreened interfaces are:

- Cable cores terminated with stress control appropriate to the cable design and voltage
- Unscreened local insulation enhancement at the terminal connections
- The minimum distance from any unscreened, shrouded, live metal (e.g. shrouds, cable cores etc.) to an adjacent phase or to earth determined by power frequency (e.g. corona inception and extinction) and impulse withstand voltage considerations

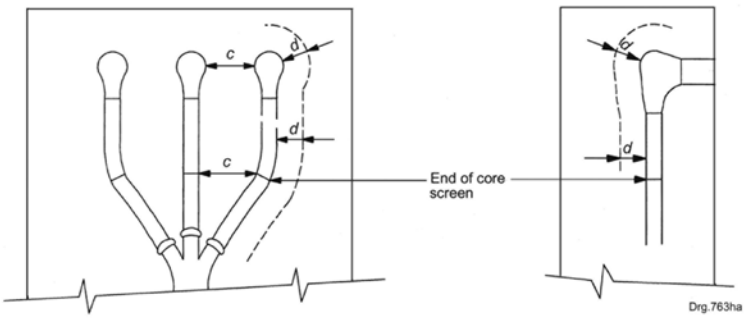


Figure 9: Shrouded termination (Type 2).

Type 3: Unscreened Separable Connector (USC) termination

In a Type 3 termination, the interfaces are unscreened but utilise specially design USC and:

- Cable cores terminated by stress control appropriate to the cable design and voltage
- USC at terminal connections
- The minimum distance from any unscreened, live metal (e.g. USC, cable cores etc.) to an adjacent phase or to earth determined by power frequency (e.g. corona inception and extinction) and

impulse withstand voltage considerations
- Leakage current limited by quality of the interface between USC and bushing – interference fit

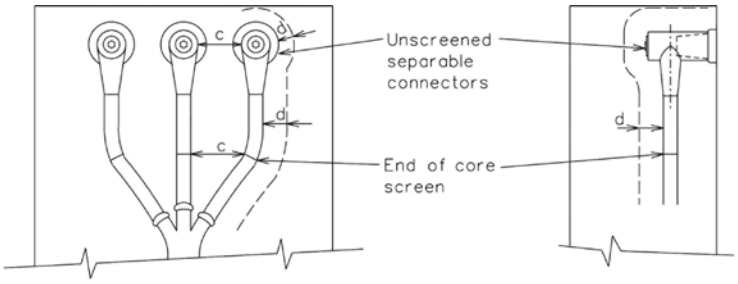


Figure 10: Unscreened separable connector termination (Type 3).

Type 4 and 5 Screened separable connector interfaces (SSC) – inside or outside cone

In a Types 4 and 5 terminations, the interfaces screened and utilise special designed SSC and;
- Clearances determined by the mechanical clearance required to fit the SSC's within the cable box
- Safe to touch due to surface being earthed
- Leakage current limited by quality of the interface between SSC and bushing (interference fit)
- NOTE –traditionally PILC cables could not use SSC especially above 11 kV because:
  * Sector shape cores
  * Loose core screen

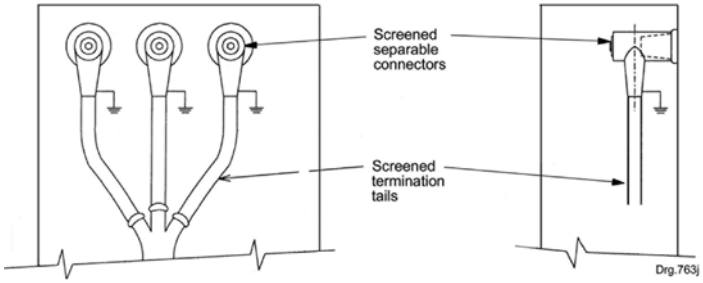


Figure 11: Screened separable connector termination – outside cone (Type 4).

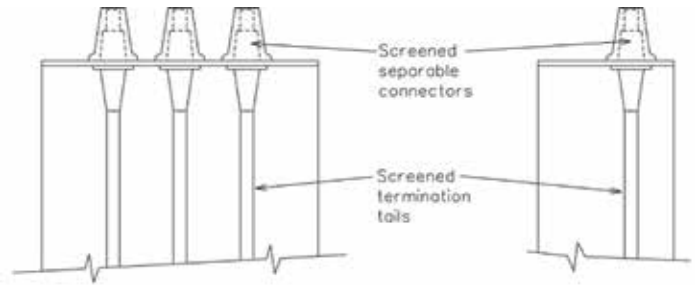


Figure 12: Screened separable connector termination – inside cone (Type 5).

Cable box sizes (heights)

It is important to ensure that the correct size cable boxes are supplied, as nearly all MV power cables installed are three cores, so extra space is required.

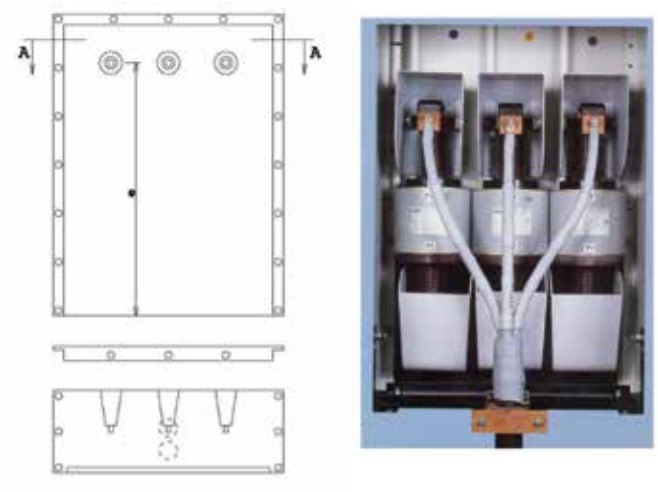


Figure 13: Height of the cable box.

LV CTs in MV cable boxes

As technologies have improved with the use of screened cables, the use of LV current transformers in MV cable boxes for metering and protection applications has been incorporated.

It is essential that these LV current transformers be installed in a screened area, otherwise discharge may occur if the air clearances are not adequate.

The dimensions in the Types 2 and 3 terminations cover the dimensions from the top of the LV current transformer to the screen cut.

Note: Part 3 of this discussion will appear in the April issue of Electricity+Control.

take note

- If the wrong equipment has been specified and purchased, things can become hectic on site.
- This means that the installation is wrong from day one and premature failures can be expected.
- These failures can be costly and life-threatening.

Patrick O'Halloran worked for Schneider Electric as the MV product manager and Tyco Electronics as the regional sales manager for Africa. He is presently employed by City Power as the Chief Engineer, Plant Condition Monitoring, responsible for advising City Power on best ways to detect Partial Discharge and prevent future failures. Enquiries: Tel. +27 (0) 11 490 7485 or email pohalloran@citypower.co.za

Thermography maintenance program

The goal of a successful preventative maintenance program is to have easy access to historical data for each piece of critical equipment, so measurement trends can be monitored and maintenance downtime planned – preventing equipment down situations.

Getting started

- **Gain support from management:** Get thermography training, ascertain as to how thermography program performance results will be measured
- **Practice reading thermographic images:** Gain Ti expertise by using the camera two to three times each week for six months and get certified. Plan work, track findings, and document result
- **Meet regularly with first level managers, line supervisors and other coworkers:** Explain what thermography involves, demonstrate the camera, ask for support and set up a mechanism to request thermography surveys
- **Integrate with other maintenance efforts:** Thermography is often part of a larger preventive or predictive maintenance program. Data from several technologies, such as vibration, motor circuit analysis, airborne ultrasound, and lube analysis can all be used to study the condition of a machine asset
- **Establish written inspection procedures:** Written inspection procedures drive the quality of the data collected and ensure the inspection is done safely

Fluke Connect's unique added feature, ShareLive video call, keeps the facility running by sharing critical data, answers and additional work approvals instantly without leaving the inspection site.

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

Pressure transmitters for gas, and dust atmospheres

Keller – represented locally by **Instrotech** – has introduced a complete range of pressure transmitters for use in hazardous areas. These intrinsically safe transmitters offer measurement ranges of between 0,2 bar and 1 000 bar, so they can be used for measurements of all types in areas subject to explosion hazards in Group II (Gas), and as per the relevant ATEX Directive. Individual types from the product range are also approved for Group I (Mining) respectively Group II (Dust). Common features of all Y-line pressure transmitters include a very low temperature error, with correspondingly high measurement accuracy. Thanks to the integrated temperature sensor and an additional digital circuit, the range of envisaged operating temperatures can be divided into as many as 120 sections with a width of 1,5 Kelvin. During factory calibration, a mathematical model is used to calculate individual compensation values for TK zero point and TK amplification for each of these sections; the values are then stored in the transmitter. During operation, these values are fed into the analogue signal path according to the temperature, without reducing the 2 kHz signal processing dynamic. A relevant total error band for measurement purposes of ±0,8% FS can therefore be attained over the typical temperature range of -10°C to +80°C. This includes all error sources, from linearity to range tolerance.

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

New Intrinsically Safe I/O platform for hazardous areas

Manufacturers and industrial operators can now bring devices deployed in hazardous areas into The Connected Enterprise via EtherNet/IP using the new Allen-Bradley Bulletin 1719 Ex I/O platform from **Rockwell Automation**. With the new platform, users can access data from field devices and more easily control process operations in hazardous areas.

As part of the PlantPAx Distributed Control System (DCS) from Rockwell Automation, the Bulletin 1719 Ex I/O allows users to monitor operations using a common platform that communicates with the DCS or other automation systems. This helps create a seamless flow of information throughout the plant and enterprise.

"The Bulletin 1719 Ex I/O platform is ideal for organisations that are embracing smart manufacturing and seeking to capitalise on the power of their own information in a Connected Enterprise," said Christo Buys, Business Manager for Control Systems, Rockwell Automation sub-Saharan Africa.

Three chassis models are available, providing scalability for anywhere from eight to 45 I/O modules on a single adapter. Once operational, a removal-and-insertion-under-power (RIUP) feature allows users to replace modules and make connections while a system is running in the absence of a hazardous atmosphere. The I/O platform operates in a wide temperature range and is designed for use in industries with hazardous applications, such as oil and gas, chemical, life sciences, pharmaceutical, and food and beverage.

Enquiries: Christo Buys. Email cbuys@ra.rockwell.com

Breakthrough with 3D printed gas turbine blades

Siemens has achieved a breakthrough by finishing its first full load engine tests for gas turbine blades completely produced using Additive Manufacturing (AM) technology. The company successfully validated multiple AM printed turbine blades with a conventional blade design at full engine conditions. This means the components were tested at 13 000 revolutions per minute and temperatures beyond 1 250°C. Furthermore, Siemens tested a new blade design with a completely revised and improved internal cooling geometry manufactured using the AM technology. The project team used blades manufactured at its 3D printing facility at Materials Solutions, the newly acquired company in Worcester, UK. Materials Solutions specialises in high performance parts for high temperature applications in turbomachinery where accuracy, surface finish and the materials quality is critical to ensure operational performance of the parts in service. The tests were conducted at the Siemens testing facility in the industrial gas turbine factory in Lincoln, UK.

Siemens finished its first full load engine tests for conventional and completely new designed gas turbine blades produced using AM technology.

"This is a breakthrough success for the use of AM in the power generation field, which is one of the most challenging applications for this technology," said Willi Meixner, CEO of the Siemens Power and Gas Division. "AM is one of our main pillars in our digitalization strategy. The successful tests were the result of a dedicated international project team with contributions from Siemens engineers in Finspång, Lincoln and Berlin together with experts from Materials Solutions. In just 18 months they completed the entire chain from component design and AM material development to new methods for lifing simulations and quality controls. With our combined know-how in 3D printing, we will continue to drive the technological development and application in this field," added Meixner.

Enquiries: Email alfons.benzinger@siemens.com or jennifer.naidoo@siemens.com

High powered searchlights based on LEDs

Francis of the United Kingdom has released high powered searchlights based on LEDs. The new Francis LED searchlight range has been developed to offer an efficient and environmentally friendly alternative to traditional lamp sources. Their advantages included their low power consumption and long lamp life of 20 000 hours. Utilising a series of precision made glass lenses to optimise and collimate the light output, which achieves a greater range and output. The new searchlights are constructed from marine grade aluminium and stainless steel, resulting in a robust high quality product. Beam angles of 4° Spot, 6° Mid Beam or 10° Flood are available. Available from **Denver Technical Products**, the 234 W LED provides illumination characteristics in excess of a 300 W Xenon lamp or 3 kW Halogen, resulting in a range of 1 Lux at 1 647 m.

Enquiries: Tel. +27 (0) 11 626 2023 or email denvertech@pixie.co.za

Smart capacitive buttons for food industry

Comitronic-BTI supplied locally by **RET Automation Controls** has updated their buttons for the Food Industry. The fifth generation of their smart capacitive buttons uses a new filtering technology:

- Water cannot trigger them, even if the water jet goes directly onto the button
- Works with latex gloves or protective per EN 3088

Some changes have also been made to the housing of the button:

- The housing is IP69K
- The button is completely smooth without any food retention areas, which is a requirement for the food industry
- The housing is available in numerous colours so you can customize it to your application. Green, Red and Blue have been added to the standards which were Black and Grey

"We designed them to survive in the harshest environment. We added more LEDs to increase visibility and retained the multiple LED design, with up to six LEDs per button they are a lot more reliable than a single LED illumination version. With three colours per LED they able to clearly indicate the machine status to the operator. Colours really are an international language," explains Benjamin de Gournay, Comitronic-BTI Export Team leader. Both the Kapix ON and Kapix OFF buttons are laser engraved ensuring that the labels remain visible and that the labels will not fade with the daily factory wash down.

The buttons are also available with built in time delays. For example you need to touch the button for 3 seconds in the 'Kapix OFF' before it activates the outputs. This helps to avoid accidentally shutting down the machine when an operator touches a button by mistake.

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

New range of rugged battery cabinets

A new range of battery cabinets has been released by power provisioning specialist, **Powermode**. The locally-manufactured units are marketed under the Q-on banner and are suitable for applications ranging from solar PV to uninterruptible power supply (UPS) and self-consumption systems.

According to Jack Ward, Managing Director of Powermode, the safe storage of batteries is important from a safety as well as space-saving perspectives. "General hazards related to energy storage include chemical leakage and fire dangers as well as the possible escape of non-flammable gases when charging or discharging certain batteries."

He says the Q-on cabinets, which are manufactured from rugged, durable steel to the highest standards and come with a class-leading quality guarantee, are available in four standard sizes (A8, A12, A16, A20) to suit a wide range of stand-alone or mobile requirements.

The compact, space-saving cabinets feature multiple, removable shelves, and come with a built-in battery switch breaker for battery isolation.

Enquiries: Garreth Johnson. Tel. +27 (0) 11 235 7708 or email garrethj@powermode.co.za

Jack Ward, Managing Director, Powermode.

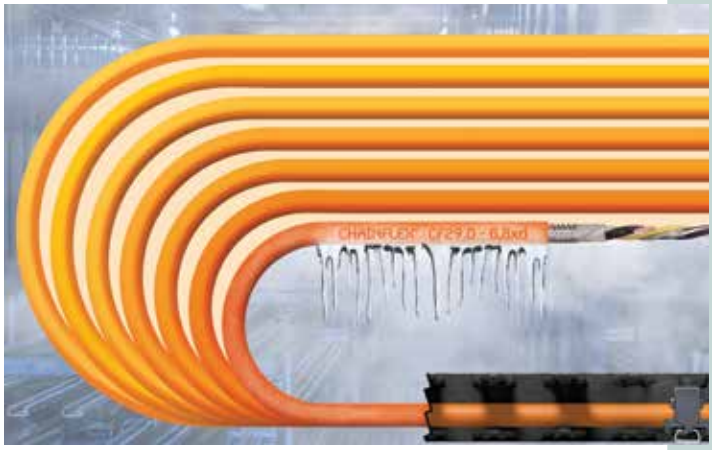
Servo cables with world's smallest bend radius

At the 2016 SPS IPC Drives, **igus** presented its new CF29 servo cable series – one of several new high-end cable families for continuous motion in e-chains with an outer jacket made of halogen-free TPE. This product range extension offers completely new possibilities for energy supply to drives, for users with very tough requirements such as ambient temperatures or small installation space.

A core structure optimised for motion combined with a gusset-filling extruded TPE inner jacket that provides even more stability as well as a highly flexible TPE outer jacket are the features of the new CF29 chainflex servo cable series. The high-end series is suitable for the smallest bending factors for servo cables down to 6.8xd and is therefore unique on the market. The new series offers a guaranteed solution in a temperature range of -35°C so can be even used for moving applications in deep-freeze warehouses. This is made possible by the igus halogen-free TPE outer jacket material, which offers an almost unlimited resistance to oil.

All cables were successfully tested in a climatic test chamber with real-world mechanical loads and temperatures, within the 2 750-square-metre-large test laboratory at igus. This allows the cable manufacturer to guarantee a service life of 36 months for all cables. And this applies even for cables for the highest dynamics and the most complicated movements. The chainflex service life calculator (www.igus.com/chainflex_servicelifecalculator) helps you to make the ideal selection, and gives you the expected service life of each cable in double strokes after entering the respective application parameters.

Enquiries: Ian Hewat. Tel. +27 (0) 11 312 1848 or email ihewat@igus.de



Legal concerns in mine roll-out of proximity detection systems

Moving machinery is the second highest cause of fatalities in South African mines after falls of ground, making the implementation of effective Proximity Detection Systems (PDSs) a crucial step, but there are still perceived grey areas in mine safety regulations.

According to Anton Lourens, managing director of PDS supplier, **Booyco Electronics**, the Department of Mineral Resources has laid the groundwork for the wider application of PDS through the February 2015 amendment to Chapter 8 of the Mines Health and Safety Act (MHSA). It is now required that PDS be installed on all mobile equipment on mines.

"Mines are required to assess significant risk in terms of moving machinery and people; and based on that assessment an action plan needs to be in place to mitigate that risk," Lourens says. "But there is still some uncertainty about exactly what mines must do, as the legislation has changed in the last decade from being very prescriptive to now being more reliant on the 'reasonable man' test.The law does not say exactly what activity must be carried out; rather, it says that the mine must mitigate the risk."

He says there was also confusion on the issue of intervention. The Act deals with four industry categories: underground electric machines (where the law is clear that these must have an intervention system); underground diesel equipment (where only a warning system is required by law for now); surface diesel machines (which also legally require a warning system for now); and mining plant like refineries and smelters (where PDS requirements are not clearly defined).

"The revised MHSA allows for intervention systems on diesel machines underground and on surface, but is currently excluded from the promulgation so that's where the confusion comes in," Lourens says. "Underground electrical machines must have intervention systems while underground diesel machines don't have to; it does appear that the requirement will be enforced, but not right now."

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Anton Lourens, managing director of Booyco Electronics.

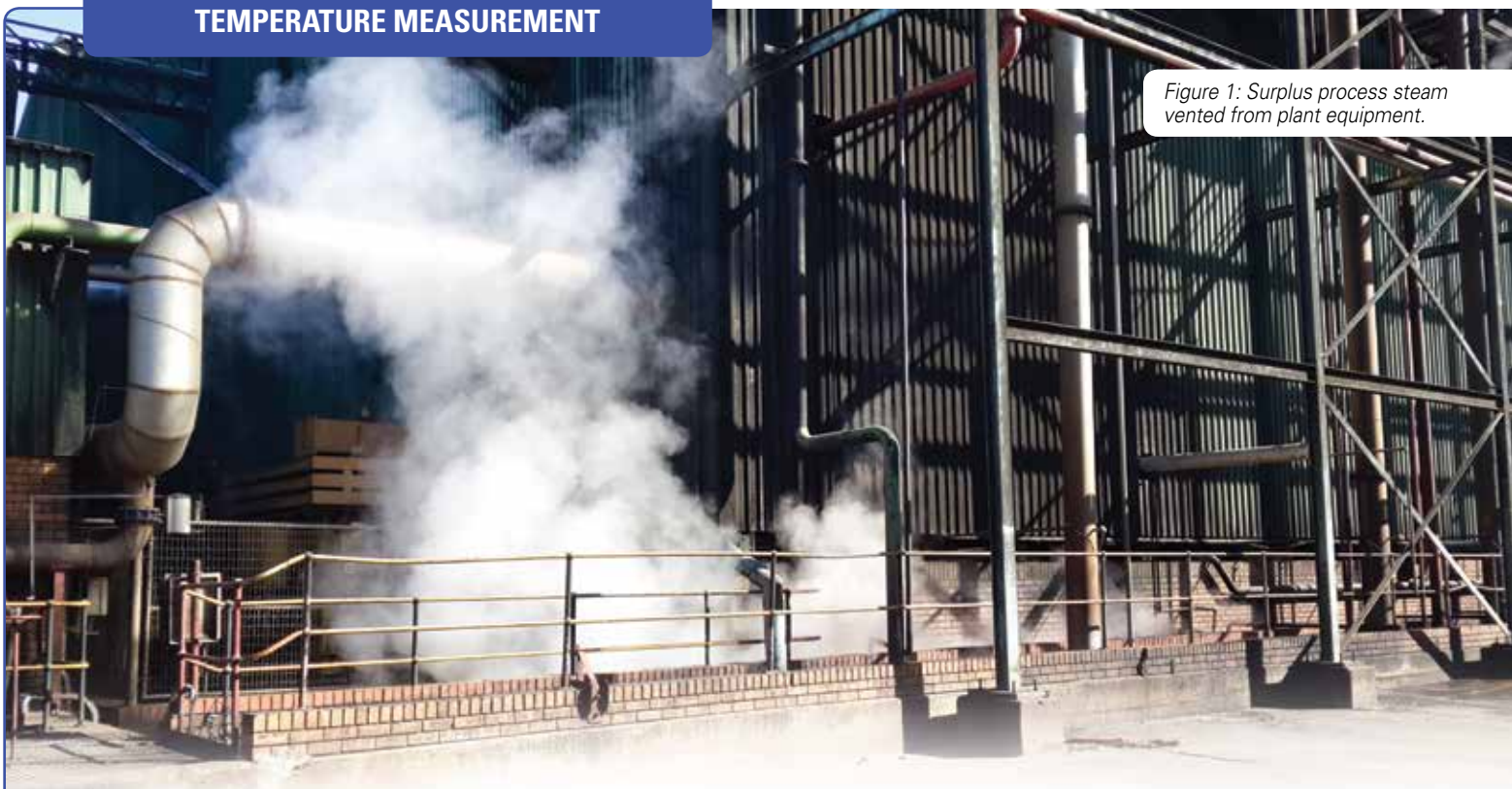

Figure 1: Surplus process steam vented from plant equipment.

Identification and **Recovery** of Waste Heat

Shaveen Maharaj, Durban University of Technology

Renewable energy sources are embraced within the environmentally friendly industries and they are the future, particularly where biofuels are used as combustible energy sources of fuels.

There is an international drive towards making renewable energy the primary energy source for up to 35% of global energy demands [1]. Modern industry is energy intensive. Examples of plants consuming large quantities of energy include paper mills, sugar mills, oil refineries, smelters and furnaces. Common components used for heating processes are boilers, furnaces, heat-exchangers, turbines, distillation columns and evaporators. These industries also have several potential sources of waste energy that can be harvested using modern technologies.

It is not uncommon to find boilers being fuelled by waste by-products such as sugar-cane bagasse, especially in the sugar industry. Bagasse burning boilers emit particulate matter composed of sulphur dioxide (SO_2) and nitrogen oxides (NOx) caused by the turbulent movement of combustion gases. Emissions of SO_2 and NO_x are lower than with traditional fossil fuels due to the characteristically low levels of sulphur and nitrogen associated with bagasse.

Industrial opportunities to recover wasted heat

Converting waste heat into electrical power has great potential within the industrial sector where large sources of heat are discharged as thermal losses directly into the atmosphere or into cooling systems [3]. These thermal losses are the result of process and equipment inefficiencies, and the failure of present process systems to recapture and utilise the wasted energy [3]. The majority of this waste heat is of low quality and is available in waste sources at temperatures below 149°C, or is dissipated as radiation losses.

Generating electrical power from waste heat depends on the temperature of the waste heat source. The waste heat source characteristics that must be considered to determine the economic feasibility of power generation will include the availability of the waste heat energy source, load factor, temperature, flow rates, pressure, plus the composition and nature of any contaminants. [4]. *Figure 1* illustrates the waste heat energy losses in the form of exhaust steam being vented into the atmosphere from evaporator vessels within a sugar mill. Steam ventilation is used to stabilise and control the

Figure 2: Steam drain pipes from the steam turbines.

vacuum pressure set-point within a range of 60 kpa to 80 kpa, at a temperature of 100°C to 150°C. This is crucial for the optimal operation of the process, and safety of workers and plant equipment.

Figure 2 shows boiler house energy losses and excessive exhaust steam being drained to the feed-water recovery system, large portions of the steam are still vented into the atmosphere. The feed-water systems can have an abundance of pipes at a temperature of 90°C to 100°C that are bare and without thermal insulation (lagging), leaving them exposed to the atmosphere where heat energy is lost. From a practical point of view, uninsulated sections of these pipes facilitate the maintenance of the control valves and flanges that are mounted on them.

First example

There are two temperature indicators in a turbine house. The one indicator displays the temperature of the high pressure steam inlet pipes at approximately 390°C, which feed steam to a second turbine. The second indicator displays the exhaust steam temperature at the turbine outlet of approximately 150°C. The exhaust steam is utilised by the process production portion of the plant in equipment such as evaporator vessels and numerous other pressure vessels. The insulated steam inlet pipes trap heat within the pipes and maintain steam temperatures in order to reduce heat losses before the steam enters the turbine rotor for efficient safe turbine operation. The waste heat sources on the second steam turbine and its steam pipes is considered a continuous waste heat source since the second turbine is in constant operation to generate electrical energy to power the entire mill.

Second example

Figure 3 shows one of the many smaller steam turbines used to operate a mill, the steam pipes feeding the turbine are insulated up to the emergency shut-off valve. Between the turbine inlet and the emergency shut-off is a pipe that carries steam at temperatures of 150°C to 390°C. These temperatures are dependent on the turbine speed and vary with the load demand of the mill. The boiler stack (or boiler chimney) from where flue gases and smoke from the boiler combustion process is vented into the atmosphere. The flue gas temperature within the boiler stack is approximately 140°C and may experience small fluctuations due to variations in the boiler's operating conditions.

Figure 3: Mill steam turbine.

Biomass plants such as sugar mills burn bagasse as fuel for their high pressure boilers to produce efficient steam to drive various plant operations [3]. Biomass is an energy source that is CO_2 neutral and causes minimal damage to the environment [5]. A steam standard boiler is made up of a sealed vessel in which boiler feed water is converted into steam by the application of heat under high pressure. This process occurs in the boiler combustion chamber, commonly known as the boiler furnace. A boiler combustion chamber at a sugar mill has doors that allow access into the furnace by the operator to stoke the fire to aid combustion. The following thermal characteristics are present in the boiler under dynamic conditions: Internal temperature ≈400°C; external wall temperature ≈60°C and flame temperature ≈1 200°C at full load. High pressure steam pipes that can vary between 3/8-inches to 14-inches in size within the boiler house and turbine house at a typical sugar mill, transport high temperature steam throughout the mill and are excellent sources of waste heat energy.

Plant and process thermography

Thermographic imaging is commonly used during preventative maintenance and is a non-contact method of providing diagnostics information about the thermal states of critical equipment [2]. Thermography provides a two dimensional visual of the thermal pattern of heat generated by the equipment. One of the major advantages of thermography is that it requires minimal instrumentation [2]. A thermography device records the intensity of radiation in the infrared part of the electromagnetic spectrum and translates it into a visible image for the human eye. Using this technology, we can identify 'hot spots' on industrial equipment in a plant.

Smelters: A thermography image of the outer furnace shell of a manganese smelter identifies the waste heat energy radiated by the smelter on different parts of the outer shell. The temperature of the waste heat is displayed alongside the image with the colour temperature corresponding to the respective temperature scale. The temperature scale ranges from 25°C to 350°C and represents the waste heat emitted by the smelter.

Electric motors: Electric motors generate substantial amounts of waste heat. A typical electric motor during its operation consumed 275 kW and lost approximately 34 W through convection at its highest hot spot. In a common distillation column used in various refineries waste heat is generated throughout the rectification and stripping sections of the vertical shell of the distillation tower. The heat radiated from the vertical shell is determined by the chemical properties

of the product being distilled within the vessel. The temperature scale indicates a maximum of 200°C of waste heat being radiated across the tower shell.

The thermography image of a furnace chamber of a high pressure steam boiler in a sugar mill using fossil fuel for combustion shows the maximum temperature radiated from the furnace chamber is 352°C.

Wasted heat adds no economic value to an industrial plant. To the best of the author's knowledge, no alternative to thermoelectric technology exists for harvesting waste heat to produce small quantities of electricity.

Converting waste heat into electrical power has great potential within the industrial sector.

Table 1: Potential power that can be generated from different heat sources.

Heat Source	Temperature	Power
Outer Shell of a Smelter	30°C – 220°C	15,6 W-114,4 W
An Electric Motor	25°C – 65°C	13 W-33,8 W
Distillation Tower	90°C – 200°C	46,8 W-104 W
Boiler combustion chamber	47°C – 352°C	24,44 W-183, 04 W

Waste heat harvesting system: Case study

Thermoelectric generator for an industrial application

Thermoelectric modules utilising the Seebeck effect are attached onto a collar which is then mounted around a high pressure steam line. A temperature differential between the hot and cold side of the module causes the Seebeck device to generate an electric voltage. The Thermoelectric Generator (TEG) collar (used in this case study) is designed and developed to operate around a steam pipe in a boiler environment [6], [7]. A base plate is mounted to the collar of the TEG unit. The base plate improves contact between the collar and the module's hot-side by facilitating heat transfer from the pipe to the TEG device.

Two TEG devices are mounted to the stainless steel base plate and an aluminium heat sink dissipates heat from the cold-side the TEG module. Thermal coupling paste is used to maximise heat transfer from the TEG's cold side to the heat sink. Following several trails, it is found that the heat sink alone is inadequate in providing sufficient cooling. This can be attributed to the high ambient temperatures within the boiler environment. To improve the cooling system, readily available compressed air is utilised to dissipate the heat away from the heat sink. A stainless steel pipe is used to spray cold compressed air to assist with heat dissipation. Multiple 3 mm holes are drilled into the stainless steel pipe to blow directly onto the heat-sink fins for cooling. A 12 mm quick shut off ball valve is used to throttle and control the 6 bar compressed air. *Table 2* shows the cost of the components used to construct the unit. This cost can be significantly reduced if the device is to be implemented on a large scale. All the materials used for the unit are robust and durable, requiring minimal maintenance, on condition that the TEG device is operated within its specifications.

take note

- Modern industry is energy intensive.
- Plants consuming large quantities of energy have several potential sources of waste energy that can be harvested using modern technologies.
- Generating electrical power from waste heat depends on the temperature of the waste and heat source.

Table 2: Thermoelectric collar cost breakdown.

Component	Material	Material Type	New Cost (ZAR)
4 x TEG1B 12610-5.1	Ceramic plates	New	4 x R656 = 2 624
2 x Finned Heat-sinks	Aluminum (65 mm x 100 mm)	Reclaimed	2 x R440 = R880
2 x Base Plates	Stainless Steel 70 mm x 120 mm)	Reclaimed	2 x R200 = R400
2 x Bullet Hinges	Stainless Steel	New	2 x R150 = R300
1 x Pipe (6-inch)	Mild Steel (5.8-inches length)	Reclaimed	1 x R300 = R300
1 x Ball valve	Stainless Steel (3/8-inch)	Reclaimed	1 x R200 = R200
1 metre Air Tubing	Stainless Steel (3/8-inch)	Reclaimed	1 x R200 = R200
2 metres Flexible Air Tubing	Plastic Tubing (3/8-inch)	New	2 x R100 = R200
TOTAL			**R 4 904**

Conclusion

Figure 5: Thermoelectric generator unit simulated test.

The simulated thermoelectric generator unit (see *Figure 5*) produced encouraging results during the simulated workshop test and the plant tests. The maximum voltage and current generated by the device was 12,95 Vdc and 2,01 A, which equates to 26,04 W. These outputs are encouraging for further investigation into optimising and developing new energy harvesting applications. Heat sources can be easily identified using modern thermography technologies. By utilising thermography images, we can target high temperatures for conversion into useful electrical energy. This energy can be used to charge devices such as the batteries of an uninterrupted power supply, or to operate a low power device. Financially the cost of the technology seems to be prohibitive, but this amount becomes trivial if one takes into consideration the savings to the environment that will accumulate if these devices are utilised on a large scale to operate low power devices.

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Presented at CPUT's ICUE 2016.

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Cable test area doubled for extreme temperatures

In the course of its test laboratory expansion, the cable manufacturer and motion plastics specialist igus has set up another 40-foot container to carry out cable tests at extreme temperatures under real conditions. As a result, **igus** is the only cable manufacturer capable of providing guaranteed temperature ratings for fixed cables, moving cables, and also for cables in energy chains.

Continuous movements alone are a challenge for cables, but how do cables behave at extreme temperatures of -40°C or +60°C? There are indeed international standards for moving cables on the market, but they do not provide reliable information about the service life of moving cables at low or high temperatures in use in energy chains. For this reason, the cable expert igus has been testing its cables in continuous motion for a period of over ten years in these conditions and has now set up another test rig. "As part of our test lab extension to 2,750 square metres, we have now purchased a second 40-foot container and will run only heat tests in one, and cold tests in the other," explains Rainer Rössel, head of the chainflex division at igus. "This separation gives us even more precise test results and can thus guarantee even more reliable statements about our cables." Energy chains with cables can be moved in both containers in different lengths (also gliding) and speeds.

Guaranteed service life statements for extreme temperatures

Due to the large number of tests under real conditions, igus is the only supplier on the market to be able to make three statements on the appropriate bending radius and the permissible temperature for every cable in its chainflex catalogue. "We not only provide the information on the specific temperatures in which a cable is suitable for fixed installation as well as for the movement according to the standard cold winding test, we can also specify for each chainflex cable a temperature in which the cable can move with guaranteed reliability in an e-chain.

The varying temperatures in applications under these conditions are as different as the problems that can arise: In the case of cold tests, jacket ruptures are the biggest challenges. In the case of excessive heat, however, there is the risk that the total core formation will no longer hold due to the thermal alteration of the outer jacket and ultimately fails because of the constant bending in the energy chain. As a result, for example, single strand breakage or the so-called 'corkscrew' effect can occur. By doubling the test capacities in the second container, the limits can now be simulated better by igus and, for example, problems with condensation water caused by rapid temperature changes can be prevented in the test rigs.

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IS Infrared thermometers

IS Infrared (IR) thermometers are not common to all IR thermometer suppliers. However, Raytek has available a full range of IS units for fixed or portable applications. **Raytek**, provides a complete range of IR thermometers with IS certification, approved and certified by SANAS.The units are designed for accurate temperature investigation in all types of environments. Intrinsically Safe models include portable and fixed units with simple 2-wire loops and programmable ranges up to 2 000°C.

The popularity of IR thermometers continues to grow because of their ease of use, reliability and affordability. Like traditional thermometers, IR thermometers translate hot and cold into numeric measurements. However, unlike traditional methods, an IR thermometer does not require you to touch the object you are measuring. Simply point and immediately read the temperature in the display.

Instantaneous reading and reliable results make trouble shooting quick and easy, with less chance for error. IR thermometers help process and maintenance engineers alike to quickly check their plant, giving them the information needed to assess the temperature and plan the most effective solution.

Enquiries: R&C Instrumentation.
Email info@randci.co.za

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Wafer-thin separation

Jochen Gries, Electrical Temperature Measurement, WIKA

Innovative multipoint thermometer design enables very short response time

The pharmaceutical industry is changing. A large proportion of the manufacture, especially for the 'blockbusters', has shifted to emerging markets. The businesses in the established producing countries are increasingly focusing on high-value, personalised medicines, down to the requirements of an individual patient. The batches are getting smaller, as the diversity of medications and active ingredients is increasing. From this, changes in the production processes also follow. They are structured more flexibly and increasingly consist of small elements.

In the pharmaceutics of personalised medicines, we are generally talking about cost-intensive products. Losses due to errors in the process can cost the company dearly. Accordingly, the demands on the process's monitoring and control sensor technology grow.

In monitoring functions, temperature measurement plays a central role. On it rests crucially whether ingredients effectively compound or whether a product loses its effect through too high temperatures. The thermometers fitted within a reactor must register both quickly and accurately whether the limit values have been reached and heat must be supplied or limited. Multipoint thermometers lend themselves to the monitoring of processes in reactors. Depending on the task, these offer several predefined measuring points. One common variant is the 'multipoint thermometer in band design', where several resistance thermometers or thermocouples are arranged linearly along a guide band.

In this way, the instrument maps the reactor's temperature profile, with which the operator can, for example, understand the mixing of active ingredients or detect the thermal reactions spatially.

All measurement results are reproducible, since, in the case of a change of instrument, the orientation of the measuring point design also corresponds to the demands of the pharmaceutical industry. It is dead-space free and easily cleanable.

With the instrumentation of sensitive pharmaceutical processes, the precision of the measurement is not the only issue. It is equally important how quickly the required accuracy can be provided. The thermowell, which is indispensable on the grounds of process safety, does act as a brake in this regard. The extent to which the heat transfer from the process medium to the thermometer is delayed depends on the wall thickness of the thermowell and the clearance between the inside of the tube and the thermometer. In a multipoint thermometer in band design, for example, the individual measuring points are held against the inside with pressure springs, so that a better contact to the medium is established and the response times are thus reduced.

One can further increase the rate of the heat transfer by using a lower thickness of the thermowell wall. This measure is relatively easy to implement, especially as the processes in reactors do not normally place high demands on the mechanical strength of a thermowell. A reduced wall thickness can, indeed, significantly accelerate the thermometer reaction. However, even this step is not sufficient for the demands in the processes mentioned. Accordingly, it is ultimately only possible to achieve a fast (meaning 'almost immediately') responding multipoint temperature measurement through an alternative measuring point design. Against this background, WIKA has developed an innovative multipoint thermometer construction on behalf of a pharmaceutical company.

With this instrument model, already proven in practice, the temperature measuring points are only separated from the medium by a diaphragm with a thickness in the range of tenths of a millimetre. The sensors are each fixed to the rear side of the diaphragm and the diaphragm then welded to the thermowell. An encapsulation from the surrounding wall of the thermowell thermally decouples each measuring point from the inert thermowell mass that retains the heat longer and would thus distort the measuring result.

Through this almost direct contact of the probe with the medium to be measured, a response time t90 of < 7 seconds can be realised. The thermometer can thus accurately detect even the slightest changes in the temperature profile, which would otherwise remain undetected due to the thermal inertia of the thermowell.

For the sensor, a thin-film resistance thermometer with high measurement accuracy is used. For applications with high temperatures, the multipoint thermometer principle can also be implemented with thermocouples. The arrangement of the measuring points in the thermowell can be designed flexibly – in a straight line, offset or helically. A measuring point in the tip of the stem is also possible.

The multipoint thermometer has been custom-designed for an operating pressure of up to 60 bar. With this quality, it is suitable for most pharmaceutical applications of this type. The instrument can, however, also be designed for processes where the reactions run at higher pressures.

Enquiries: Email sales@wika.com

Jochen Gries, WIKA

HOT high temperature IR thermometer

Fluke, represented locally by **The Comtest Group**, has on offer the highly accurate Fluke 572-2, high temperature Infrared (IR) thermometer for extreme heat conditions over long distances. Typical applications are:

- ***Manufacturing:*** Repair and maintenance of motors, pumps with data logging
- ***Electrical HVAC installation:*** Repair and maintenance of panels, fuses, circuit breakers, compressors, ducts, and remote access vents
- ***Power utility:*** Measurement of nodes between power transmission and distribution
- ***Metals:*** Maintenance and quality control where there is monitoring of temperature during the process
- ***Petrochemicals:*** Maintenance of the exterior of the kiln (temperature), monitoring the surface temperature of the reformer tubes

The Fluke 572-2 measures between -30°C to 900°C with ±1% accuracy. Measurements from further away are accurate with a 60:1 distance-to-spot ratio with dual laser sighting for fast, accurate targeting. It displays current temperature plus MAX, MIN, DIF, and AVG temperature with adjustable emissivity and predefined emissivity tables. Available from The Comtest Group, the unit features a multiple language (user select) interface and is compatible with standard K-type mini-connector thermocouple probe (KTC), and is shipped with a USB 2.0 computer interface cable; FlukeView Forms Documenting Software.

Enquiries: The Comtest Group. Tel. +27 (0) 10 595 1821 or email sales@comtest.co.za

Intrinsically Safe IR thermometers

Fluke, represented locally by **The Comtest Group**, has on offer the Fluke 568 Ex, intrinsically safe (IS) infrared thermometer which meets intrinsically safe certifications from all major safety agencies for Class 1 Div 1 and Div 2 or Zones 1 and 2 hazardous environments. Ideal for use in environments such as petroleum, chemical, oil and gas or pharmaceutical environments, the Fluke 568 Ex is one tool that can be used anywhere, worldwide.

The unit measures between -40°C to 800°C with ±1% accuracy. Measurements from further away are accurate with a 50:1 distance-to-spot ratio. The Fluke 568 Ex captures up to 99 points of data and is versatile, with a multiple language (user select) interface and adjustable emissivity, built-in material table. The Fluke 568 Ex is compatible with standard K-type mini-connector thermocouple probe (KTC) and is shipped with a conductive case for carrying into hazardous areas. It also carries the standard Fluke 2-year warranty.

Enquiries: Tel: +27 (0) 10 595 1821 or email sales@comtest.co.za

Service-oriented Drive Deployments **Improve VSD Driveline Uptime**

Philippe Hampikian, Schneider-Electric

Variable Speed Drives (VSDs) were introduced to the market several years ago, and since then, they have proliferated across many industries.

Despite their popularity, much work still needs to be done to fully integrate these technologies in order to develop highly available manufacturing environments. This article explains how VSDs can be utilised as smart devices that help to monitor system performance and also reveals how these devices can be converted to function as Service-oriented Drives (SODs).

Today's VSD phenomenon can be compared to the state of the automobile in the 1960s. Although many families owned a car during that era, car safety was not yet a high priority. Over the last 50 years, many automobile safety initiatives were gradually introduced on a number of different levels. As a result of these initiatives, in developed countries, the number of automobile-related deaths decreased significantly.

As with the automobile in the 1960s, even though VSDs have reached a certain maturity level from an installed base perspective, the ways in which these devices are being implemented and maintained are still immature. This is a problem because users and purchasers of these devices are not leveraging the full energy consumption and equipment uptime benefits of the technology.

Most VSDs are installed within a 'chain' of other electromechanical devices (such as transformers, circuit breakers, motors) or mechanical devices (motors, gear box, mechanical transmission). Together these all form what we refer to as a 'driveline'. However, the VSD stands out as being quite different from the rest of its partners in the driveline. VSDs are electronic devices and are the only 'actors' in the chain with embedded intelligence. This intelligence allows for the concept of the SOD to become a reality. The SOD concept allows these VSDs to minimise their own downtime and also allows them to be utilised as smart sensors for the entire driveline (monitoring, for instance, motor torque temperature, main voltage, and load energy consumption).

Today, maintenance managers agree that, in most operations, maintenance practices are 60% reactive, 30% preventive and 10% predictive (see *Figure 1*). Reactive, or corrective maintenance, is a response to an unanticipated problem or emergency. Preventive maintenance implies the systematic inspection and detection of potential failures before they occur. Predictive maintenance is a type of preventive maintenance which estimates and projects equipment condition over time, utilising probability formulas to assess downtime risks. The SOD concept helps facilities managers and maintenance personnel to 'move the needle' more in the direction of the anticipative behaviour (predictive) model.

FAQ – Frequency Asked Question
HMI – Human Machine Interface
QR – Quick Response
SOD – Service-oriented Drive
VSD – Variable Speed Drive

Abbreviations/Acronyms

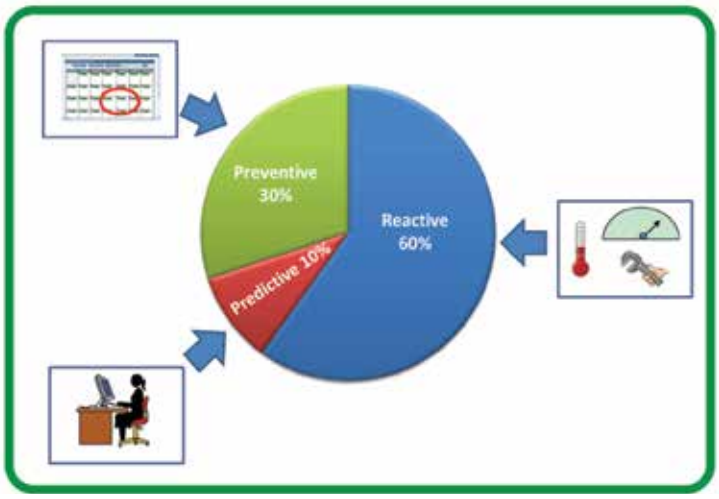

Figure 1: The current state of industrial site maintenance strategies.

Engaging pre-alarming and alarming capabilities

Drives must be connected properly so that they can inform maintenance service providers in an automated, real time fashion of any impending failure or of an actual failure. Drives with SOD-enabled capabilities use both local area network protocols and web services to communicate.

The drives can be designated as either 'on premise' or 'remote access' depending on IT infrastructure and privacy constraints. Automatic E-mails and short message service (sms) texts can be generated to inform operators on any unusual equipment behaviours. Again, the SOD functionality not only sends warnings about the drive's own internal issues, but can also report on the status of the entire drive line.

Enabling remote technical support

High turnover of on-site maintenance personnel and low failure rates in VSDs make outsourcing diagnostic and troubleshooting activities to outside experts a sensible option. Nowadays suppliers provide phone and online access to certified remote technical support and field service engineers.

Tools such as QR (quick response) code technology (for non-connected drives), and remote monitoring (for connected drives) can help to link the SODs to the diagnostic experts. These people are trained and certified to address issues that surround commissioning, diagnostics, spare parts selections, troubleshooting, and preventive / predictive maintenance operations.

When setting up remote technical support, on site or remote operations intervention conditions have to be pre-defined and agreed to among the users and the providers, particularly when it comes to critical operations.

Allowing easy access to documentation

In the context of maintenance and support, easy access to proper documentation is a key factor in enhancing operational efficiency. Implementation of SODs allows for easy on-line access to either standard generic information (such as datasheets and instruction manuals) or asset specific information (such as a product maintenance booklet or parameter files). Listed below are tools that can help to facilitate implementation of such a process:

- ***Static QR codes:*** Scanning an SOD label provides access to instruction manuals and FAQs
- ***Dynamic QR codes:*** Scanning an SOD terminal display links directly to the proper part of the troubleshooting documentation
- ***Dedicated service maintenance software:*** This allows service personnel to access detailed key measurements and indicators
- ***Cloud data repository:*** This vast resource of inexpensive storage can house the entire product lifetime information, from one line drawings, to conformity certificates, warranty status, maintenance booklets, start-up and commissioning reports, and repair reports

Consider the following real-world example of how such digital connectivity helps to address business problems:

For some unknown reason, the grinder at a manufacturing plant went down. Production came to a halt. The human machine interface (HMI) of the machine reported 'General circuit breaker switched off'. The operators opened the door of the enclosure to switch the device on, but a short circuit had damaged the 500 kW VSD of the motor.

By scanning the QR code on the front face of the drive, the operators were instantly connected to the drive manufacturer's customer care centre, which promptly dispatched a field service engineer. The engineer replaced the defective control board and then, by scanning the same QR Code, he was able to access the cloud database which contained the specific configuration file (on-line documentation) of the drive. In short order the grinder was re-started and functioned properly. By the end of his visit, the field engineer stored his report in the same database, to be sure that a documented record of the event was kept on file.

Improving ease of repair and enabling lifetime monitoring

Depending on installation criticality, several spare parts management options such as on-site spare parts, a partial set of spare parts, or ownership of parts should be considered. Some of the VSD manufacturers may suggest the approach that makes the most sense given the specific situation. To minimise troubleshooting operations, and subsequently downtime, SOD is 'designed for maintenance'. The

SOD architecture facilitates simple and quick maintenance repair procedures. A lifetime monitoring system is also embedded in an SOD-enabled drive. This system issues warnings when parts are likely to wear out (this depends upon operating time and environmental conditions) and when warranties are about to run out.

> *VSDs can be leveraged to perform predictive maintenance so that plant uptime can improve.*

Start up and commissioning benefits

'The system issues warnings when parts are likely to wear out and when warranties are about to run out.'

The proper start-up and commissioning of VSDs is not a trivial exercise and the penalty for doing it wrong can lead to unanticipated downtime. Experts who perform the start-up of 'on-load' VSDs over and over are well equipped to make sure the process is smooth and painless.

The time savings that result assure faster time to market and the risks of poor operation of a new installation are minimised. The SOD approach serves as a high level commissioning tool. The feedback provided by the intelligence of the drive indicates whether the system is functioning as specified. In addition, asset specific documentation access is instant. With the addition of these very early field service reports, documentation history is complete and recorded starting Day One.

Preventive and predictive maintenance planning

Electromechanical and mechanical devices such as transformers, circuit breakers, motors, gearboxes and mechanical transmission have a predictable behaviour allowing their maintenance to be planned. Models exist which have compiled operating time, load and torque, and temperature data and established sets of rules for when these components can be expected to fail.

Similar rules for VSDs (since they are electronic devices as opposed to the aforementioned electromechanical and mechanical devices) are unclear and more unpredictable. However, SODs can act as 'smart' sensors, and collect data on all of the key parameters affecting the driveline lifetime (such as operating time, temperatures, torque, main voltage, currents).

Through such monitoring, the SODs can compute future outcomes for those chain elements that are predictable, and to perform statistical analysis on those components in the driveline that are not predictable. Recent surveys indicate that global process industries lose an estimated $20 billion annually due to unscheduled downtime (equivalent to 5% of production revenue).

This loss significantly impacts factory profitability and efficiency. In order to address this issue, many industries are reducing overall downtime impact by migrating to technologies designed specifically to maximise uptime.

Conclusion

The SOD approach represents a new generation of devices that are integrated with services which allow for minimal downtime. The 'built in' capabilities of SOD-enabled devices help manufacturers to begin their migration to future 'smart' factories by connecting key devices and transmitting digitised information that allows for preventative actions in the maintenance arena.

In the short term, SODs will make reactive and preventive maintenance operations more efficient. In the longer term, data collection and analysis capabilities begin to allow predictive maintenance to become a reality. The SOD concept allows for a transition from reactive to anticipative maintenance, which is at the heart of all maintenance operation strategies.

take note

- VSDs have proliferated and are installed in large numbers throughout various industries.
- Since these technologies are relatively new, not much thought has been given to the integration of these drives.
- Nor have their potential energy savings been fully realised.

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Creating the awareness we need to reduce electricity consumption

Johan Jansen Van Rensburg, T-Systems South Africa

Smart electricity metering is a technology field that continues to gain momentum, with a number of developed economies successfully introducing the technology. In the European Union, for instance, governments aim to replace about 80% of electricity meters with smart meters by 2020. Smart meters enable households, municipalities and energy companies to accurately monitor consumption, adjust energy flows and pricing to create optimal balances between supply and demand, and more easily integrate renewable energy sources into the grid.

We believe that it is not the smart meters themselves that will solve South Africa's energy crisis, but rather their ability to create greater consciousness about how we can all play a role in solving the problem. Think about the example of prepaid airtime and mobile data. Consumers are generally very comfortable dialling a USSD string or opening up a mobile app to quickly check their balances. We've all become very good at regulating our behaviour based on this instant and always-available information. We know which types of phone calls, websites, apps and messaging services use the most airtime or data.

Imagine getting to the point where we have that same level of detail about our household electricity usage – knowing which appliances are consuming the most electricity at which times of the day. Just like with our smartphone behaviour, we'll start becoming much savvier about how we use our electricity.

More information = more action

This has traditionally been the problem with post-paid, and to some extent prepaid electricity. Feedback on our usage patterns is just too opaque for us to know how to make those little changes in our usage, which add up to create a big difference at a national level.

Contrast that with the scenario that becomes possible with intelligent metering solutions: smart apps showing the time of the day that you use the most electricity, and revealing the most energy-hungry applications; useful tips that are tailored to your specific usage patterns and guide you on reducing your consumption; and the chance to participate in national energy-saving campaigns or incentives. When it comes to energy consciousness, more information really does equal more action.

Smart metering technology can be easily retro-fitted into existing prepaid meter environments, with little additional investment required on the part of the consumer. The dashboards and consoles showing usage patterns can be viewed from simple mobile apps or web portals.

Due to the greater infrastructure costs further upstream in the value chain (utilities, distributors, municipalities etc) the 'per kilowatt hour' price of smart-metered electricity may be slightly more expensive. However, these increases will be greatly outweighed by the reduced number of units now consumed, generally resulting in a net financial gain for the consumer.

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Drives for auto-retrieval area at major pharmaceutical distributor

Pharmaceutical distributor and logistics service provider DSV Healthcare of Meadowview, Johannesburg is a showcase of SEW-EURODRIVE products, with a large quantity of drives in the automatic retrieval area alone.

The four-year-old Meadowview facility is the result of extensive growth at DSV Healthcare, which distributes products to pharmacies and hospitals throughout South Africa, as well as exporting to the rest of the continent. Maintenance Manager Peet van der Linde adds that the plan is to add the MOVITRAC LTP-B Eco HVAC drive units to its extensive spares inventory, as the company cannot afford any downtime on any of its systems.

It is also planned to standardise on **SEW-EURODRIVE** products at the pharmaceutical distributor in the future, as its automated pick-and-place and sorting system, including cranes and conveyor belts, already uses gearmotors and drives from the German OEM. "In the automatic retrieval area alone, which has 16 levels and is 28 m high, we have a large quantity of drives from SEW-EURODRIVE.

"The main benefit of standardising on SEW-EURODRIVE products, apart from the quality and cost-effectiveness, is the aftermarket service and support that is offered," van der Linde adds. In addition, the HVAC drives are extremely user-friendly in terms of installation and start-up, with a text-based screen guiding the user through the parameters.

The new HVAC drives are an integral part of DSV Healthcare's facility-wide Building Management System from Johnson Controls. The Medicines Control Council, which regulates the Medicines and Related Substances Act for the manufacture, distribution, sale, and marketing of medicines, requires the facility to maintain a constant humidity of 60% and a temperature of 22°C.

"If the humidity and temperature level of our facility goes out of range, it becomes a reportable deviation after 24 hours. This means we end up with critical stock that cannot be distributed. Therefore it is vital that the internal environment be maintained within the prescribed parameters," van der Linde comments.

DSV Healthcare decided to opt for the MOVITRAC LTP-B Eco HVAC drive units from SEW-EURODRIVE following lightning damage of existing competitor units. Despite heavy storm conditions following the successful installation, the drive units have performed flawlessly, comments Mechatronic Sales Engineer Hendri Oosthuizen.

"These units were supplied to run the centrifugal evaporator fans for the client's building air-conditioners. They offer exceptional reliability and longevity due to the fact that they are supplied with built-in line filters." Oosthuizen notes that the design specifications were three-phase 400 V supply, 15 kW HVAC drives, while the installation requirements were IP55, analogue setpoint control, and relay feedback for running and alarm status.

The main advantage of the new HVAC drive is that it is designed for maximum motor-control efficiency. Efficiency is improved by up to 4% compared to standard AC drives, while also reducing supply current total harmonics distortion (iTHD), improving the Real Power Factor, and reducing total input current, leading to installation cost-savings through reduced cable and fuse ratings and smaller supply transformer rating. The drives are also manufactured in accordance with RoHS, a European Union product directive applying to electronics manufactured within the EU, or imported from other countries.

Additional features include intelligent standby. This parameter defines the time period whereby if the drive operates at minimum speed for greater than the set time period, the LTP-B HVAC output will be disabled, and the display will show 'standby'. This parameter can be customised according to the customer requirements. Another feature is the energy-saving function.

When enabled, the inverter automatically reduces the applied motor voltage at light loads. This inverter is also EN 61000-3-12 compliant, and has a wall-mounting design, an OLED multi-language plain text display, and interfaces for BACnet IP, EtherCat, DeviceNet, Profibus DPV1, Modbus TCP, and ProfiNet.

The drive also has a programmable service-interval parameter for routine drive or system maintenance alerts, with the diagnostics menu including a handy read-only 'time to service' parameter. The OLED display flashes an indicator whenever a service is due.

Meanwhile, the drive outputs are configurable for 'service due' indication, followed by a simple service 'reset' procedure. The Variable Speed Drive (VSD) service procedure is as recommended by SEW-EURODRIVE, with published checks for increased product life. Other features include fire mode, fan-belt break detection, a PID sleep/standby function, and a bypass control.

While a qualified electrician is required in terms of the wiring, SEW-EURODRIVE is always willing and able to assist clients with start-up if required. Oosthuizen adds that the inverters on the new HVAC drives boast an array of 'smart' features to assist with maintenance and service intervals for pumps and fans.

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Eskom Contractor Academy

Mamapo Chemicals owner, Ezekiel Madigoe, will be awarded a certificate after successfully completing the **Eskom** Contractor Academy course. Madigoe learned about the academy when his company competed and won the overall prize in the Eskom Development Foundation Business Investment Competition in 2015.

"Being a believer in continuous learning and self-improvement, when I heard about the academy, enrolling for it was an obvious next step for me," says Madigoe. His company, based in Lebowakgomo, Limpopo, was established in 2012. They manufacture and distribute a range of industrial and household chemicals such as degreasers, laundry and dish-washing liquids. They also recently started manufacturing animal feed and fertilisers and providing waste management services.

The Contractor Academy is the Eskom Development Foundation's programme to equip small business owners and emerging entrepreneurs with the necessary skills required to build sustainable businesses. It is offered to contractors and suppliers wishing to improve their skills in project and financial management, entrepreneurship, legislation and technical acumen.

Madigoe says he and his 34 employees have been struggling to secure long-term and major contracts and his participation in the academy will go a long way towards helping them change that. He was inspired by the success stories of some of the academy's previous students.

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Mamapo Chemicals owner, Ezekiel Madigoe.

Central network management with Direct Access Point

Siemens is expanding its portfolio of network components with the launch of a new Direct Access Point: the Scalance W1750D-2IA RJ45. It transmits in accordance with the latest WLAN Standard IEEE 802.11ac Wave 2. Scalance W1750D-2IA RJ45 is capable of transmitting at extremely high data rates, making the device particularly suited for wireless applications requiring high bandwidths. Benefits include the scalable design, central management, eight integrated omnidirectional antennas and simple integration into both new and existing networks. When it comes to secure, rapid wireless communication and data transmission within industrial networks, the Siemens Scalance portfolio contains all the network components needed to ensure reliable operation in all kinds of industrial environments. The Scalance W1750D-2IA RJ45 Direct Access Point is the latest addition in the field of wireless communication solutions from the Scalance product spectrum.

The device transmits in compliance with the latest Wireless Local Area Network (WLAN) standard IEEE 802.11ac Wave 2, enabling significantly faster data rates than were possible with the IEEE 802.11n standard previously supported by Scalance W. Its modern low-profile design and minimal weight allow the Scalance W1750D-2IA RJ45 to be mounted simply and flexibly on walls or ceilings. Application possibilities also include e.g. assembly halls with adjacent office, admin or conference rooms, canteens or warehouses, where the device is particularly suited for applications requiring high bandwidths, such as video transmission.

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Wärtsilä to supply its first ever gas-fired power plant to China

Wärtsilä will supply a 30 MW combined heat and power (CHP) plant to CGGC UN Power in China.

This will be the first gas-fired medium-speed engine power plant in China, marking the entry of a new technology in the market. This is a landmark project and proof that innovative, flexible and efficient power generation plays a key role in the Chinese power system.

The Smart Power Generation plant, consisting of three Wärtsilä 34SG engines running on natural gas, is scheduled to be fully operational during 2018. Wärtsilä's scope covers the equipment supply. The order is booked in the first quarter of 2017.

China Gezhouba Group Cooperation (CGGC), established in 1970, is a state-owned enterprise engaged in construction, environmental protection, real estate, cement, civil explosive, finance and, equipment manufacturing.

CGGC UN Power, as its key member, is focused on the integrated service for various distributed energy solutions such as gas engine power plants and is investing in power generation in China.

CHP plants are gaining foothold in the Chinese market, supported by the need for a reliable heat and power supply as the population increases.

The new Guangdong Huadian Panyu Wanbo CBD Distributed Energy Project power plant will be located in Guangzhou.

It will generate electricity that will be fed into the national grid. The CHP plant will also provide heating and cooling energy to commercial office buildings and shopping malls in the area.

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Spotlight on PID solution at The Solar Show Africa 2017

An industry-leading solution to the problem of Potential Induced Degradation (PID), which can slash the output of a solar-power plant by as much as 70%, will take centre stage at The Solar Show Africa 2017 from 28 to 29 March at the Sandton Convention Centre. This exhibition and conference for the renewable energy sector will provide an ideal opportunity for **Omron Electronics** to showcase its technology to designers, integrators, and EPC contractors, which offers increased flexibility in terms of system design – a major factor in ramping up the cost-effectiveness and return on investment of these projects in Africa.

The KP100L is unique in the industry in being the only PV inverter of its kind to prevent Potential Induced Degradation (PID)," Omron Electronics Solar Specialist Ross Allan comments. PID poses a huge limitation, as it reduces the output of a PV module after only a few years of service. "The cost implication is apparent when you consider that solar-power plants usually have a 25-year lifespan."

The particular innovation of the KP100L is its embedded ZCC (ZigZag chopper circuit) technology. "What this achieves is effective control of the negative pole voltage, as if it was virtually grounded," Allan points out. This removes the need for integrated transformers or any other hardware to prevent negative voltage.

"Not only is the KP100L a transformer-less PV inverter, it is also cheaper, lighter, smaller, and much more efficient, and the inverter boasts an impressive efficiency rate of 97,5%."

Additional features include a wide Maximum Power Point Tracking (MPPT) range, three MPP trackers suitable for multiple and single use, extra peak capacity, increased efficiency in low-radiation scenarios, a balanced three-phase feed-in, and integrated smart functions for ancillary grid services.

The KP100L PV inverter also features NRS 097 2 1 certification specifically for application in the South African electricity supply industry.

Global representatives from Omron Electronics who will be on hand to share their experience and expertise with visitors and prospective clients are Stefano Corni, Key Account Manager, and Eleonora Denna, Product Marketing Manager, both from Environmental Solution Business, Europe.

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Up the uptime with high quality electrical products

Component, equipment and system specialist, Hudaco company Powermite, locally manufactures electrical products for a wide range of mining, marine and industrial machinery including mobile generators, pumps, welding machines, continuous miners, shuttle cars, tunnel borers, and transformers.

According to **Powermite** Marketing Director, Donovan Marks, quality and reliability are prerequisites for extending the lifecycle of products operating in the notoriously stringent mining environment. "Increased product lifecycle goes hand in hand with optimised uptime and productivity so quality therefore takes centre stage when it comes to our range of electrical products and components."

Powermite's ISO9001:2008 compliant electrical products are manufactured locally by sister companies Proof Engineering and Ampco under one roof in a new state-of-the-art manufacturing facility on Johannesburg's West Rand. Both companies carry SABS approval to IEC60079 Parts1 and 2, and SANS 1489 – 2005, and to 60309 Parts 1 and 2 respectively.

"Pooling the talents and resources across both businesses has created the largest plug and socket manufacturer under one roof in Africa," states Marks. "In addition to lowering our cost base, combining the strengths and synergies of the two companies has improved efficiencies across the board and has resulted in more streamlined processes and logistics. Marks adds that local manufacture ensures rapid product and spares availability, another vital element to maximising production levels.

Plugs, sockets, couplers and adaptors

Proof Engineering is a flame- and explosion-proof product specialist with over 45 years' experience in the manufacture of world class components, equipment and systems for Southern African industry. The company produces PLM366 and PLM415/515 plugs and sockets as well as an 11 kV 800 A tunnel coupler and adaptor for open cast applications, 22kV 400A couplers for draglines and more recent additions include a new 35 kV 400 A coupler and adaptor for overhead line skids. An extensive series of plugs, sockets, couplers and adaptors, ranging from 120 A 1,1 kV to 400 A 12 kV, is also available from Proof for underground equipment. Proof Engineering's unique phase-to-phase segregation eliminates the risk of phase-to phase-faults which can cause costly downtime and lead to serious injury to personnel.

Another innovation from Proof Engineering is the unique ProAlloy coupler. Manufactured from a non-theft zinc, copper and aluminium combination material, the coupler a remarkable 33% lighter than its brass counterpart and most importantly, holds no resale value.

Plugs and sockets for underground operations

Available from the Ampco stable are plugs and sockets suitable for certain underground operations. The company also manufactures a range of products that focuses primarily on industrial applications and is ideally suited for mobile generators, pumps, welding machines, factory installations, etc. The Ampco range features a unique interlocking design which prevents the end user from removing the plug under load. The application of LM 6 reduces the possibility of corrosion and extends product lifecycle.

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6,6 kV 300 A Pro-Alloy Anti-Theft Coupler.

CESA's interventions to drive constructive and sustainable transformation

'Watch this space'!

This year will see Consulting Engineers South Africa (CESA) take the lead in transforming its membership and industry. This is a critical theme in the light of the many obstacles the country is facing more than 20 years after democracy, despite significant strides made by government to transform society, CESA President, Lynne Pretorius, told members of the media at a function, in Rosebank. "Consulting engineering is experiencing similar challenges. Broad-based black economic empowerment (BBBEE) policies also gave rise to 'fronting', and questions are being raised about the effectiveness of the BBBEE scorecard in realising transformation," cautioned Pretorius.

Change driver

This presidential theme for the year is being driven by CESA's Transformation Committee, which comprises members from both Established and Emerging firms. The committee will promote transformation as an ethical business practice and monitor progress made by its members beyond the requirements of the Construction Sector Scorecard. In addition, it will help members understand that transformation is an ongoing process:

- *Facilitate sustainable BBBEE practices within the industry*
- *Promote the practice through member's professional and business activities, among others*

Pretorius noted that this intervention is essential considering that black ownership is still low at all levels of the industry.

"An overall assessment of employment by race indicates that the percentage of black employment has varied between 40% and 50% since 2007. There has also been no notable increase in black staff within CESA membership over the past four years," she said. Of the 533 firms on CESA's current database, only 122 firms are black-owned, with this ownership less than 51%, at present.

Women in the minority

Meanwhile, the percentage of women engineering staff employed by CESA members is between four and six percent of total consulting engineering professionals, and black women make up about 12% of this group. Transformation of the consulting engineering profession is also being hindered by the limited number of learners competent in mathematics leaving the school system, while the industry has to compete with other sectors to attract talent from this small pool to engineering degree programmes. She says the status quo has been extremely damaging to the profession, with these unconvincing statistics further eroding the credibility of the sector. "Typical statements made in the country refer to 'engineers being old white males' and that 'consulting engineering firms are only interested in making money'," noted Pretorius. CESA's interventions to drive real and sustainable transformation will include developing a pipeline of engineering professionals over the long-term by identifying and then supporting learners with a technical aptitude at secondary school level. It will also consolidate efforts to create and implement a process for supporting tertiary engineering students and mentor graduate engineering staff in the workplace to develop their skills and competencies required for professional registration.

CESA takes action

Meanwhile, the association has identified a host of potential support programmes for small, medium and micro enterprises, which constitute about 95% of CESA's existing membership. Of this grouping, only 24% are black-owned with black ownership greater than 51%. Pretorius said CESA is also offering to partner with government departments to second young engineering staff in the public sector to member firms where they will gain critical experience. It will also develop awareness programmes to combat the barrier faced by women in the industry in order to attain a win-win situation for both employers and employees in our sector. Importantly, the thorough detailing of BBBEE in annual declarations of members firms submitted to CESA will definitely bolster this transformation agenda, as we will for the first time to be able to measure and monitor transformation in our industry at a detailed level over overtime as opposed to being reliant on BBBEE scorecards, which are not always a true reflection of the demographic profile of our industry. In the words of Pretorius,

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CESA Chief Executive Officer (CEO) - Chris Campbell and CESA President, Lynne Pretorius.

Yokogawa

Gopolang Tsheole, QC Specialist

Kgutsitse Mthunzi, Procurement and Logistics Manager

Kalind Singh, Systems Proposal Engineer

AVeS Cyber Security

Cecil Munsamy, Managing Director

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Smart Buildings & Infrastructure
24 May (Africa Summit in Sandton, Johannesburg)
15 August (Western Cape Summit, Cape Town)
Enquiries: Visit www.smart-summit.com

Power & Electricity World Africa 2017
28 – 29 March 2017
Sandton Convention Centre, Johannesburg
Incorporates 'The Solar Show Africa' (meet with the right customers in the solar industry), 'The Water Show' (discover the latest services and innovation) and 'Energy Efficiency World' (bringing together buyers from across the energy spectrum).
Enquiries: Email Courtney.Harty@terrapinn.com

Domestic Use of Energy (DUE) Conference 'Energy efficiency in the home'
3 – 5 April 2017
Cape Town campus, Cape Peninsula University of Technology (CPUT)
Prospective delegates may register for the conference by contacting. Delegates are also invited to present papers at the conference. Delegates who would like to present papers should submit provisional titles of their presentations. Full papers are to be submitted before 30 January 2017. Brief abstracts of about 200 words may be submitted.
Enquiries: Nadia Cassiem.
Email cassiemn@cput.ac.za
Visit http://energyuse.org.za/due/

Securex 2017
30 May – 01 June 2017
Gallagher Convention Centre, Midrand, Johannesburg
Securex is Africa's leading security and fire exhibition. The exhibition enjoys the support of a number of industry associations, a fact that underlines the credibility of Securex as Africa's leading security and fire exhibition.
Enquiries: Email leighm@specialised.com

POWER-GEN & DistribuTECH Africa 2017
18 – 20 July 2017
Sandton Convention Centre, Johannesburg
Sustainable power generation and distribution in a constrained market is a top of mind issue across Africa. Seeking to share knowledge and catalyse development that helps address Africa's power challenges, PennWell Corporation, the organisers of POWER-GEN & DistribuTECH Africa, have issued a Call for Papers. The abstract submission deadline is 5 January 2017.
Enquiries: Leigh Angelo.
Email leigh@tradeprojects.co.za

Industrial and Commercial Use of Energy (ICUE) Conference
14 – 16 August 2017
Enquiries: Nadia Cassiem.
Email cassiemn@cput.ac.za

Drive360

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Girth gears - the latest offering in our industrial gear range - are used to drive large, rotating systems such as dryers, rotary kilns or horizontal mills. Traditional girth gears generally consist of two to four segments that are assembled together for processing. In contrast, SEW-EURODRIVE girth gears are split into several identical segments in order to keep the component parts short and easy to handle. We deliver not only girth gears, but the entire drive package!

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- Handling of each individual segment is easier
- Segmented design enables easy and cost-efficient transportation

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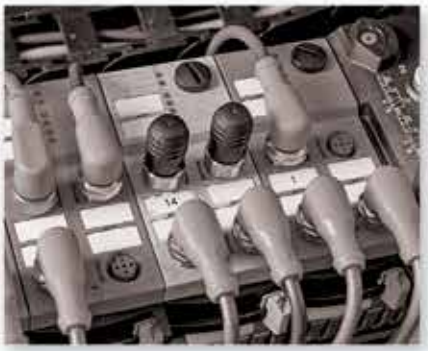
SEW EURODRIVE

ifm electronic

Safety technology from ifm electronic



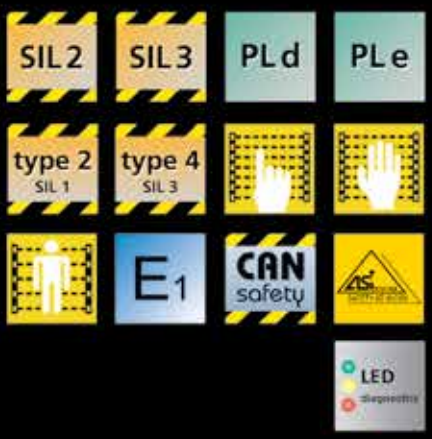






Safety technology in automation minimises the risk of damage to persons or installations.

- *Fail-safe inductive sensors*
- *Safety light curtains*
- *Safety light grids*
- *Safety relays*
- *Safety controllers*
- *AS-i Safety at work*
- *Safe speed monitoring*
- *Safety control system ecomatmobile*



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