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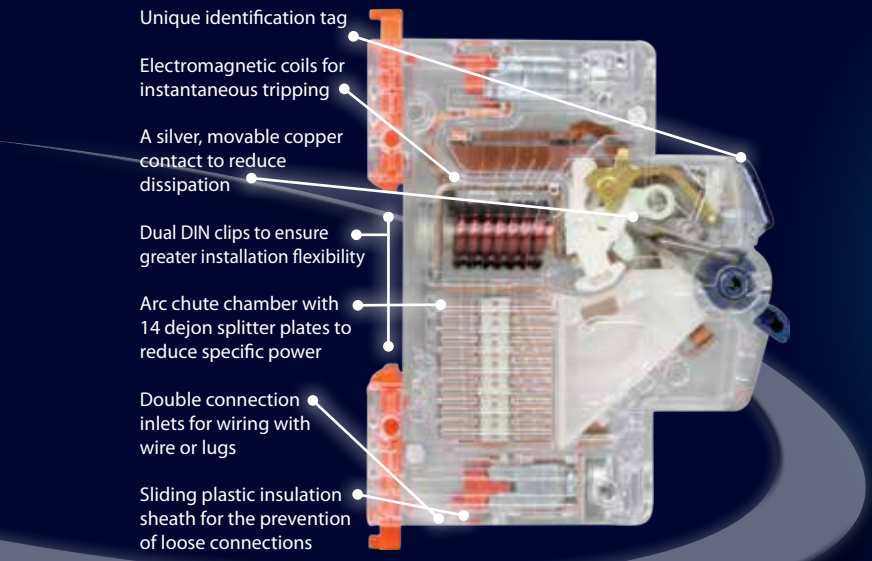

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I recently had the privilege of travelling to Lusaka to attend the 2nd African Centres for Lightning and Electromagnetics (ACLE) International Symposium: 'Strategic Interventions to Mitigate the Hazard of Lightning'.

The conference was organised by the ACLE-Zambia, which was also launched at the Symposium. I am one of the Research Advisors to the ACLE, but have never had the opportunity, previously, of being able to attend one of their events.

The Symposium was run under the auspices of the Science and Technology desk of the Non-aligned Movement (NAM), represented at the Symposium by their Director.

The ACLE is a pan-African Network of Centres dedicated to reducing deaths, injuries and property damage from lightning. While we hear terrible stories about death and injury caused by lightning here in South Africa, many other parts of the continent have a far more serious problem on their hands.

The symposium covered many topics, and I was impressed by the acknowledgement that some of the processes and procedures that apply to good lightning safety practice simply cannot be applied with impunity in the African context.

For instance, within many parts of Africa deaths of people sheltering within structures is not uncommon. In South Africa we would advise people to get into a building in a lightning storm. The reasons are clear. Generally the structure is earthed and provides a form of lightning protection.

Structures made of non-conductive materials with no electricity supply, on the other hand, probably offer no better protection than if people remained outdoors.

Evidence seems to suggest that clustering in such informal structures may put them at even greater risk, resulting in multiple injuries and deaths.

An even more profound problem, of which we have some experience, is figuring out how to deal with the mythology around lightning – and how that has an impact on the way people behave in lightning storms. This has evolved as an important research area, with nuances of each region playing a role.

As I had never been to Zambia I found the whole experience most fulfilling. The first surprise, as it were, was to observe that the flying time from Johannesburg to Lusaka was less than the time to Cape Town. This emphasises the huge opportunity for collaboration and the possibility to begin conversations around common themes – one of which, of course, is energy. Energy, like water, is generally somewhat scarce on the continent – although the potential is spectacular.

It remains impossible, however, to travel north of South Africa without becoming profoundly aware of the potential... sensing that you are looking at economies poised for growth. It is well known that some of the fastest growing economies are on this continent, and I am firmly of the view that Africa – specifically because of its riches – will become the next genuinely sustainable good news story.

I wonder who will be smart enough to become a part of that process?

Ian

Ian Jandrell

Pr Eng,
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Cover

United States of America Department of Energy publication – 'Operations and Maintenance Best Practices, a Guide to Achieving Operational Efficiency' has been released. *Read more on page 13.*

Regulars

Industrial cyber security and control systems
Protection against cyber threats

By C Pool, Proconics

A breach in cyber security has the potential of closing a company down or even affecting country-wide operation in the case of critical facilities.

In the wake of the Stuxnet shock, many thought the concept of attacking a country or business through its control and automation systems was a new and novel idea. The fact is that this has been an option and high level concern since the late 1980s and it took something as drastic as Stuxnet to create awareness of the problem. This awareness and enthusiasm has since mellowed in the face of financial pressure in the aftermath the global economic recovery. After all it is the responsibility of the government to ensure that the regulatory framework for protection and compliance is in place. Unfortunately, as we will see, this is not the case and when facing new threats like Duqu and Flame, it is up to companies to protect themselves.

International state of affairs

Internationally, regulatory frameworks are being strengthened and increased measures are being put in place to combat cyber intrusions and attacks against critical infrastructure control systems. Unfortunately it is still being seen as a rear guard action as hackers are running ahead of protection measures – mainly because they had such a massive head start. *Figure 1* shows reported incidents of cyber attacks in the United States of America (USA).

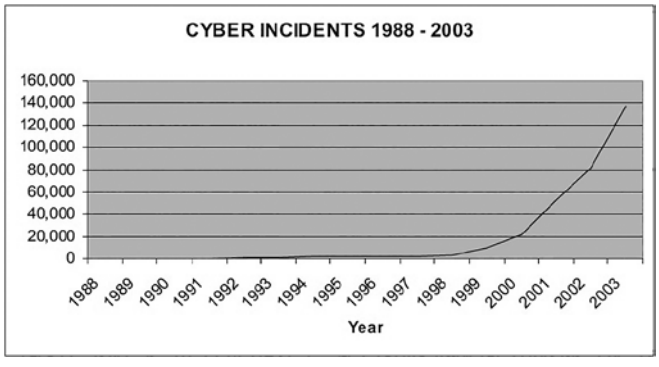

Figure 1: Reported cyber incidents (USA) [1].

In 2014, approximately 430 000 incidents were reported. Of these, 245 were related to control systems in some form or another. This might seem miniscule, but the potential impact is enormous. Even in the USA where there are mandatory reporting requirements, it is estimated that under reporting of incidents is in the region of 70%. Looking at the targets, it is clear that the majority was associated with critical manufacturing and energy – the lifeblood of an economy.

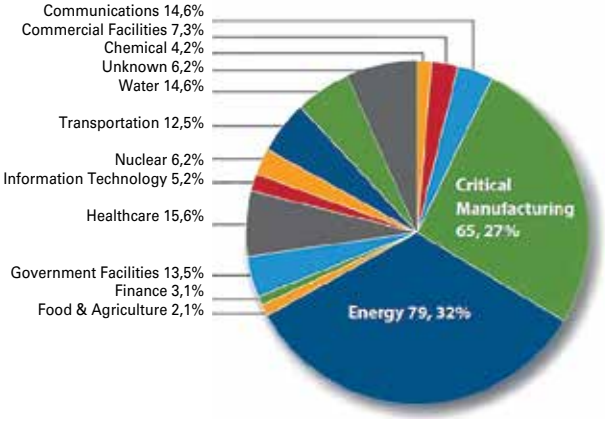

Figure 2: Industrial targets US 2014 [2].

Analyses of the incidents showed that more than half (55%) of the incidents involved so-called advanced persistent threats (APT). Basically this means that the attacks were sophisticated and would be able to bypass most protection measures. Attack vectors varied substantially as shown in *Figure 3*.

Cyber crime is a global problem and South Africa is as vulnerable to this scourge as any other country.

- With networking being the order of the day, most companies are exposed to possible cyber attacks.
- Cyber security threats include both intentional and unintended breaches.
- Cyber crime must be guarded against – not just by policy-makers, but also by every company.

take note

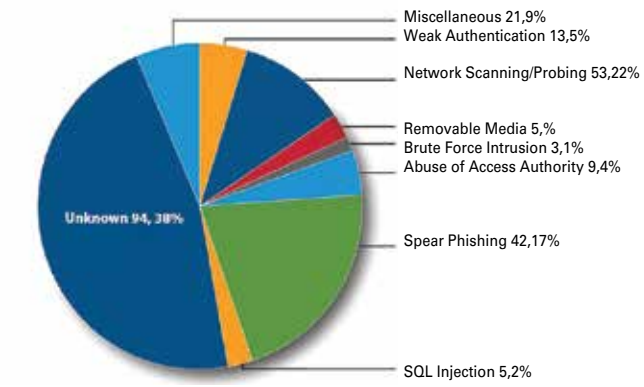

Figure 3: Attack vectors for industrial targets US 2014[2].

What is concerning is that more than a third of attacks left too few footprints to identify the vector, thereby identifying the lack of forensic custody or sophisticated intrusion detection. Reporting in Europe differs in format and information, but indications are that the same trends are being followed.

What standards?

Internationally there is a bewildering set of standards in various states of publication and review. None of these are unfortunately seen as authoritative and as widely accepted as the functional safety standards. Summary of some of the different standards:

- ISA99 / IEC62443: The ISA99 (ANSI/ISA-99.02.01-2009. Security for Industrial Automation and Control Systems) standard is generally seen as the basis for the newer standards with the IEC version the newer, more widely acceptable one. The standards are being developed by three groups, namely ISA/ANSI, ISO (part of the 27 000 suite) and the IEC. See *Figure 4* for structural information. While envisioned to be comprehensive and useful, it is being hampered by slow development. The only section that has been fully published (there are others still in review and development) is the one about the security technologies for ICSs
- NIST 800: This has beeen developed and published by the National Institute of Standards and Technology (the US equivalent of the SABS) and is an extremely comprehensive set of documents. It is, however, focused on general IT security and not specific to control systems. It is also confusing and difficult to use. NIST800-30 is the most widely used for risk management in IT systems with NIST900-53 most applicable to ICS applications. A basic breakdown is shown in *Table 1*. This should be kept in mind when considering protection measures
- NERC CIP (Critical Infrastructure Protection): Developed by the North American Electric Reliability Corporation for securing electric grids and specifically smart grid operations, it is a useful set of eight (002-5 to 009-5) standards. While also not user friendly, the structure is clear and comprehensive. For general ICS security, the author would advise its use. As can be seen in *Table 2* , there are a number of similarities between the NERC and NIST standards with the difference being the focus of the NERC standard is strictly ICS based applications. The security controls given in T*able 2* are a small sample to give some understanding of what is required.

ANSI – American National Standards Institute
APT – Advanced Persistent Threat
CIP – Critical Infrastructure Protection
CSET – Cyber Security Evaluation Tool
CSERT – Cyber Security Emergency Response Team
CSIRT – Cyber Security Incident Response Team
DHS – Department of Homeland Security (USA)
DiD – Defence in Depth
DRP – Disaster Recovery Plan
HART – Highway Addressable Remote Transducer
ICS – Industrial Control System(s)
IEC – International Electrotechnical Commission
ISA – International Standards Authority
ISO – International Standards Organisation
NCAC – National Cybersecurity Advisory Council
NERC – North American Electric Reliability Corporation
NIST – National Institute of Standards Technology
PLC – Programmable Logic Controller
SABS – South African Bureau of Standards
SHINE – SHodan INtelligence Extraction
P&P – Policies & Procedures
SCADA – Supervisory Control And Data Acquisition
SSA – State Security Agency

Abbreviations/Acronyms

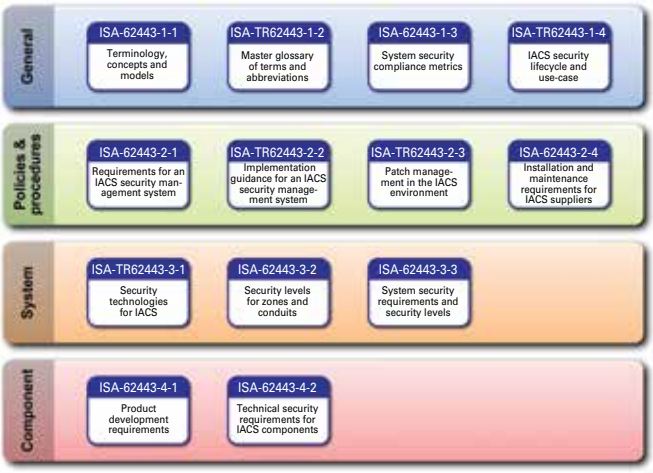

Figure 4: IEC62443 modules.

Table 1: NIST SP800 Prophylactic controls.

Problem	Relevant section	Description
Policy and procedures	General	P&Ps are addressed as a first control in most sections
Personnel security	PS	Vetting and personnel control
Hardware and software	SA	System and services acquisition
Awareness and training	AT	Different training levels according to responsibilities

Audit	AU	Accountability and adherence to P&Ps
Contingency planning	CP	Disaster recovery
Incident response	IR	Forensic data retention and investigation
Information protection	SC	System and communication protection

Table 2: NERC CIP section overview.

Section	Description	Sample security controls
002-5	Cyber system categorisation	Inventory of systems and software Continuous vulnerability assessment and remediation
003-5	Security management controls	Controlled access based on minimum need to know Secure configuration of network devices
004-5	Personnel & training	Security skills assessment and training
005-5	Electronic security perimeters	Boundary defence Account monitoring and control
006-5	Physical security	Maintenance, monitoring and auditing of security logs Access control
007-5	Systems security management	Limitation and control of ports, protocols and services
008-5	Incident reporting and response planning	Data loss prevention Incident response and management
009-5	Recovery plans	Disaster recovery and analysis

Local situation

Depending on which report is given credence, South Africa is either the country with the sixth [3] or the third [4] highest incidence of cyber crime in the world. Independent corroboration seems to indicate that the latter is the more likely scenario. Irrespective of what the actual case is the economy lost in excess of R3,4 billion in 2013 through reported cyber crime. The lack of consistent reporting means that this is most likely much higher. We are still awaiting the release of the 2014 statistics.

South Africa is far behind on establishing official structures for both the reporting and investigation of cyber crime incidents. The draft policy for cyber security was published in the government gazette in 2010 [5]. To date little progress has been made in putting this into practice with the exception of the establishment of the National Cybersecurity Advisory Council (NCAC) in October 2013 [6]. Looking at the reports generated by the Cyber Security Incident Response Team (CSIRT) (http://www.ssa.gov.za/CSIRT.aspx) investigating threats and incidents in South Africa it is apparent that emphasis is being placed on business and general ICT related incidents. ICS systems are not referenced except where the same type of issues impact it.

The process of establishing the regulatory framework and reporting structures falls under the auspices of the State Security Agency (SSA) and has been classified secret with the result that no updated information is available. Publication of the draft legislation was expected in October 2014, but it has been delayed. What can we expect from the legislation? As stated it is still unclear, but the following is expected to be addressed:

- Responsibility for securing systems will reside with the owner with severe penalties in case of non-compliance
- Government and 3rd party audits will be required on a periodic basis
- Securing the forensic evidence chain will be required
- Different levels of security based on the criticality classification will be applied

While proactive implementation and protection is advised, it is unlikely to be widely implemented until a catastrophic incident occurs or it is mandated by national legislation.

Threats

Threats to control systems can generally be classified as follows:

- **Internal**
  - o Unintentional
  - o Intentional misuse of authorised privileges
  - o Intentional misuse of unauthorised privileges
- **External**
  - o Hacktivists
  - o IP theft
  - o Intentional plant / equipment damage

Many control systems (project SHINE located at least 600 000) are fully or partially accessible to outside agents. More concerning is that some of these systems are responsible for safe operation of plants and protecting lives and equipment. *Figure 5* is an anonymised diagram showing some of the open systems in South Africa.

Figure 5: Open control systems in South Africa (Source: SCADACS).

Each indication represents up to 100 systems. The classic vertical and horizontal Defence in Depth (DiD) strategy does provide a reasonable degree of protection against external threats as shown in *Figure 8*. Insider threats, which form a substantial part of breaches, are not controlled by this because trusted and authorised people are using their credentials to perform unauthorised actions. The most damaging actions are not always intentional, but intention does not determine the damage.

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Protection practices

There are a number of 'best practice' methodologies available including the Tofino / Exida model [7] and the widely accepted DHS Defence in Depth (DiD) [8] guidelines. There are several aspects that most of these methodologies have in common. These include:

- System assessment
- Threat vector risk assessment – this is not the same as the system assessment
- Development and implementation of ICS specific policies and procedures
- System segmentation, by using ICS firewalls, resulting in Defence In Depth (DiD)
- Access control, both physical and logical
- System hardening
- Monitor and maintain

One aspect that is not always included, but would be useful in the South African context, is that of training and as part of that, awareness creation. Some of these aspects are self-explanatory; others need more discussion.

System assessment

In the same way that there are different variations of 'best practices', there are no absolutes in doing system assessments. One of the best tools available for system assessments is published by the US DHS. This is known as the Cyber Security Evaluation Tool (CSET) and it is actually a comprehensive toolset for doing system evaluations as well as providing guidance when compiling the policies and procedures for protecting ICSs from cyber threats. As can be seen in *Figure 6*, the process is detailed and comprehensive. It is not always strictly required to follow the full process, but for critical infrastructure and plants, the time spent on this is well worth the reduction in risk.

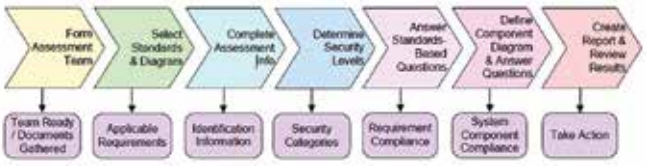

Figure 6: CSET assessment process [9].

System segmentation

The biggest mistake made by many companies is to think about vertical segmentation and isolation only when applying DiD strategies. This is well illustrated in *Figures 7* and *8*. This is generally not sufficient as segmentation should be implemented between plant/unit areas to limit or prevent cross infection in case of malware or horizontal targeted attack vectors. As part of the segmentation a sadly neglected aspect is that of Intrusion Detection (IDS). When considering the amount of undirected attacks being performed continuously one must consider the possibility that if your system has not been attacked, it is likely because you do not know about it. An IDS is absolutely critical in not only determining whether your system has been targeted, but also what kinds of attacks are involved. SANS states that many unexplained malfunctions in control systems can be caused by directed and undirected attacks, which have simply not been identified as such: Abnormal activity or unexplained errors deserve a closer security look [10].

System hardening

Hardening can take many forms, but in general there are a few actions that should be performed. These are:

- Patching
  - o OS
  - o Antivirus
  - o Firmware
- Component disabling
  - o Web servers
  - o Background services
- Port access
  - o Disable ports not required especially ports for Modbus TCP
- Application whitelisting
  - o Only allow the required applications to run
  - o Only allow the required communication to take place
- Scanning
  - o Check and fix vulnerabilities frequently

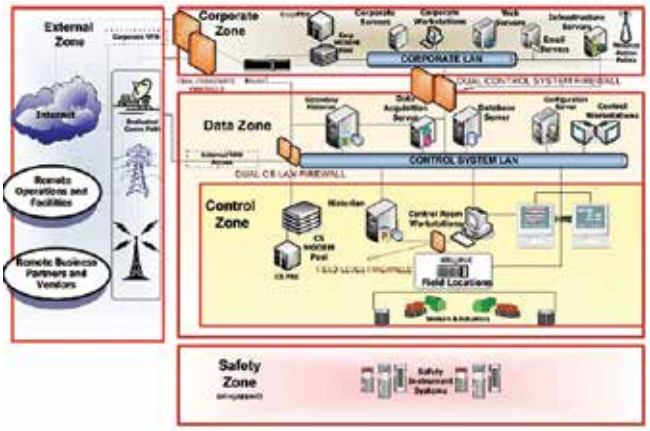

Figure 7: Typical vertical segmentation (Source: US-DHS) [8].

DiD strategies are designed to keep out intrusion from external sources; they are not effective against internal sources. One of the most concerning trends that are now emerging is the subversion of the traditional (seen as secure) field buses. Specifically the HART protocol that has been widely deployed on 4-20 mA analogue systems has been shown to be vulnerable to code injection and spoofing of the transmitter values [12]. The proof of concept was demonstrated by Alexander Bolshev at the recent Digital Bond S4X14 conference [13]. While it is true that a high level of technical competence is required to exploit this, the software and associated hardware schematics is freely available on the internet.

This vulnerability is also applicable to HART enabled safety systems. There is currently no available protection against this type of combined insider and field entry attack. Periodic system audits, vulnerability assessment and intrusion detection (combined with

traffic analysis) systems provide some possibility of locating and correcting these types of attacks. Prevention is unlikely.

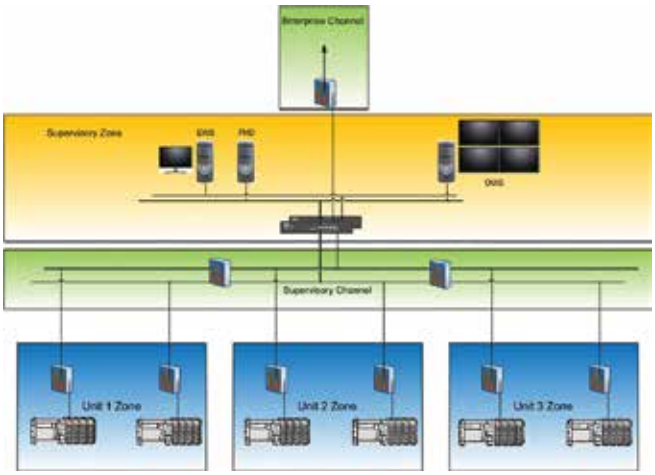

Figure 8: Practical implementation of DiD segmentation (copyright – company represented by the author).

Conclusion

The threat against ICS systems is not decreasing and protection, good practices and monitoring are becoming ever more important. While measures are being put in place by government to ensure better protection through a legislative framework, we are still far behind and much still needs to be done especially in the protection of production systems. The onus will rest on the system owners to ensure that until this is in place, protection of critical control and safety systems is catered for. Cyber crime is a global problem and South Africa is not exempt. The first step is to create awareness that there is a problem. DiD will not protect against all threats, and especially not against the insider threat, but together with good intrusion monitoring and vulnerability scanning and patching your systems will be much better protected.

Acknowledgement

The author presented this topic at the Safety Control Systems & Hazardous Areas Conference 2015, held in Johannesburg, organised by IDC Technologies.

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Innovative applications centre opens

Automation solutions provider, **Festo**, unveiled its brand new applications centre at its Johannesburg headquarters recently. Customers and media were treated to a tour of the cutting edge centre. The applications centre is the first of its kind in South Africa, boasting state-of-the-art 'Electric Drive Handling and Vision Systems'. Festo customers are now able to physically test any 4D electric drive applications in a controlled environment to confirm details like maximum speed, accuracy and cycle time.

With remote capabilities such as live video streaming, the applications centre is positioned to meet the needs of customers all across Southern, East and West Africa. Brett Wallace, managing director of Festo South Africa, highlighted the value that the applications centre is able to deliver to African manufacturers in a highly competitive global marketplace.

"Our clients cannot afford to make mistakes. Whatever they design and implement needs to work the first time. Our applications centre is there to support them by allowing them to simulate the handling of the actual products with real products and software. Although Festo has powerful simulation software, there is nothing as reassuring as taking a concept from theory to practice. In this way, we are able to add value that brings them security, confidence and competitiveness."

The applications centre works hand-in-hand with another recently unveiled Festo innovation, its Handling Guide Online (HGO). This intuitive online tool, another first in the South African market, allows users to quickly and easily design and order a handling system from scratch. The customer is prompted to enter parameters and information critical to the task on hand. The powerful software then makes use of Festo's extensive data base of proven designs to provide possible solutions.

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Brett Wallace, managing director, Festo South Africa.

Courses accredited for CPD points

Yokogawa South Africa's training courses have been accredited by the Society for Automation Instrumentation Measurement and Control (SAIMC), for Continuous Professional Development (CPD) points for registered professionals of the Engineering Council of South Africa (ECSA). For the first time in Yokogawa's 100 year history, field instrumentation and control systems training courses offered by Yokogawa South Africa have been evaluated and accredited by a professional body.

It has been a lengthy process of six years to reach this important milestone which was spearheaded by Yokogawa's service training manager, Nico Marneweck. "We believe that the recognition of our training courses will make a meaningful contribution to the competency of South African and African industrial automation", explains Marneweck.

SAIMC is an ECSA recognised voluntary association which has the ability to validate courses for CPD points. Fourteen courses covering field instrumentation and control systems have been accredited. Yokogawa has embarked on a strong drive towards training and skills development since 2009 offering training courses at the Yokogawa South Africa head office in Roodepoort or onsite at customer premises as well as 12 month student internship programmes.

Since 2011, Yokogawa South Africa has successfully trained over 1 200 people.

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Actuators improve productivity and efficiency in automotive industry

Johan Bester, head of sales at **SMC Pneumatics South Africa,** shares information on one of the successful SMC installations recently completed. When Renault was developing its new generation K9 engine to meet the now obligatory Euro6 regulations, it also needed to develop new processes in different areas of its Valladolid plant in Spain that supported its SPR and lean manufacturing principles. The K9 produces fewer than 80 mg/km of nitrogen oxides, which is a requirement of Euro6. It features steel pistons that generate less friction and delivers 3% lower fuel consumption.

The particular challenge facing Renault's Production System (SPR) was how to maximise efficiency and output while optimising the available space and keeping maintenance as simple as possible. With ambitious targets to reduce overall costs of the new engine and increase production, whilst maintaining quality, Renault needed an experienced and trusted components supplier. SMC with its LEF actuators met the requirement to support the screw part of the process. With the highest repeat action, the screwing of components was a key focus for Renault in its efforts to improve productivity in an efficient way. Renault was one of the original adopters of SMC's electric range of products and has expressed their satisfaction with the LEF actuators. According to Bester, SMC´s electric actuators have provided Renault with the high flexibility required for the development of new products, and at a very competitive price. Renault also believes the continuous collaboration with SMC has been key to the integration of the electric actuators and has reinforced the image of the company as a components supplier for the automotive industry. It was Renault's ambition to replace its costly robotic technology, where possible, with more efficient and effective alternative solutions. As a result, SMC's LEF actuators have been installed as preferred alternative to a bulky robot.

Since installing the electric actuators, Renault has significantly reduced the screw cycle from 16 seconds to nine seconds. The overall time of the operation was reduced by six seconds to just 24 seconds.The company has also halved its production area to just 4 m². It is a great example of lean manufacturing and has provided Renault with the perfect solution to their production challenges and ultimately helped them to bring a highly competitive product to market" adds Bester.

Enquiries: Email sales@smcpneumatics.co.za or visit www.smcworld.com

Johan Bester, head of sales, SMC Pneumatics.

SMC's LEF actuators installed as preferred alternative to a bulky robot.

Management and optimisation of remote assets

Schneider Electric, the global specialist in energy management and automation, has released StruxureWare SCADA Expert ClearSCADA, an open software platform enabling efficient management and optimisation of remote assets. "We continue to improve on the user experience and provide functionality based on our southern African customers' needs," said Quintin McCutcheon, marketing and operations manager: Industry Business at Schneider Electric South Africa. "Template expressions save engineers time during implementation, alarm summaries help pinpoint maintenance issues faster, and the seamless integration with a tier-2 historian facilitates data accessibility across the entire enterprise." These functionalities are part of a software platform that is designed to lower the overall operating costs of remote assets while providing a complete, comprehensive overview of site operations. Other features include:

- ***Enhanced WebX user interface*** – Process information is available anytime, anywhere through any device with HTML5 cross-browser support for trends, alarm lists, event lists, and queries
- ***Extended integration of telemetry hardware*** – Enhanced integration with the Realflo software, a flow measurement application, now including support for Realflo Liquids 6.91, plus native support for well-known 3rd Party Flow Computers via a new O&G EFM Driver suite
- ***Increased system security*** – A substantial increase in security features includes enhanced user account security, auditing of the system security through a dedicated security event list, and dedicated security logging queries.

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

Safety control and visual interface package

Omron Corporation has set another benchmark in the automation industry by launching a new safety and visualisation package containing all the components to provide a programmable and flexible machine safety control solution, with the added benefit of a visual interface that provides detailed diagnostics and user information. According to Victor Marques, general manager at Omron, the package was developed to give customers added value without compromising on quality.

The package contains a standalone G9SP safety controller which provides all local safety in- and outputs while controlling the safety application with diagnosis information provided via Serial or Ethernet interface. It also has a memory cassette for easy duplication of configuration and unique programming software to support easy design, verification, standardisation and reusage of the programme. The next element is the S8VK-G power supply, offering a wide product range (from 15 W up to 480 W), in a very compact size. It is 13% smaller than comparable power supplies and the smallest on the market of its type and has a wide operating temperature range (-40 to +70°C) to guarantee operation stability. It has a double set of dc output terminals (three for the negative) to provide easy wiring, a 90% efficiency to reduce energy consumption, a 120% power boost functionality and improved DIN-rail mounting clip to provide better vibration resistance and allow for easy installation

The third component is a 7-inch wide colour TFT LCD touch screen which offers maximum screen size in the most compact format.

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

Western Cape stockholder of automation and drives products

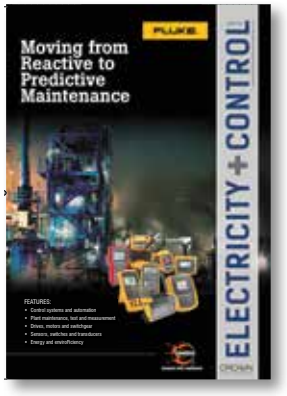
After having been a Siemens Partner for many years, **H B Systems** is gearing towards direct sales of Siemens' Automation and Drives products. These products are now kept in stock in addition to those used for systems and components manufactured at the HB premises in Somerset West. First on the list is the new range of entry-level Variable Speed Drives, the SINAMICS V20 Basic Performance inverter range as a simple and cost-effective drive solution. The V20 Inverter sets itself apart as a result of its quick commissioning times, ease of operation, robustness and cost-efficiency. With five frame sizes, it covers a power range extending from 0,12 kW up to 30 kW.

SINAMICS V20 has a compact design, and can be individually adapted to the particular application or user requirements using various options (for example, an external BOP, connecting cable, filter, braking resistors, shielding, etc). The compact and rugged devices are tailored for operating pumps, fans, compressors and conveyor belts as well as for basic drive applications in the process and manufacturing industries.

Engineering, commissioning and operating costs must be kept as low as possible. You have precisely the right answer with the SINAMICS V20. To increase energy efficiency, the inverter is equipped with a control technique to achieve optimum energy efficiency through automatic flux reduction. It can also display the actual energy consumption and has additional, integrated energy-saving functions. This allows energy consumption to be slashed drastically. With its team of well-versed technicians HB Systems is positioned to provide expert affordable customer support and assistance.

Enquiries: Visit www.hbsystems-electrical.com

Moving from Reactive to Predictive Maintenance



The Federal Energy Management Program (FEMP), part of the US Dept. of Energy (DOE) (www.energy.gov), has released its 'Operations and Maintenance Best Practices, a Guide to Achieving Operational Efficiency'. The 320-page guide provides useful information about operation, maintenance, management, energy efficiency, and cost reduction approaches.

One of the interesting aspects of the publication is its emphasis on Predictive Maintenance (PdM). Three of the PdM technologies presented in the guide include thermography, vibration analysis, and performance trending. The guide lists reactive, preventive (PM), PdM, and Reliability Centred Maintenance (RCM) as the maintenance program types and describes their differences:

- Reactive maintenance allows equipment to run to failure
- PM personnel perform maintenance tasks on time-based or equipment run-time schedules
- PdM bases the need for maintenance on the actual condition or health of the machine or equipment
- RCM closely resembles the methodology of PdM, except that RCM takes equipment criticality and context into consideration

Another interesting point to note from the FEMP guide is that 'more than 55% of maintenance resources and activities of an average facility are still reactive' while 'The Changing World of the Plant Engineer' states: 'More than 60% of US plants and more than 70% of international plants do not have a maintenance strategy in place'.

The FEMP guide explains the pros and cons of PdM, and compares its advantages and disadvantages in relation to the other maintenance methods. Although it estimates that a properly functioning PdM program can provide savings from 8% to 12% over a program using PM alone, it also recognises the significant initial investment that PdM potentially requires.

This investment includes diagnostic and monitoring equipment, training in-plant personnel to use the equipment, and educating them about PdM methodologies and concepts. Although PdM can create significant upfront costs, depending on your process, downtime can potentially cost your plant much more.

While most of the information in the guide is not new, it reinforces existing tried-and-true PdM strategies. This is important because so many plants still 'manage' maintenance reactively. Therefore, established methodologies that can help predict and prevent situations that could cause downtime bear repeating.

For example, using infrared (IR) thermography to inspect electrical systems is well established and well documented. From generators, motors, and transformers to switchgear, motor control centres, cable trays, and lighting distribution panels, thermography can detect many impending failures on most electrical systems.

Don't stop at electrical. Thermography is used to detect and diagnose problems in mechanical equipment too. In addition to the ability to detect problems associated with rotating equipment, such as bearing failure, alignment, balance, and looseness, thermography can be used to check boiler tubes and refractory materials; steam traps, valves, and lines; fluid vessel levels and pipeline blockages; environmental water and air discharge patterns; and even building roof membrane integrity.

Vibration detection instrumentation and signature analysis software have long been used to detect abnormal equipment conditions. This type of PdM technology can help define existing problems such as mechanical unbalance, eccentric rotors, misalignment, mechanical resonance problems, sleeve-bearing problems, flow-induced vibration, gear problems, and belt drive problems, to name a few.

In the past, vibration analysis equipment was prohibitively expensive and complex. Plants that used this type of PdM typically outsourced vibration testing and analysis to third-party services. However, as with IR thermography, vibration testing equipment is now available, affordable, and much less complex than earlier technologies.

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

Thermal imaging camera can avert disaster

The Land Arc range of cameras are general purpose radiometric thermal imaging cameras which are designed to be rugged enough for industrial applications while being small enough to fit into confined areas. Introduced locally by **Protea Automation**, the cameras are used to detect hot spots that are above the desired temperature of materials being transported. With parameters stored onboard the camera as well as on the Arc Land Imaging Processing Software (LIPS), the detection of a hotspot will trigger an alarm and set in motion a sequence of measures to prevent fire and avoid damage to the belt. In the event of the SCADA or control system being unavailable, the onboard intelligence of the camera acts as a failsafe system and still triggers an alarm that will allow appropriate action to be taken. "Management of warm materials on conveyors is a hot topic following a recent fire which destroyed an entire incline conveyor system at a lime manufacturing plant in the Northern Cape which caused millions of Rands' damage to the plant and led to considerable loss of production," says Gavin.

"Following the catastrophe we were called in to design and install a system to prevent a recurrence of this type of event and have subsequently installed Land Arc Thermal cameras as well as scanners to identify hotspots, as well as identify trends which show when the temperature of clinker from the rotary kilns is rising above the normal range. With the equipment and procedures in place the plant is now able to significantly reduce costly belt repairs, reduce downtime and prevent dangerous situations from occurring in future."

Enquiries: Gavin Westley. Email: gavinw@protea.co.za

Takes less space in the control cabinet

Due to innovative technologies, the new AS-i power supplies from **ifm electronic** require considerably less space in the control cabinet, as compared to common cabinet power supplies. Another advantage of the efficient design is the above average degree of efficiency of up to 94%. This saves energy costs and reduces waste heat in the control cabinet. The switched-mode power supplies provide the specific nominal power across the entire temperature range. Derating only has to be taken into account above an operating temperature of 60 °C.

All AS-i switched-mode power supplies are equipped with double terminals. This simplifies wiring and provides more clarity in the control cabinet. Instead of an inrush current limitation with a simple NTC, charging the capacitors of the switched-mode power supplies is microprocessor-controlled. This ensures an ideal start-up of the voltage supply. In the development of the power supplies, particular importance was attached to the dimensioning of the components, so that operation is permanently ensured. This results in an excellent MTBF value of about 1,4 million hours. Moreover, all ifm power supplies feature sufficient power reserves to reliably handle even short current spikes.

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

SIL2-certified wireless gas detection system for LNG facility

Yokogawa and **GasSecure AS**, a Dräger owned company, have produced the world's first SIL2-certified wireless gas detection system for use at an LNG facility in Northern Europe. Yokogawa has been developing a wide variety of ISA100 wireless technologies and field wireless devices such as adapters that enable conventional wired devices to access wireless networks. Yokogawa supplies these technologies and devices to plants and other facilities primarily in the upstream oil and gas sector. GasSecure has developed ISA100 Wireless gas detectors that can detect leaks of explosive hydrocarbon gases and are certified for compliance with the ATEX directive and the IEC Ex Certified Equipment Scheme. The gas detectors are installed on offshore oil and gas drilling platforms and at tank farms, industrial plants, and the like. GasSecure has already supplied a number of these products to leading oil and gas companies around the world.

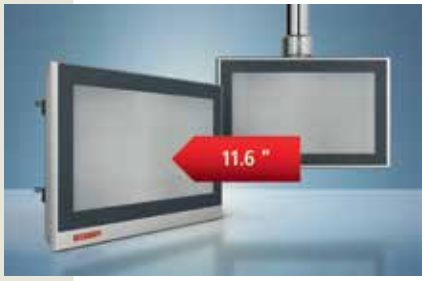
In 2014, GasSecure and **Yokogawa** concluded an agreement under which the two companies jointly developed a wireless gas detection system that would meet their customers' requirements.

This system uses GasSecure's GS01 wireless gas detectors to measure hydrocarbon gas concentrations. Using the ISA100 Wireless communications protocol, the GS01 establishes a link with a Yokogawa YFGW510 access point and sends data to a host system via a Yokogawa YFGW410 field wireless management station. Although the GS01 uses a low-power infrared sensor and is very energy efficient, it has a very fast response time. This capability of the GS01 and the utilisation of dual redundant communications by Yokogawa's field wireless products make them essential components for the construction of a fast and highly reliable monitoring solution. To meet its customers' safety requirements, GasSecure has made enhancements to the GS01 to obtain SIL2 certification for this device. For its part, Yokogawa has modified the YFGW410 so that it now supports the PROFIsafe safety communication standard, and has verified that both companies' products perform and operate as specified.

Enquiries: Christie Cronje. Tel. 11 831 6300 or email Christie.cronje@za.yokogawa.com

New 11,6-inch widescreen display format – increased scalability

With its comprehensive range of Control Panels and Panel PCs, **Beckhoff** provides the optimum product portfolio to address all multi-touch HMI needs. These devices offer a solution for complete machines or systems, in an integrated and customisable manner, and provide a top quality look and feel. The new 11,6-inch widescreen display format offers increased scalability in the range of compact HMI devices. The popular CP2xxx and CP3xxx multi-touch panel series from Beckhoff are complemented by new 11,6-inch devices in 16:9 widescreen format. The display range now comprises a total of nine models: 7-inch, 11,6-inch, 15,6-inch, 18,5-inch, 21,5-inch and 24-inch in widescreen format; 12-inch, 15-inch and 19-inch in the conventional 4:3 format. With this wide range of options, the multi-touch panel series from Beckhoff now offers the modern widescreen format in the fine scalability offered by traditional 4:3 HMIs. Another bonus is the high resolution of the new 11,6-inch display, at 1 366 X 768 pixels. This matches the impressive resolution of the 15,6-inch and 18,5-inch devices, enabling the use of an existing visualisation on HMIs in three different sizes without additional engineering effort. This is particularly beneficial for machine builders that use a uniform user interface for their machine range and want to scale the operating panel according to the machine size in a simple and cost-effective manner.



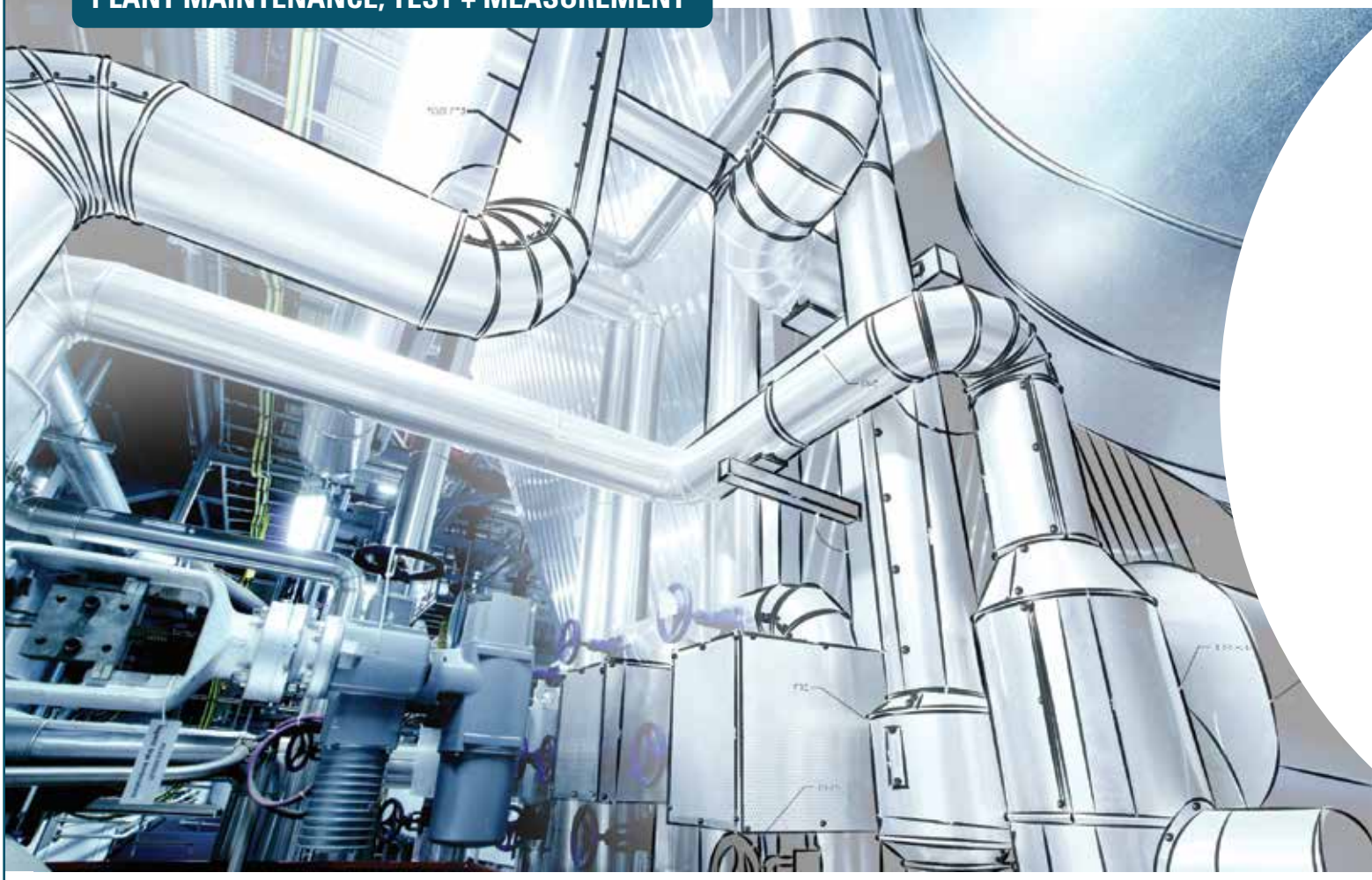
Enquiries: K McPherson. Email k.mcpherson@beckhoff.co.za

Productive, safe, fast

Rockwell Automation has introduced its new Allen Bradley MobileView tethered operator interface. The mobile terminal gives plant and industrial personnel the freedom to take a machine's human-machine interface (HMI) with them to make real-time adjustments to out-of-view applications. The MobileView tethered operator interface is ideal for maintenance tasks, machine setup or calibration activities, and other HMI applications that require the operator to see the machine. The inclusion of a hardwired e-stop button and three-position enabling switch also supports applications that require local safety functionality.

"Between making an adjustment on the terminal and viewing the results on the machine, fixed operator terminals can require a lot of back and forth for personnel, for certain applications," said Christo Buys, business manager for control systems, Rockwell Automation, sub-Saharan Africa. "The MobileView tethered operator interface puts the terminal in the operator's hands to increase productivity and safety. Tasks are made more efficient and machines are set up faster." The MobileView tethered operator interface complements the Allen-Bradley PanelView graphic terminals, giving manufacturers and industrial operators a range of fixed and mobile terminals for different applications. It also uses the FactoryTalk View Machine Edition (ME) HMI software from Rockwell Automation, allowing users to develop and re-use their software applications across the MobileView and PanelView platforms.

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



Solution for improved pump **protection**

By L Dutrieux, NewElec

Replacing pumps and associated parts at a local Polymer plant was taking place frequently – costing the company a great deal of money.

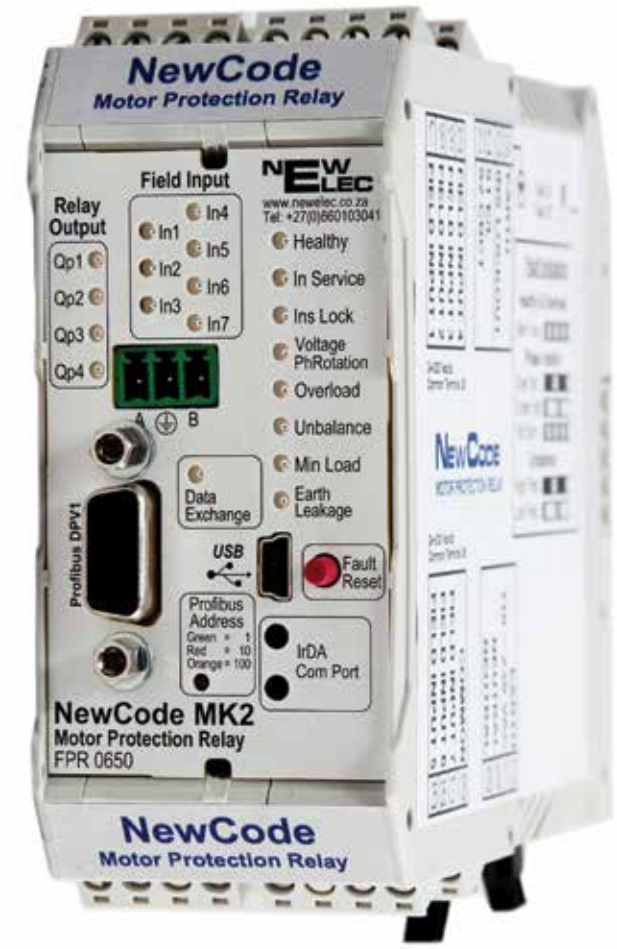
The company represented by the author was recently approached by management of a local Polymer plant who was seeking a solution for improving the protection method on its pumps as an inordinate amount of money was being spent on maintaining and replacing pumps and associated parts at a pace that seemed extraordinary. The existing protection relay was a dry cut motor protection product that sensed the motor load current and the current trip level was user-selectable. However, owing to the very small current differential between the full load and minimum load conditions, the product appeared to have difficulty in appraising the load condition.

Typically, a 3 kW motor running at 380 Vac, if operated at full load, would result in a load current of 6 A. However, the actual full load condition at the plant is usually in the vicinity of 3 to 3,5 A. The measurement of the load current is made even more difficult by the HCL medium that is prone to forming gas bubbles at certain pressures and is also affected by ambient temperature. It seemed that it would be necessary to re-evaluate the protection protocol and make it ready for a more futuristic approach that would incorporate both an improved and more modern protection concept.

The client's requirements were to improve the overall protection of the pump motor and pump, introduce futuristic features that could satisfy longer term requirements, and to improve the safety of technicians working at the MCC when altering relay settings. It was also requested that statistical motor performance analysis be made available to maintenance technicians, and to provide a simple means of setting the relay in the event of replacement. Any new solution needed to prove that it was capable of reliably measuring 'dry-run' conditions as this was a prime criteria. It was suggested that the company provide a free trial product of their NewCode motor protection and control relay for testing.

The existing relay was removed from the MCC cubicle on a 3 kW, 380 V HCL handling pump and replaced with a New Code relay for trial purposes. It was decided that the method used for measuring the 'dry-run' condition would be based on power factor measurements rather than on current, as it was more accurate in this type of application. The pump was used for medium transfer and off-loading, the former utilising more loads. For test purposes, a radio was used to

Preventive maintenance instead of repairing or replacing damaged equipment saves time and money.



communicate with a pump operator to start the pump, slowly open the delivery valve and then reverse the process in order to obtain useable data for relay set-up.

It was established that the time taken to open and close the delivery valve was determined by the operator and varied between 20 to 30 s. For that reason, a 'dry-run' trip had to be avoided during this period. A hold off delay of 20 s was set in the relay. A power factor setting of 0, 47 was initially selected with a trip delay of 2 s. The latter setting however resulted in many nuisance trips so that the settings were revised to a power factor of 0,43 and a trip delay of 10 s to allow for spurious flow. The start hold off delay was left at 20 s. This implied that if the delivery valve remained closed for the starting period the relay would remove power to the pump. This in fact did occur, resulting in a request for an automatic minimum load reset which is facilitated in the software. In addition, the maintenance staff requested an output trip indication, a pump running indication and an 'un-safe' to reset output contact for serious faults such as earth faults, short circuit faults and others.

With regards to the 'dry-run' protection, it was important to note that in the event of the protection relay not reading any phase voltages, it would automatically revert to current measurements.

There was little doubt that the motor protection and control relay used would completely meet the application's requirements both in the short and long term owing to the following reasons:

- Last 1 400 events and last 35 faults stored in rotating buffers with time and date stamping
- Fully Prefabs DPV 1 ready and certified
- Control panel mounted Leeds for all four output contacts; all seven digital inputs and Prefabs address notification
- Reports provided on motor utilisation, such as motor available hours, motor off load and hours motor running on load
- Monitoring and providing reports on power factor and motor efficiency
- Providing reports on motor running hours, amount of trips and amount of starts
- Equipped with user selectable starts per hour and consecutive start limitations
- A setting memory module can be fitted that stores all the relay settings so that setting up a new relay with previous settings is very easily done

With regards to the safety requirements, the relay includes earth leakage protection including earth insulation lock-out, as well as an infrared communication port so that it is unnecessary to open the MCC cubicle to access its settings or reports.

The relay met all requirements and was successfully implemented. By immediately initiating a warning or stopping the process, the NewCode relay minimises production downtime, prevents equipment damage and eliminates unnecessary wear.

Conclusion

Preventive maintenance instead of repairing or replacing damaged equipment saves time and money. Payback time is short, in many cases negligible considering the cost of one single production stop.

- Why wait for a failure before you replace old equipment?
- Understanding your system permits better protection and monitoring.
- Proper preventive maintenance saves you time and money.

take note

HCL – Hydrochloric Acid (Hydrogen Chloride)
MCC – Motor Control Centre

Abbreviations/Acronyms

Luc Dutrieux is a sales executive at NewElec in Pretoria. He has extensive experience in the motor protection and control industry and provides technical support and training to a customer base throughout the mining and manufacturing industry. Luc's qualifications include a diploma in marketing management as well as a National Technical Certificate Part 6 (NTC 6 Certificate).
Enquiries: Tel. 0860 103041 or email luc@newelec.co.za

Process calibration tools

Fluke – represented in southern Africa by **Comtest** – has on offer a range of process calibration tools for process environments such as pharmaceutical, refining or other industrial areas at a bench, out in the plant, or in the field.

Electrical and multifunction calibration: Fluke's broad range of field and bench calibrators source, simulate, and measure pressure, temperature, and electrical signals to help verify and adjust test equipment or almost any process instrument.

mA loop calibration: Fluke loop calibrators provide mA sourcing, simulation and measurement, readouts in both mA and % of span, 24 V loop supply, simple operation and reliable accuracy.

Pressure calibration: Fluke provides a wide selection of field and bench calibration tools to quickly and reliably calibrate pressure instrumentation.

Temperature calibration: Fluke offers bench and field solutions to ensure process temperature accuracy of not only the system's electronic temperature signals, but also the very temperature sensors that initiate those signals.

- Fluke 7526B precision process calibrator: The best balance of economy and accuracy for calibration of temperature and pressure process measurement instrumentation
- Fluke 754 HART multifunction documenting process calibrator: This field and bench calibrator sources, simulates, and measures pressure, temperature, and electrical signals with exceptional precision
- Fluke 718-300G pressure calibrator: With pump provides a total pressure calibration solution for transmitters, gauges and switches with pressure source and milliamp measurement to calibrate and maintain almost any pressure device
- Fluke P3100 hydraulic deadweight tester: High quality, high performance, easy to use oil pressure calibration
- Fluke 726 multifunction process calibrator: Designed specifically for the process industry with broad workload coverage, calibration power and unsurpassed accuracy
- Fluke 9144 field temperature metrology well: Lightweight and portable field dry-well small enough to easily carry in one hand. (50 °C to 660 °C and accurate to ± 0,1 °C)

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

A highly accurate picture of health

Instrotech, distributor and manufacturer of a range of process control instrumentation and specialised systems, has announced the launch of UK-based Monitran's MTN/5000-16, a robust and reliable microcontroller-based condition monitoring system.The system contains up to 16 Monitran g-mac signal conditioning units and features a 7 cmTFT touchscreen with an easy-to-navigate menu that enables users to set data sampling periods, ranges and accuracy levels plus vibration threshold (alarm) levels; on a channel-by-channel basis or across all channels. In addition, the system has 20 digital I/O channels, enabling the MTN/5000-16 to be integrated with other systems. Scott Hunter, Instrotech sales director, comments, "The MTN/5000-16 is a versatile system that can be used at the heart of a plant/machine protection scenario or as the monitoring system within a condition-based predictive maintenance strategy." Each g-mac unit within the MTN/5000-16 can accept any standard two-wire accelerometer; but the data can be viewed and interpreted as acceleration or velocity. However, the g-macs can also be used with other transducer types and the MTN/5000-16's software can, upon request, be written to display virtually any parameter (e.g. temperature, light, voltage and so on). Systems are made-to-order and customers can specify how many channels they require (1 to 16), the condition to be monitored by each channel and what levels of control they wish to have over each channel. Customers can specify what power source the system should utilise and whether or not they want the system to do any direct switching for emergency shutdowns.

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

Industrial plugs and sockets range now in SA

Schneider Electric has introduced its high performance industrial plugs and sockets range, Pratika, to the local market. Kadra enclosures, specifically designed to embed Pratika sockets, complete the range, making it the ultimate system for electrical distribution in locations requiring weatherproof equipment. "This wide range of PratiKa plugs and sockets is the result of Schneider Electric's experience and expertise. It is a complete range, available for the 16 A, 32 A, 63 A and 125 A with degree of protection IP44 and IP67 in the wander, panel and wall versions," says Christo Janse van Rensburg, product manager: final distribution, at Schneider Electric South Africa. He adds that the solutions are especially fast to connect, as well as being safe, functional and ergonomic, easy-to-use and intuitive. Furthermore, complying with IEC 60309 standards, all the PratiKa industrial sockets have a lock or holding mechanism, which keeps the plug firmly locked in the socket, preventing them from being pulled out involuntarily. Sockets with an interlock switch have been designed to meet the safety requirements and, in particular, to prevent plug insertion or removal while the socket is under load. The interlocking device allows closure of the main switch and, subsequently, the power supply only when the plug is fully inserted in the socket, and when complete mechanical and electrical connection has occurred between the sleeves and pins. Plug removal is possible only when the switch is in the 'off' position.

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

Wireless dc clamps improve measuring productivity

Comtest, local distributor of **Fluke** test and measurement tools, has added two new dc current clamps to the Fluke Connect (FC) system of wireless test tools: the Fluke a3003FC wireless dc current clamp and the a3004 FC wireless dc 4-20 mA current clamp. Both fully-functional current clamps can wirelessly send measurements to FC enabled master units as well as the FC mobile app so users can view measurements from multiple devices simultaneously, review equipment history, and share measurements with other team members for faster troubleshooting. The a3003FC wireless dc current clamp measures up to 2 000 A dc making it ideal for very high dc current measurements typically found in utility and dc machine controller applications. It features a large jaw size (64 mm) for clamping around and measuring on large, high current conductors.

The a3004 FC Wireless dc 4-20 mA current clamp measures 4 to 20 mA signals without breaking the loop so process control technicians can make accurate measurements without interrupting the workflow. It features a detachable clamp with extension cable for measurements in tight locations.

Both current clamps can record and store up to 65 000 measurements with the logging feature to isolate intermittent events or record fluctuations without even being there.

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

Minimising the effects of acid mine drainage

The harmful effects of acid mine drainage on the environment are being successfully combatted by a large acid mine drainage plant in Germiston, Gauteng, which contains a comprehensive mixing system developed by leading mixer manufacturer Mixtec. The acid mine drainage plant consists of a combination of 53 specialised Mixtec mixers, which are in turn individually powered by the same amount of gearboxes manufactured and supplied by leading drive engineering company SEW-EURODRIVE. Mixtec sales manager Brian Paxton states that the agitators' role in the process can be split into different sections. "In simple terms, the first is the make-up of lime into a slurry, which is in turn introduced to reaction vessels where the lime slurry comes into contact with the acid mine drainage. By mixing the lime slurry with the acid mine water in this area, the lime reacts with the acid to cause a neutralising effect."

The bi-product produced is Gypsum, a soft sulphate mineral composed of calcium sulphate dihydrate, which can be used as a fertiliser, and is the main constituent in many forms of plaster and chalk. The mixing system had to be designed to accommodate the highly-corrosive pH levels found in water contaminated by acid mine drainage. **SEW-EURODRIVE** contracts engineer Rudi Swanepoel notes that the gearboxes were covered with an OS2 paint work.

"The 210 µm paint work is specially-designed for acidic environments. Viton seals were also fitted on the high speed shaft and low speed shaft, which is standard for these environments. Without these extra precautions, the seals would perish and the paint would peel off."

SEW-EURODRIVE's scope of work included the supply of 36 MC mixing units fitted with EBD (extended bearing distance) to absorb the radial forces encountered in mixing. A further 17 helical gear units were supplied, some of which were assembled with AM Adapters.

According to Swanepoel, the bearings on the system should last more than nine years. "Based on our calculations, the bearing life should be in excess of 100 000 hours if they are properly maintained. This ensures high-efficiency and minimal downtime," he adds.

Enquiries: www.facebook.com/SEWEurodriveSA

The acid mine drainage plant consists of a combination of 53 specialised Mixtec mixers.

Petrol powered water pumps

LEO's petrol powered water pumps are designed to transfer clean water with liquid temperatures between 0 °C and 40 °C. They are particularly suited for use in water supply and drainage applications in factories, mines, municipal facilities, field irrigation and more. The LEO LGP petrol powered water pump has a robust pump body ensuring long operational life and reliable service, while at the same time, uses less petrol compared to similar models. The water pump offers improved sealing due to its special mechanical seal, and the five-directional outlet provides easy operation. A newly designed handle provides simple start-up, while the compact design allows a 20% increase in loading. With an anti-rust cast iron impeller and diffuser, the pump has a high quality forged steel crankshaft with a maximum 8 m suction. LGP is powered by a single cylinder, four-stroke, air-cooled 5.5HP/6.5 HP engine with a speed of 3 600 rpm. LEO is represented locally by **Raptech**.

Enquiries: Carl Mulock. Tel. 011 693 5110 or email enquiries@raptech.co.za

First-of-its-kind motor range that complies with all IEC standards

Electric motors worldwide are estimated to consume up to 40% of global electricity supply. With increasingly-stringent environmental legislation and unreliable energy supply, the International Electrotechnical Commission (IEC) has established regulations set out in its IEC 60034-30:2008 standard. The IEC standard focuses on single-speed, three-phase 50Hz and 60 Hz ac cage induction motors in the 0,75 kW to 375 kW power range – the most widely used range of motors. According to this standard, motors are produced and categorised as:

- IE1: Standard Efficiency
- IE2: High Efficiency
- IE3: Premium Efficiency

As of 1 January, 2015 the European Economic Area officially prescribed that all asynchronous ac motors with squirrel-cage rotors be classed as IE3. SEW-EURODRIVE has proactively expanded its comprehensive portfolio of ac motors by adding new IE3-accredited units, writes the company's general manager for engineering, Conrad Pilger. Although the SEW-EURODRIVE DR modular motor system has been available since 2008, it became IE3-compliant in 2014, after being optimised in dimensions, weight and performance. The systems can be integrated easily into existing machines and systems to enable greater energy-efficiency. The DR series is now the only system of its kind worldwide that satisfies the requirements of all efficiency classes, from IE1 to IE3, in a single product range.

Despite the recent optimisation, the IE3 motors are compatible with the same components, which simplifies the stocking of spare and wear parts. This represents a significant cost benefit for suppliers and end customers. The new DR motors are as compact as an IE2 class motor of the same power rating. The motors are available in the power range between 0,75 kW and 200 kW, and can be combined with SEW-EURODRIVE gear units using direct mounting, or as stand-alone motors. While IE1 and IE2 motors are still commonplace in South Africa, rising electricity costs and continued load-shedding are factors prompting local industries to invest more money upfront in energy-efficient motors, in order to ensure long-term savings. The new motors from **SEW-EURODRIVE** set standards in terms of global innovation and sustainability. Given that efficiency regulations are expected to get stricter worldwide, these new solutions will be recognised as the 'motors of the future' for the next 10 to 15 years.

Enquiries: Tel. 011 248 7000 or email cpilger@sew.co.za

Gearbox improves efficiency at mine

Bearings International recommended the new ABB Dodge motorised torque-arm (MTA) reducer as a more effective replacement to a standardised gearbox system that the CJ Rensburg mine in Klerksdorp had been using for a number of years. The recommendation was made by **Bearings International** Klerksdorp branch salesman Jaco van der Schyff. "I shared all of the features and benefits of the ABB Dodge MTA reducer, and how it would save time and money. I had been through extensive training and have made joint sales calls with the local ABB Dodge representatives, and I was confident the MTA was the right solution for the mine," he says.

After discussions and technical support from ABB to select the correct size ABB Dodge MTA for the conveyor application, mine officials purchased two units for testing. Van Rensburg notes that the MTAs were standardised on the plant shortly after installation, following a strong performance. "It only took 15 minutes to install the MTAs, as opposed to a number of hours that we normally spend installing a competitor's gearbox. What's more, the gearboxes are just as easy to remove. This is a major convenience, as the competitor gearbox had to be cut off the shaft, which was time-consuming. As this is a direct drive, costly V-belt maintenance has been eliminated too," he adds.

CJ Rensburg mine maintenance manager, Rocco van Rensburg, said that the ABB and Bearings International teams assisted the mine in overcoming challenges related to bearing assembly. "We experienced difficulty installing standard SN style plummer blocks, as these bearings arrive in pieces and have to be assembled on site. This not only takes time, it also means the bearings are easily contaminated, leading to shorter product life."

Enquiries: Tel: 011 899 0000 or email matthewt@bearings.co.za

Industrial serial device servers with dual LAN

Antaira Technologies is a developer and supplier of device networking and industrial communication products and is proud to introduce the advanced version STE-708 and STE-716 Industrial Serial Device Server series that encompasses device server network redundancy and zero data loss redundancy feature solutions. Antaira Technologies' new STE-7xx series is a 1U 19" rackmount type designed serial-to-Ethernet device server designed to transmit any standard serial RS232 or RS422/485 data through the ubiquitous TCP/IP Ethernet based network. This series comes with optional models supporting 8 (STE-708) or 16 (STE-716) serial COM ports with 2,5 kV serial optical isolation protection for serial data. The new STE-708 and STE-716 are embedded with dual independent IP address LAN (10/100Tx) ports to support any mission critical application with built-in dual subnet mode to execute a data redundancy solution. The device servers can also be connected directly to a redundancy network infrastructure by accessing RSTP or ERPS ring protocol function. An LCM (Liquid Crystal Monitor) is installed on the front panel of the unit that can be used to display the unit information and perform basic configurations. This product series has different optional models to support 100~240 Vac or 24/48 Vdc power input and each model version provides extended operating temperature support of -20° to 70° C. The STE-708 and STE-716 series can be configured via a user-friendly web console, windows utility software, or Telnet command line through the serial console (RS232 DB9 male) port in front of the unit.

Enquiries: Elyse Wang. Email sales@antaira.com.tw or james.liao@antaira.com.tw

Solution for pump protection

A range of electronic motor protection and control relays, especially designed to protect pumps and motorsfrom a variety of faults associated with this market is available from **NewElec.** The entire K series is aimed at rendering assistance to pump users and consultants that specify protection requirements for pumps. What makes these relays unique is that they incorporate features such as dry-run protection and phase reversal protection which are basic requirements for the protection of pumps. A model exists for every budget. The more upmarket models also include built-in features that allow for a user-selected pump priming time, as well as a user-selectable pump operating time slot. Automated re-start times for dry-run trips are available together with selectable automatic overload trip resets. A useful asset on some models permit the user to measure dry-running conditions by means of power factor measurements instead of conventional current measurement so that greater accuracy can be achieved. The range includes the most basic features that need manual adjustments directly by the user to the more sophisticated that can only be programmed by the supporting software avoiding possible setting interference by users. These include the monitoring of statistical information such as the number of starts, trip faults and pump efficiency. Motor protection is achieved by the usual current measurement methods and user-selectable phase voltage.

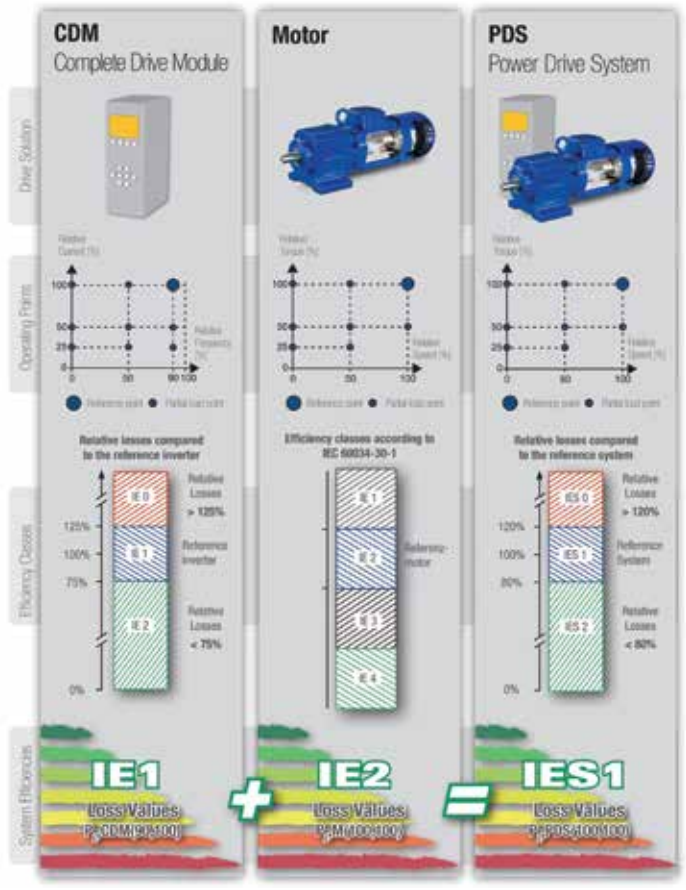
Enquiries: Email sales@newelec.co.za

Delivering the latest **efficiency standards** for power drive systems

By Dipl Ing FH Y Yüce, Bauer Gear Motor GmbH

The latest developments in gear motor design and the benefits to the end user.

Recent regulations relating to electric motor efficiency requires a motor between 7,5 kW and 375 kW to use either an IE3 rated motor or an IE2 motor installed with a variable frequency drive (VFD). However, this is the minimum standard and some manufacturers continue to develop motor technology and designs to help end users maximise the potential energy savings. While the minimum energy efficiency ratings are tightened for the majority of electric motors, there are some exceptions - namely brake motors and those operating in potentially explosive atmospheres - that will retain their exempt status. However, the company represented by the author, is leading the field with the development of the S series of Permanent Magnet Synchronous Motor (PMSM) which offers variable-speed motors in efficiency class IE4 for use in explosion hazardous areas. Clearly explosion protection takes precedence over energy savings, but this has put some industries, such as Oil and Gas and Mining, at a disadvantage when trying to improve the overall efficiency of their operations. While safety has to be prioritised in such environments, historically this exemption has meant that operators are missing out on potential energy savings of as much as 40%.



Motor technology and designs should maximise energy savings.

Currently most Ex e (Increased Safety) rated variable speed, three-phase induction motors on the market are generally available in standard efficiency class IE1. While the efficiency of these can be improved with the addition of frequency inverters, they still fall well short in comparison to the improved design of IE3 motors.

Fortunately the company represented by the author has a long history of working within such sectors and has developed the S Series of Ex rated IE4 motors. The S Series brings the latest technology to applications that require motors to be specified and designed to meet ATEX classifications and deliver the energy savings that are available in other industrial areas.

The S series is part of Bauer's PMSM motor range which has been proven to provide the best possible energy efficiency. The range of motors is available from 0,55 kW to 15 kW and is classified for Zones 1 and 21. Not only is the PMSM design superior at converting electrical energy into mechanical power, it also offers the added benefit of maintaining constant speed independent of the load. This means that motor speed does not vary - despite overload variations or cases of voltage drop - as long as the mains frequency is kept constant.

The PMSM series is an environmentally friendly range of motors, employing a highly efficient design of rotor that integrates embedded permanent magnets made from rare-earth material, instead of the squirrel-cage rotor found in induction motors. This design offers a number of key benefits. It reduces heat losses from the rotor by 100%, total losses by approximately 25%, and increases total efficiency by 10% or more. For the PMSM user, this improved performance translates into lower total cost of ownership, a reduction in CO_2 emissions, and ongoing savings that buffer against future increases in energy costs. PMSM synchronous motors offer considerably improved efficiency when compared to induction motors, even under partial load conditions; and extremely high efficiency under rated operating conditions. They also have considerably higher power density, which, for geared motors, yields higher system efficiency with minimal installation volume – and also reduced weight. Importantly, PMSM drives can produce higher torque values for the same installation

ATEX – Atmosphere Explosive
Ex e – Increased Safety
IE – International Efficiency
PMSM – Permanent Magnet Synchronous Motors
VFD – Variable Frequency Drive

Abbreviations/Acronyms

There are series that deliver all the efficiency benefits of PMSM technology within an ATEX-certified package classified for Zone 1 and Zone 21 environments.

volume as conventional induction motors, a factor that allows cost saving, through the ability to specify a smaller motor size in some applications. The PMSM motor series is available in ventilated and non-ventilated configurations across the power range from 0,55 kW to 15 kW. They operate on 380 V to 500 V power supplies, and are rated for inverter duty, offering an extended speed range with constant torque.

IE4 is being discussed by many manufacturers yet few are actually delivering.

Conclusion

IE4 is something many manufacturers are talking about yet few are actually delivering. There is a cost premium to these motors, but the market uptake should be driven by the economics over the life of the motor. For a small to medium sized electric motor that is running close to capacity for the majority of the time, used in a continuous manufacturing process for example, then the additional investment in terms of purchase cost is quickly outweighed by the energy savings that can be achieved.

take note

- Lifetime costing is becoming an increasingly important consideration for any equipment.
- The efficiency of a motor drive system is based on the efficiency of the motor, as well as the mechanical system coupled to it.
- Leading geared drive manufacturers are now able to provide highly efficient combinations, and clients are urged to confirm that the systems they purchase are indeed as efficient as they claim to be.

Dipl-Ing (FH) Yasar Yüce has been product manager at Bauer Gear Motor GmbH since 2006.
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A success story in trying times

Generally, when speaking to people about business prospects, one finds significant negativity and concern about the future of certain sectors, especially mining. Of course, the country faces huge challenges, especially around the supply of electricity, which is vital to support industry growth. In addition to that, commodity prices are down, and industrial unrest is impacting on investor confidence. Yet, despite tough economic conditions, some companies manage to thrive and grow. One such example is JB Switchgear Solutions, a leading manufacturer of low voltage switchgear systems and associated equipment.

Based in Brakpan on the East Rand, the company recently moved into new premises boasting some 4 500 m^2 of factory space, complete with overhead cranes and other logistical features to support JBSS' continued growth objectives.

JB Switchgear started trading just over three years ago, after Johan Basson, previous owner and managing director of RBF Technology, decided to establish a new company to service the needs of industry, in respect of electrical switchgear solutions. With some forty years of experience in this field, there was a clear understanding of what would be required.

The key to success lies – largely – in competent staff who are focused and committed to total customer satisfaction. To this end, JB Switchgear managed to establish a very strong team with outstanding levels of experience, know-how and reputation for excellence. Technical director, John Balsdon, says that the team can design around site and customer-specific requirements whilst ensuring compliance with the relevant technical standards. JBSS provides technical input and guidance to its customers to produce the most practical solutions.

Basson says that JB Switchgear's vision is simply to be the supplier of choice in its field of activity. This prompted the company to demonstrate its commitment in various ways; JB Switchgear carries official ISO 9001 listing for its quality management system, through SGS. Basson says that the company is in the process of obtaining ISO 14000/ISO18000 listing through Makrosafe. In addition, JB Switchgear's 'Eagle Series' of motor control centres carries SABS-type test certification for compliance with IEC 61439-2 and SANS 1973-1. The company is a level 4 BEE supplier, and constantly strives towards employee upliftment and the creation of a working environment in which people can flourish. Basson maintains that the greatest asset in any company is, and always will be, its people.

Basson believes in putting something back into the industry, and has therefore served as chairman and exco member of two key industry associations, the Electrical Engineering and Allied Industries Association (EEAIA) and the Electrical Switchgear Association of South Africa (ESASA) for many years, and has spearheaded numerous initiatives around technical forums and standards' development. Basson is an active member of the SANS 1973-1 working group, and industry representative on various SABS technical committees. 'If you want to stay in the game, you need to know the rules,' says Basson. 'Participating in the working groups and industry associations has always given me great pleasure whilst keeping me abreast of the latest developments'.

JB Switchgear's ability to provide simple, robust and user-friendly switchgear systems has been a key feature of its offer to market. That, coupled with good quality, competitive pricing and exemplary customer service, positions JB Switchgear as a strong, reliable sup-

Board of Directors

Example of a modular substation

Ample workshop space

Discussing a component layout

plier in this field. 'The company is a preferred supplier to numerous organisations and companies, a position achieved through hard work, but that motivates us to do even better. We must never underestimate the value of our customers', says Basson.

Basson says that the company is focusing on providing packaged solutions wherever possible, including E-houses, containerised substations, RMUs, transformers, MV and LV switchgear, UPSs, fire suppression, etc as a one-stop solution which promotes more competitive pricing and easier project management.

Whilst JB Switchgear's primary focus is on mining and water treatment, the company also maintains a strong drive in heavy industry, cement, materials handling, paper and pulp, power generation and petrochemical. Various industries require specific solutions, and JBSS' in-house capabilities enable it to design and engineer products to meet such specific needs.

JB Switchgear is fortunate to have a healthy order book covering a broad spectrum of industries and applications. This includes platinum, diamonds, iron-ore, coal and rutile mining projects. JBSS regularly executes projects in other African countries such as DRC, Ghana, Burkino Faso, Botswana, Namibia and others. Basson says that the company is in a favourable position to execute large and small projects with quick turn-around times, due to its depth of engineering and manufacturing capacity.

He concludes by confirming JB Switchgear's commitment to service the needs of its customers for many years to come. 'We are proudly South African. We understand Africa's challenges and the environment we operate in. We believe in creating a footprint to be proud of, and which will facilitate sustainability into the future of this vibrant country of ours'.

Our Symbol

The eagle's vision is legendary. It sees detail that others don't, often from afar. It has the ability to focus on large and small opportunities with equal dexterity and commitment.

The eagle is equally at home on solid ground, or soaring at great altitudes to where it rises above all else. From high above it can see the big picture, and study its surrounds for opportunities and threats.

Eagles are known for their strength and intelligence. Yet they never abuse these qualities. They will hunt their prey, protect their families and defend their territory with skill and total commitment. They have a special ability to interpret their surrounds, and to position themselves to take advantage of opportunities.

These qualities are what inspire us at JB Switchgear. We want to be visionary, to rise above our competition, and to establish ourselves as a strong and respected player in the market. We want to be....The Eagle.

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Power and productivity
for a better world™

New switchgear for City Power

City Power is **ACTOM MV Switchgear**'s first customer for its new generation AMV12 range of air-insulated switchgear officially launched into the market at the beginning of the year. The business unit was awarded a contract in April last year to provide a 17-panel 12 kV rated switchboard incorporating the new switchgear for installation in the 88 kV/11 kV Industria substation in Industria, West of Johannesburg's city centre. The contract, which formed part of a refurbishment and upgrade of the substation by City Power, was awarded by Midrand-based Machite Engineering, the electrical and civils contractor on the project. ACTOM MV Switchgear, which completed the contract in January this year, developed the AMV12 range in line with the changing requirements of its principle customers and in conformity with the latest international quality and safety standards. It developed the new range in partnership with YIHE Electric Group, a Qingdao (China) based manufacturer of electrical equipment. The AMV12 range of switchgear is rated for 12 kV with current ratings of 800 A, 1250 A and 2 500 A at 31,5 kA in accordance with IEC 62271-200.

Enquiries: Greg Whyte. Tel. 011 820 5140 or email greg.whyte@actom.co.za

ACTOM MV Switchgear technicians completing assembly and inspection of the AMV12 switchgear panel for City Power's Industria substation.

Unique handheld instrument

Diagnosis, maintenance and servicing of electric drive motors necessitate the measurement of various electrical quantities, as well as function and safety testing. Several measuring and test instruments are required which are only conditionally portable and therefore unsuitable for on-site service calls. Gossen Metrawatt's new Metrahit Coil unites all important measuring and test instruments for electric drives into a single handheld device. The instrument includes a universal digital multimeter, an insulation measuring instrument and a motor coil tester. This combination is unique in a handheld instrument. The short-circuited coil detection function is a world first. Asymmetries resulting from short-circuited coils can be detected by comparing the measurement results obtained for motor coils in multiphase drives. Measurement is performed with a charging voltage of 1 000 V, which makes it possible to detect errors which only occur under operating conditions.

Enquiries: Timecount. Joss Laurencik. Tel. 011 882 3105 or email sales@timecount.co.za

PSA-31 Pressure switch with flexible adaptation to various mounting situations.

Economical reliability

Electronic pressure switches in sanitary applications

By J Zipp, WIKA

Simple pressure monitoring tasks are carried out electronically so that the plants can be controlled reliably – conveniently with a switch.

Automated processes increase the process safety, therefore they are essential for sterile production processes. They eliminate the potential for error that inevitably exists when all routine control tasks are carried out manually. This also applies to the upstream and downstream cleaning and sterilisation processes. Thus, even simple pressure monitoring tasks are carried out electronically so that the plants can be controlled reliably – conveniently with a switch.

The control of the replenishment of ultra-pure water or sterile air is a classic example for a straightforward switching task in the supply units. Electronic pressure switches are used in such applications, not only for measurement technology reasons, but also for efficiency ones. Plant control, whether through PLC or relays, is more economical when using such decentralised elements.

From these determining factors of reliability and economy, the requirement profile for the pressure switches is derived. They must be robust in order to survive in harsh industrial environments. Commissioning, maintenance and service operations must be uncomplicated and fast, so that plant downtime is avoided, or is, at least, reduced to the shortest possible duration.

In such applications, electronic switches with transistor switching output and an integrated digital display have proven particularly useful. There is generally a limit value, e.g. for over or under-pressure or level that has to be monitored. For the connection to machine control, a binary, digital input is sufficient. The digital display is a helpful component during commissioning and maintenance, enabling the measured value to be checked conveniently and directly on site in the system.

For pressure switches, the typical applications in sterile process technology require numerous measuring ranges up to 25 bar with gauge, vacuum or absolute pressure. Should continuous measurement be required over and above the switching function, the operator will need an instrument with an additional analogue output (up to 20 mA). On the basis of these requirements, one can generate a wide variance with a single switch model. With the PSA-31 from WIKA, for example, there are around two million combinations in total (from the possible process connections, measuring ranges and output signals) possible as a standard design.

Simple operation

Using the example of the PSA-31, it can be illustrated how the determining factors for operation have had an effect on its design and function. Correct sensor measurement and switching functions do not alone guarantee the required reliability. Operation and display are also ancillary to this goal, with the additional measure of economy: The manual handling of this interface between man and machine must be accordingly simple, unambiguous and time-saving.

To meet this requirement, the VDMA has published a guideline. The aim of the 24574 [1] standard is to simplify the operation of switches by standardising the menu navigation, the terms and the display parameters, as well as the electrical connection. This standard was developed within the Fluid Power Association of the VDMA with support from customers. This is the base for the operation of the PSA-31. Its three-key system and the alpha-numeric display ensure fast, intuitive menu navigation without the need for additional assistance. The simple operation of the pressure switch is supported by the large and ergonomic arrangement of the keys, giving the operator a clear, tactile feedback.

CIP – Cleaning-In-Place
EHEDG – European Hygienic Engineering Design Group
LED – Light Emitting Diode
PLC – Programmable Logic Controller
VDMA – Verband Deutscher Maschinen - und Anlagenbau eV (German Engineering Association)

Abbreviations/Acronyms

Good readability

The demands on a digital display are clearly defined: an 'unshakeable' as well as durable reproduction of the required information as well as good readability, also in harsh environments. Currently, LED displays are mainly used with four digits and seven segments. The possible representation of letters and text in this configuration, however, is very limited and thus often hard to read, which can affect intuitive instrument programming.

Therefore, the PSA-31 operates with a 14-segment display. Its far better resolution considerably increases the readability of the parameters in the setup and thus minimises the risk of mistakes. With this pressure switch, as with all WIKA measuring instruments with digital displays, the figures are displayed in red. In contrast to displays in blue or yellow, these displays are clearly visible, even from a distance.

All settings for a pressure switch, from the commissioning to the parameter update during the process optimisation, are made on site. The instrument must therefore also be easily accessible in confined spaces. This requires a compact design with flexible adjustment within a range of mounting situations. With all WIKA switches, the display can always be positioned to face the operator and the M12 connection aligned according to the desired cable routing of the plant. Even when the location of the electrical connection is on the side, the instruments are still very compact in comparison to an axial plug connection. Should a switch need to be mounted overhead, a display is available which can be electronically rotated through 180°. The readability of the display is made even easier by the inclined angle, and it offers a large viewing angle due to the LED technology.

The interface between man and machine must be simple, unambiguous and time-saving.

Conclusion

Sterile production processes have automated upstream and downstream cleaning processes. For 'Cleaning In Place' (CIP), the company's engineers paid attention to a modern hygienic design for the wetted parts of the PSA-31. Its EHEDG certification and the 3-A marking confirm that the relevant components of the pressure switch can be cleaned directly and without risk of contamination. In terms of the materials, high-quality 1.4435 stainless steel is used with a low delta ferrite content, which is predominantly the first choice in the pharmaceutical industry. With the traceability of the steel, both to the smelter as well as to the user, the conditions of the EC 1935/2004 [2] European regulation are fulfilled and can thus be confirmed with a manufacturer's declaration.

References

[1] VDMA 24574-1. 2014. Standard for fluid sensors. Part : Pressure switches.
[2] EC 1935. 2004. EU food contact regulations for safe food processing.

Application example, PSA-31 pressure switch.

Application photo, sanitary applications (photo courtesy werbefoto-burger.ch - Fotolia.com).

take note

- The best control is the simplest control – providing it is safe.
- Often, achieving the simplest solutions requires the smartest thinking and the smartest systems.
- Modern switches provide good readability, are compliant with the latest specs, and are easily incorporated into system designs.

Joachim Zipp is the segment manager of sanitary applications at WIKA's head office in Germany.
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Extends functionality of machines

IO-Link is the intelligent connection between the device (sensor or actuator) on one side and PLC or field module on the other side. The AC5225 AS-i IO-Link module from **ifm electronic** combines the advantages of the AS-i wiring system with the standardised IO-Link communication. The simple AS-i system connects the data and power supply for IO-Link sensors and actuators.

AS-Interface has become a well-established means of simplifying and speeding up machine wiring, while adding diagnostics. IO-Link, as a supplementary system on the lowest field level, is rapidly increasing in the number of devices available on the market as this standard is now supported by so many major manufacturers. IO-Link not only simplifies the design and construction of machines by virtue of its standardisation, it also significantly extends the functionality of machines. Short set-up times, higher productivity, and new modern maintenance concepts send a clear message for IO-Link. To assure its international use, IO-Link has been incorporated into the globally recognised PLC standard IEC 61131. Mandatory test specifications, test tools for masters and devices, and the resulting manufacturer's declaration ensure the interoperability and quality of IO-Link.

As defined by the IO-Link standard, the AC5225 can connect to binary or analogue sensors, standard devices or IO-Link-enabled. A feature of IO-Link is exact data transmission with IO-Link: IO-Link and AS-i transfer analogue values in a digitised manner, i.e. without conversion losses. Distorted signals by electromagnetic interference or contact resistances are excluded. Using an IO-Link sensor extends the powerful AS-i diagnostics to the sensor level.

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

Foam – no problem for new level sensor

Exact level measurement in heavily foaming media is no problem for **ifm**'s new LR2750 level sensor for hygienic applications.. The device was specially developed for demanding applications in the food industry. It features a hygienic design and resists aggressive cleaning processes. In addition, the sensor is equipped with an Aseptoflex Vario thread for a multitude of process adapters. Due to the use of high quality and insensitive sealing materials such as PEEK and EPDM, as well as a high grade stainless steel housing, the new level sensor is best suited for internal and external cleaning. LR2750 meets IP 69K requirements, has an enhanced pressure resistance of up to 40 bar and is also rated for high medium temperatures of up to 150°C. This makes the sensor extremely resistant to the most adverse operating conditions such as steam cleaning. An optional tank adjustment feature ensures extreme flexibility for the LR2750. Even if an installation proves to be difficult, the device operates precisely and reliably. Whether smaller storage tanks, expansion tanks, separators, or for filling, the LR sensor can be used almost everywhere.

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

Sensors for early tsunami warning

SENIX specialist distance measurement manufacturers, represented in South Africa by **Instrotech**, have their ToughSonic sensors playing a critical role detecting sea level changes as part of a sophisticated Tsunami Early Warning System (TeWS) in the Philippines. Senix engineers collaborated with the Philippines Advanced Science and Technology Institute (ASTI) to customise ToughSonic 50 ultrasonic sensors for this first-of-its-kind system. Each ToughSonic 50 sensor is integrated into a tide gauge platform that also includes ASTI-designed wet and dry sensors, a solar power system and wireless communications equipment. Hundreds of these tide gauge platforms are integrated to create the largest and most sophisticated Tsunami warning system in the world.

The impetus for the TeWS system is the Manila Trench, an earthquake-prone zone west of the Philippine island of Luzon that reaches depths of 17 700, which is prone to earthquakes. The Philippines Institute of Volcanology and Seismology (PHIVOLCS) has forecast that a strong earthquake in the Manila Trench could trigger tsunamis with waves up to 32 feet high that could reach the populous Manila metropolitan area in less than an hour. How it works: The Senix sensors detect any significant rise and fall in the sea level. The data is logged on each platform and then sent in real time to a data receiving center operated by PHIVOLCS where data from all the sensors are consolidated and analysed using data visualisation, interpretation and decision software. The analysis results can be sent to local government agencies in near real-time where officials can sound off sirens to warn people in high risk areas to move to higher ground.

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

Retro-reflective sensors – no need for manual alignment

The calibrated abeam optics on the Leuze PRK 18B Series sensors ensure precise striking of even the smallest reflectors, eliminating the need for time consuming alignment after mounting. With a host of new features, the innovative sensor can reliably detect small, thin and transparent objects, such as foils, even under extreme environmental conditions.

Gerry Bryant, managing director of sole Southern African distributor for Leuze sensing equipment – **Countapulse Controls**, says that these compact sensors have a shorter response time, higher switching frequency, improved adjustability of the switching point and a tracking function for extending the cleaning interval.

Leuze abeam technology includes an auto-collimated lens which is up to eight times more precise than standard optics.

With a maximum deviation of ±0,25 %, the light beam has a deviation of only ±2,2 mm over a distance of 500 mm.

"When compared to a two lens system, these auto-collimated sensors have only one optical channel, thereby eliminating angle errors and removing restrictions with regard to their fitting position. This makes them the ideal choice for detection of objects at short ranges," Bryant points out.

The elimination of an additional front screen prevents reflections and reduces drop formation for a more accurate sensing capability. Accuracy and reliability of detection is further ensured through the compensation for temperature fluctuations of ±20 °C.

The Leuze PRK 18B has a switching frequency of up to 5 000 Hz, a response time of 100 µs that makes it considerably faster than comparative sensors at dynamic transport speeds and a jitter time of 32 µs, resulting in increased accuracy at static transport speeds.

The M4 internal threads of the Leuze PRK 18B sensor are integrated into the highly robust housing, reducing materials by 80 % and resulting in faster, uncomplicated initial mounting and subsequent device changes.

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

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Superior interlocking and position monitoring for industrial applications

Banner Engineering introduces its SI Series Safety Limit Switches, designed to effectively monitor the position of a wide variety of guards, gates, covers and other moveable machine fixtures and tooling. The SI Series is available in three models – SI-LM40, SI-LS31 and SI-LS83 – offering various actuating systems, contact arrangements, housing and mounting configurations to satisfy diverse industrial applications. Banner's SI Series feature a limit-switch style, complying with Type 1 per ISO 14119 standards, with actuating elements integrated with the enclosure. Configured with a positive-opening design of the normally closed contacts, per IEC 60947-5-1 standards, these switches provide reliable monitoring regardless of environmental conditions and withstand any attempt to override the switch and defeat the system. "With a unique limit-switch design, the SI Series Safety Limit Switches are ideal for safety or non-safety interlocking and position monitoring applications," said Mike Carlson, technical marketing manager (safety products), Banner Engineering. "The switches are ideal for monitoring sliding gates and guards on machines in safety fencing systems, in addition to solving simple position monitoring such as end-of-travel and home-position."

The SI Series offers multiple actuating systems, including plunger, roller, spindle-mount lever and two lever styles. The switches' actuator head is rotatable in 90-degree increments to ensure thorough monitoring. When properly interfaced, or used with an appropriate safety controller/module, two safety switches monitoring an individual guard can achieve a category 4 level of safety, per ISO 13849-1.

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

Digital converter

To provide accurate control of, for example, the speed of a conveyor motor, often requires a feedback of the actual speed of the adjacent machine. If this is only available as a pulse sequence, the DW2503 digital converter from ifm electronic offers a solution. The upgraded DW2503 can accept high-frequency incoming pulses up to a maximum 10 kHz, from as low as 1 pulse per minute. The user can scale the conversion of these pulses into the desired 0/4 to 20 mA or 0 to 10 V signal. If needed, the DW will also invert the signal.

As a bonus the DW also features a switched output in the form of a relay and a solid-state transistor, allowing the user to set an alarm signal.

The output can be set to stay on for a chosen time. ifm electronic has upgraded the original DW frequency converter to cover an extended operating temperature range down to 40°C below zero.

The newly developed luminous OLED display is not only clearer but also brighter, and the menu-guided parameter setting is designed for maximum user friendliness.

The DW2503 will operate on a wide range of voltages, ac or dc, and provide dc supply to input sensors. As a market leader in the field, **ifm electronic** can advise on and supply suitable sensors, such as inductive or magnetic pulse pick-ups, or shaft encoders.

Enquiries: Tel. 27 12 450 0370 or email: info.za@ifm.com

Q3X Laser contrast sensor – fixed background suppression

RET Automation Controls is now stocking a version of the Q3X laser contrast sensor with fixed background suppression from Banner Engineering. Featuring contrast detection, plus fixed background suppression, the Q3X LD50 reliably detects targets within the desired sensing range while ignoring objects in the background.

Out of the box, the Q3X LD50 operates like a fixed-field laser sensor and detects targets within its 50 mm sensing range.

However, the sensor can be programmed for low-contrast sensing within this range, while ignoring objects at least 60 mm away. This allows the sensor to accurately detect its target without background objects affecting its performance.

"With fixed background suppression, the Q3X overcomes the main problem of standard diffuse-mode sensors where objects in the background affect the application," said Dennis Smith, Technical Marketing Manager at Banner Engineering. "The Q3X LD50 is an innovative solution for our customers' hardest detection and error-proofing problems."

Featuring high-speed part detection as fast as 250 µs, Banner's Q3X laser contrast sensor can capture up to 2 000 events per second. This, along with background suppression, makes the Q3X ideal for solving applications with small contrast changes where a background needs to be ignored.

A typical application is label detection on a bottle where contrast differences between the label and bottle provide reliable detection but the sensor must ignore the shiny metal rail in the background.

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

‘Smart Sensors – New technologies for process optimisation’

78th NAMUR Annual General Meeting on 5 – 6 November 2015, Germany

Today, process control is mainly based on the measurement of variables such as flow, level, pressure and temperature as well as analytical parameters. In the interlinked, model- or knowledge-based production and process world of the future, the field sensor remains the basis to gain required information from the process.

NAMUR (User Associationof Automation Technology in Process Industries), in cooperation with the GMA, has already expressed the needs of their member companies with regards to sensors in the Roadmap Process Sensors 2015+, which will be updated this year.The main objectives of the Roadmap include: To unite technology and market view, analysis and prioritisation of (future) information needs in industrial processes, elaboration of development goals for new sensors, as well as pointing out possible solutions and when to expect their implementation.

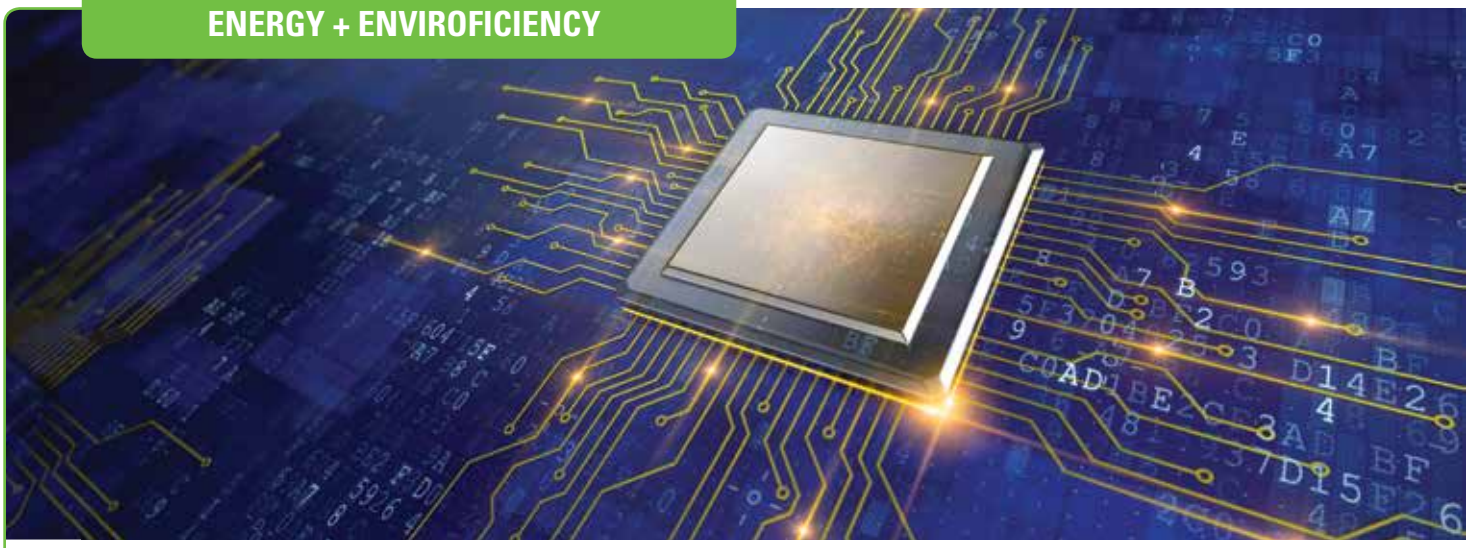
To implement this roadmap, a new generation of sensors is required, based on the accumulated application knowledge but technologically significantly different from present sensors: ‘Smart Sensors – New technologies for process optimisation’ is the issue that engages both users and manufacturers of sensors, and is the central theme of the 78th NAMUR Annual General Meeting on 5 - 6 November 2015 in Bad Neuenahr, Germany.

As sponsoring partner, KROHNE was chosen: the supplier of process instrumentation and measurement solutions is actively engaged in the field of smart sensors. In the keynote speech, the two managing directors of KROHNE Group, Stephan Neuburger and Michael Rademacher Dubbick, along with Dr Attila Bilgic, CTO of KROHNE Group, will give an outlook on the process measurement technology of the future: "We are working on smart sensors that, in addition to quantitative, will also make qualitative information available inline/online" said Stephan Neuburger. "In the future, process optimisation will depend even more on the intelligent networking of field devices that, for example, can detect deviations from the model process via a pattern recognition software. Based on current research and development projects, KROHNE will introduce the innovative technologies and associated opportunities that users can expect in the coming years.”

Traditionally, the NAMUR Awards mark the start on Friday.The benefits of NAMUR will consecutively be shown in several lectures. News about automation security will also be presented before theme and sponsor of the NAMUR Annual General Meeting in 2016 are introduced.

The NAMUR Annual General Meeting with **KROHNE** as a sponsor, with hands-on topics and the strive for innovation as spirit, will inspire the participants: An event in the automation world that must not be missed!

Enquiries: John Alexander. Tel. 011 314 1391 or email J.alexander@krohne.com



Smart control in power networks with object oriented modelling

By Taha Selim Ustun, School of Electrical and Computer Engineering, Carnagie-Mellon University, PA, USA

The modelling of electrical networks with the Object Oriented (OO) models proposed in this article and the implementation of Dijkstra's algorithm on it will make microgrid management easier from power flow, generation, load sharing and protection aspects.

The large-scale deployment of Distributed Generators (DGs) introduced unprecedented problems to power networks [1]. In an effort to tackle these problems, the microgrid concept has been introduced. A microgrid is a collection of loads and microgenerators with some local storage and behaves just like a model-citizen from grid side thanks to intelligent control [2].

The following may be counted among the reasons for the changes in the microgrid structure [3]:

- New DG or load deployments
- Islanding of the system
- Fault conditions
- Reconfiguration of the structure for maintenance

This dynamic behaviour of microgrids is a major protection challenge since the conventional selectivity methods assume a fixed network structure and a predetermined relay hierarchy [4]. Whenever restructuring occurs, the selective levels assigned prior to that become erroneous. For a proper operation, the selective levels of relays should follow the changing conditions of the network.

New relay hierarchy should be extracted and corresponding time delays should be assigned before updating them with the help of communication lines [5]. This requires an algorithm which will determine the current structure of the system and yield the relay hierarchy at all branches of the network. There are some studies presented in the literature which emphasise the importance of such an adaptive selective operation such as in [6]. However, the prior discusses the issue qualitatively without any technical details whereas the latter implements an algorithm which includes a look-up table. This is a large set-back because it requires the knowledge of all possible microgrid configurations beforehand, plus human input for the preparation of this table and finally it requires that the microgrid should always match one of the predetermined structures. Moreover, any kind of a new deployment, which is very common to microgrids, requires that the whole selectivity table should be re-written.

Dynamic structure of microgrids

One of the key features of microgrids is their dynamic behaviour. The connection/disconnection of a relay, load or generator at any given instance impacts the operation [7]. Connection of a load or a generator changes the load flow and generation settings. Therefore, the generation settings of the generators shall be updated, accordingly. Connection or disconnection of a relay changes the structure of a network and it requires adjustments. To further elaborate the challenges, as an example, we shall focus on the protection challenges due to dynamic behaviour of microgrids . The challenges from other aspects can be detailed in a similar fashion.

Selectivity is a well known protection concept which means isolating the fault with the nearest relay in an effort to minimise its effect on the rest of the system. This requires that in case of a fault, the relays should react according to a hierarchy. In conventional protection systems designed for passive networks, the relays which are downstream and closer to the fault point are required to operate first. However, if the fault current is very large and downstream relays are not capable of interrupting it, then other relays with larger capacities are expected to operate and isolate the fault. Implementation of selectivity is not that straightforward with the introduction of DGs. The very concepts of downstream and upstream relays are prone to change according to the status of the microgrid. The operating mode, i.e. grid-connected or islanded-mode, changing network structure

CB – Circuit Breaker
DG – Distributed Generator
ENN – Electric Network Node
ID – Identification
LN – Logical Node
MHEPP – Micro Hydro Electric Power Plant
NS – Node Setting
RDIR – Class created in IEC standard
UML – Unified Model Language

Abbreviations/Acronyms

with alternative paths and new deployments are some of the factors that would alter the selectivity parameters.

Consider the system shown in *Figure 1*. In this network, all branches have generation and load, and various alternative network structures can be formed through the combination of relays.

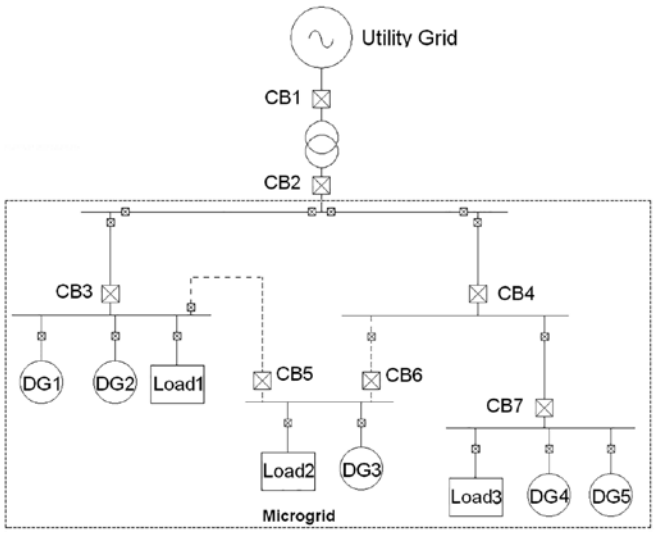


Figure 1: A sample microgrid.

As first case, assume that the Circuit Breakers (CBs) CB1, CB2, CB3, CB4, CB6 and CB7 are closed whereas CB5 remains open. When a fault occurs at the terminals of Load 2, then the most downstream relay will be Load 2's own relay (represented by the little box) and selectivity implies that it should interrupt the connection. If Load 2's relay fails to achieve that in a predetermined time (delay), then the proper sequence for the selective operation should be CB6, CB4 and finally CB2. In similar fashion, should a fault occur at the terminals of Load 3, the proper selective operation requires the sequence: Load 3's relay, CB7, CB4 and CB2.

If CB4 is disconnected for any reason, for example maintenance or breakdown, in order to keep the integrity of the network CB5 closes. The line between Load 1 and Load 2 (protected by CB5) has therefore been added to form a loop structure when necessary and protect the microgrid against contingencies and failures. Now, there is only one branch for the power flow instead of two. For this new microgrid structure all selective levels, time steps and time delay calculations shall be repeated. Following the same examples should a fault occur at Load 2 or Load 3, the proper relay hierarchies are; Load 2's relay, CB5, CB3, CB2 and Load 3's relay, CB6, CB5, CB3, CB2, respectively.

These factors require that the selectivity hierarchy of the relays should be dynamic and updated frequently. An algorithm should be employed which determines the network structure whenever the status of a critical relay is changed. A critical relay refers to a relay the status of which changes the structure of the network. Following this definition relays of CB2, CB3, CB4, CB5 and CB6 are all critical relays whereas Load 2's relay, DG1's relay are non-critical relays.

Object oriented modelling of electrical networks

As mentioned in the previous section the varying structure of the microgrid requires a system which can represent the network in computer environment and monitor the changes occurring therein. In this manner, the operation settings of protective devices, generators, loads and other auxiliaries can be calculated by a central microgrid controller and updated into relative devices {8, 9]. When all the connected devices are recognised as nodes and their connection/disconnection is followed in the modelling system, then the microgrid can be defined with different methods such as the graph theory.

Over the years, the international standard IEC 61850 has defined many OO data and communication models for power system networks especially for substations. However, IEC 61850 and its various parts are continuously evolving with new additions and amendments. Such a data model would allow valuable information such as load profile or generation capacity connected to a particular point within the network to be communicated across to control equipment.

Thus, the authors are proposing the Electrical Network Node (ENN) model shown in *Figure 2*. This node is defined by following OO Modelling rules and Unified Model Language (UML) representation [10]. The node includes some public data to represent its properties such as node ID, operating settings `node settings`which vary for different node classes and connection data such as IDs of the connected nodes.

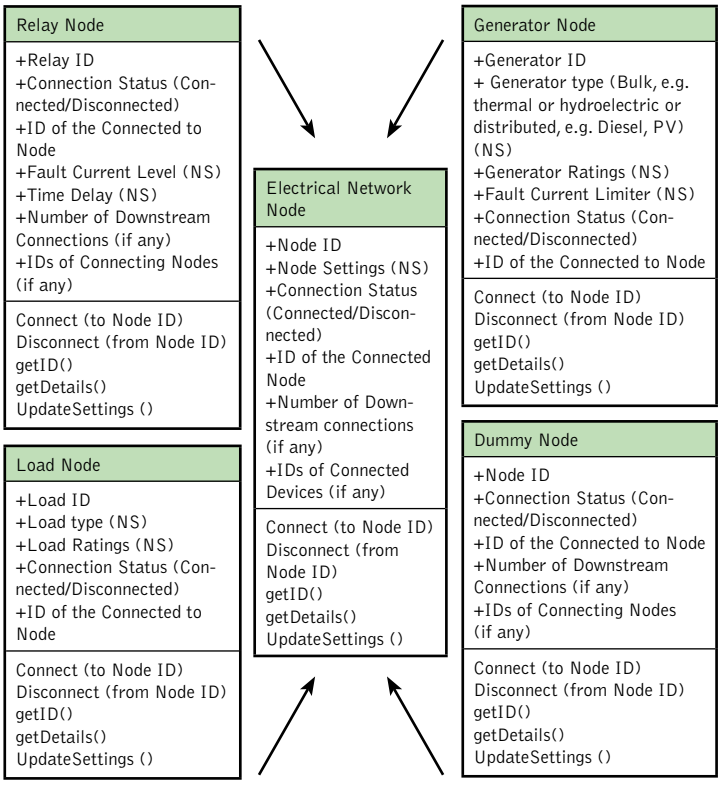


Figure 2: Electrical Network Node and four specific instances of the model.

The common data sets for different instances of the ENN are node IDs, the connection status of that particular node, ID of the upstream node to which the node is connected to as well as the number of downstream nodes which are connected the node under consideration and their IDs. The different specific instances of the ENN will have different node settings (NS) depending on the type of the node and the relevant characteristics. As shown in *Figure 2*, the general object class ENN has four different sub-classes which are:

- Relay Node
- Load Node
- Generator Node
- Dummy Node

The relay element can be modelled by using the LN RDIR from the standard set of documents, but however further advances are surely necessary. For instance, relay node should have at least two attributes which represent the operation settings of the relay. The first sub-group of attributes represents the details of a time-inverse relay while the second sub-group of attributes is used to model instantaneous relays. In similar fashion the generators are categorised under two main headings such as bulk generation and distributed generation. The former is required if the microgrid is connected to a larger generation system while the latter is a vital element for distributed generators such as diesel gen-sets, micro hydroelectric power plants (MHEPP) and other renewable energy resources.

The modelling of loads is kept very simple and only two different sub-groups have been proposed which differentiate between the rotating machine loads and resistive loads which are hard-to-control and lightweight loads, respectively.

The detailed characteristics listed in node settings shall be acquired from the international standard IEC 61850. IEC 61850 is bound to have a significant impact on how electric power systems are to be designed and built for many years to come [11].

The ENN data model shown in *Figure 2* has five different services which are needed to:

- Get connected to another node
- Get disconnected from an already-connected node
- Receive the ID of a particular node for identification purposes
- Acquire the settings of a particular node for management purposes
- Update the current settings of the node with the new operation points stipulated by the central management unit

Among these nodes, the dummy node might be of particular interest. It, in fact, does not represent a specific device but a common coupling point where different connections meet. For example, the network shown in *Figure 1* required a dummy node to connect Circuit Breaker 2 (CB2) to CB3 and CB4. Even if microgrid gets islanded, i.e. CB2 opens, CB3 and CB4 will remain connected over the dummy node. At any given instance, the new connection or disconnection of a device shall be represented by these OO models with abstracted node setting groups.

It is a challenging task to manage microgrids as they have dynamic structures which change very often.

Consider where a relay has a relay, a generator and a load located downstream. When each one of these downstream devices requires connecting to Relay X they will send a connection signal with Connect (Relay X) service. The variable holding the number of connections in Relay X and the array which holds the IDs of connected nodes will be updated. If the details of Relay X are retrieved with RelayX. getDetails() command, in addition to relay characteristics the returned data will include:

Data Attribute	Value
Number of connections	3
IDs of connected devices	{DG, Relay Y, Load}

When the same service is called for the downstream nodes, for instance DGas in DG.getDetails(), the retrieved data shall include two variables in addition to DG characteristic data. One of them is a Boolean operator, 'Connection Status', which is set to TRUE in this instance signifying that the DB is currently connected. The other attribute 'ID of the connected to node' is a pointer pointing towards the upstream node to which DG is connected.

When a connected node requires to disconnecting, for instance Load node, it shall use the service Load. Disconnect (Relay X). The connection variables in Load will be changed as:

Data Attribute	Value
Connected	False
ID of the connected to node	N/A

While the related variables in Relay X will be updated as follows:

Data Attribute	Value
Number of connections	2
IDs of connected devices	{DG, Relay Y}

Following this modelling procedure the changes occurring in the microgrid can be monitored instantaneously and the relevant power management, protection or other adjustments can be performed immediately.

Implementing Dijkstra's algorithm for microgrid hierarchy determination

It is proposed in[13] to model the microgrid system according to graph theory and implement Dijkstra's algorithm in order to extract the relay hierarchy. Since this method does not require the knowledge of the network structure beforehand, it is very robust; it easily accepts new deployments and serves well for plug-and-play purposes.In order to be able to implement Dijkstra's algorithm, the microgrid should

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be represented as a graph similar to the one shown in *Figure 3*. The components should be represented as nodes, or vertices, while the connections should be represented as edges. This requires storage of network data in an array or a linked list. Also the connections between the DGs, CBs and Loads should also be stored in a matrix or linked list structure. For real time response of the proposed technique, the real time data should be updated when a node disconnects from the system or an edge disappears and an alternative edge is connected. All these necessitate continuous monitoring of the microgrid and utilisation of communication lines between the nodes. This should not be considered as a drawback, since such a system is already needed for smartgrids. Furthermore, most of new generation microgrid protection systems incorporate a central protection unit and communication lines as in [6, 7].

In this article, selectivity application is studied as a test case. The proposed method can also be used for power flow, load sharing and generation planning purposes. For the proper application of selectivity, the main goal is to determine the relay hierarchy. It is evident that, there is only one path between the point of origin, CB2, and the destinations, all leaf nodes such as DG1, DG2, Load1, and Load2. This eliminates the effect of distance and simplifies the existing problem to a path finding problem. In other words, Dijkstra's algorithm will be used to find the paths between CB2 and leaf nodes and identify the relay hierarchy.

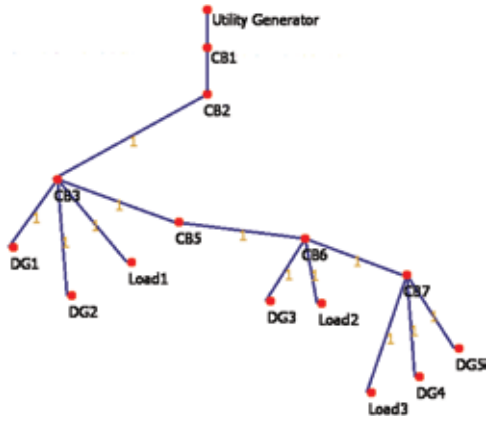

Figure 3: Modelling Case 2 with graph theory.

For the implementation of Dijkstra's algorithm on these graph representations, a C# implementation provided in [14] is used. Firstly, the algorithm is run to find the shortest path (i.e. the only path in our case) between CB2 and DG4 for Case 1. *Figure 4* shows that the path is successfully highlighted on the graph and the proper hierarchy is shown in `Report` area. In order to change from Case 1 to Case 2 following services are executed to perform required connections/disconnections:

Relay4.Disconnect(Relay2)
Relay6.Disconnect(Relay4)
Relay7.Disconnect(Relay4)
Relay5.Connect(Relay3)
Relay6.Connect(Relay5)
Relay7.Connect(Relay6)

The algorithm is executed again to find the path between CB2 and DG4. The path is successfully found without a centralised monitoring for grid structure. The shortest paths and the distances obtained for both of the cases are given in *Table I*.

Table 1: The path from circuit breaker 2.

	Case 1		**Case 2**	
Node	Dist	Path	Dist	Path
CB3	1	CB2-CB3	1	CB2-CB3
CB4	1	CB2-CB4	-	-
***DG 1**	2	CB2-CB3-DG1	2	CB2-CB3-DG1
***DG 2**	2	CB2-CB3-DG2	2	CB2-CB3-DG2
***Load1**	2	CB2-CB3-Load1	2	CB2-CB3-Load1
CB5	-	-	2	CB2-CB3-CB5
CB6	2	CB2-CB4-CB6	3	CB2-CB3-CB5-CB6
CB7	2	CB2-CB4-CB7	4	CB2-CB3-CB5-CB6-CB7
***DG3**	3	CB2-CB4-CB6-DG3	4	CB2-CB3-CB5-CB6-DG3
***Load2**	3	CB2-CB4-CB6-Load2	4	CB2-CB3-CB5-CB6-Load2
***DG4**	3	CB2-CB4-CB7-DG4	5	CB2-CB3-CB5-CB6-CB7-DG4
***DG5**	3	CB2-CB4-CB7-DG5	5	CB2-CB3-CB5-CB6-CB7-DG5
***Load3**	3	CB2-CB4-CB7-Load3	5	CB2-CB3-CB5-CB6-CB7-Load3
** Denotes the leaf nodes*				

The extracted data, the relay hierarchy and the distances, can be used to do necessary adjustments for management and protection purposes. Whenever the structure of the microgrid changes, due to disconnections or new deployments, knowledge of the point of origin and the destinations (which are CB2 and leaf nodes, respectively) is sufficient to extract the new relay hierarchy. Leaf nodes will be DGs, loads or storage devices. When connected to the network, they may have a special heading or a label which indicates that they are leaf nodes.

In *Figure 5*, three new deployments, i.e. CB8, DG6 and Load 4 are added to *Figure 4*. The following three commands are realised for this change:

Relay8.Connect(Relay6)
Load4.Connect(Relay8)
DG6.Connect(Relay8)

Dijkstra's algorithm is run on the graph and the new deployments are successfully identified in grid hierarchy. It is shown that with this simple arrangement, the path from the known origin to known destinations can be found for any possible network structure. Furthermore, if there is a new deployment of branches, relays or leaf nodes, they will be automatically considered in path calculation process provided that vertex and edge data are updated accordingly.

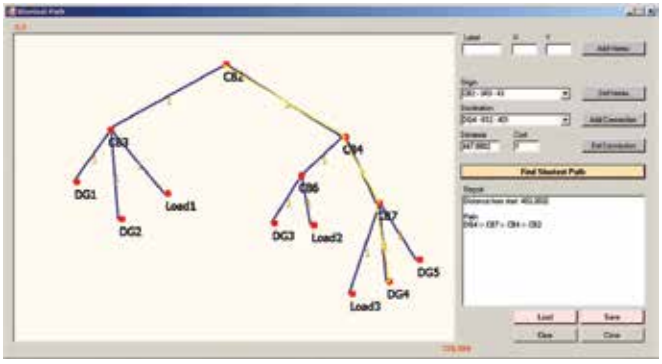

Figure 4: Dijkstra's Algorithm run for case 1, Path from CB2 to DG4.

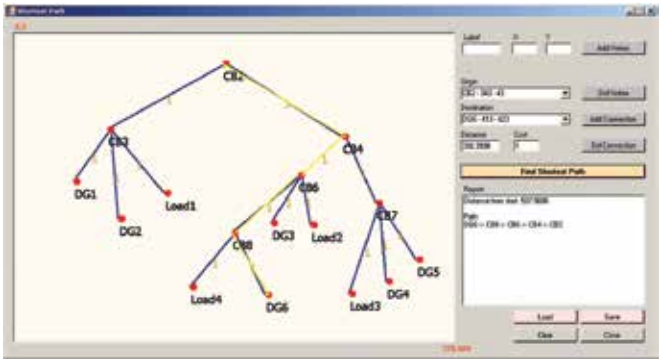

Figure 5: Dijkstra's Algorithm run after new deployments, Path from CB2 to DG6.

Conclusion

OO based models are proposed for microgrid modelling. The proposed models make it possible to define information data specific to various electrical nodes within a network in terms of connections between the nodes and the devices connected to these nodes. In this manner the changing structure of a particular network can be followed and the new operating points can be calculated, then updated. After modelling the microgrid according to graph theory, Dijkstra's algorithm is implemented to find the path from the point of common coupling to different parts of the network. This algorithm extracts the hierarchy of different components in the network. This feature is very crucial for plug and play purposes in electrical networks.

Acknowledgement

The author presented this topic at the ICUE conference in Cape Town in 2014.

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take note

- The lessons learned in distributed control systems are now being applied in power network control.
- New algorithms of control are continually evolving as we require more and more 'intelligence' in our power networks.
- Dijkstra's algorithm has been shown to be applicable to determining the path from point of common coupling to different parts of the network – enhancing our ability to understand the network operation.

Taha Selim Ustun received a BE degree in Electrical and Electronics Engineering from Middle East Technical University, Turkey in 2007 and a Master of Engineering Science degree from the University of Malaya, Malaysia in 2009. He has a PhD in Electrical Engineering from Victoria University, Melbourne, Australia. Currently, he is an Assistant Professor in Electrical Engineering, School of Electrical and Computer Engineering, Carnagie-Mellon University, PA, USA. His research interests are Power Systems Protection, Communication in Power Networks, Distributed Generation, Microgrids and Smartgrids. Enquiries: Email ustun@cmu.edu

Energy efficiency should be a strategic priority for corporate South Africa

With Eskom struggling to generate enough electricity to meet the country's energy needs and power costs steadily climbing, corporate South Africa has both the incentive and responsibility to embrace energy management as a strategic imperative. That's the word from Jason Huang, director of Outreach Engineering, a youth-led, non-profit organisation that aims to bring engineering solutions to South Africa's socioeconomic challenges. He says that companies can make a big difference as well as save money by implementing energy conservation and energy efficiency measures.

Says Huang: "Addressing the shortfall in power generation capacity will take many years, which means that mandatory load shedding will be part of our lives for a while. That means we, as a nation, need to try and make as efficient use of the available power as we can, with the business sector having an especially important role to play."

Loadshedding could be averted

Huang says that stage one load shedding sheds 1 000 megawatts. That means load shedding could be averted if one million households/businesses each reduce their consumption by 1 000 W. A substantial portion of this reduction in energy consumption can be achieved by switching to energy efficient light bulbs and switching off geysers, he adds.

Companies should be looking at reducing energy consumption, not only to help lessen the blow of load shedding, but also because energy prices are climbing with Eskom seeking high tariff increases from the regulator.

Meaningful energy management

How should businesses begin to engage in meaningful and quantifiable energy management initiatives? Huang suggests:

- Business decision-makers must make energy management an operational priority and seek expertise to drive and implement better energy management policies
- They must measure and verify energy management initiatives to ensure these are quantifiable. This may also allow the business to tap into tax incentives
- Companies must transition into green procurement practices to sustain their energy management policies
- Businesses should help drive awareness programmes for employees, customers and other stakeholders.

"If enough businesses take these actions, we'll see a domino effect that helps reduce pressure on the grid and make for a greener South Africa at the same time," Huang says. "This could also create new jobs by creating demand for skills to drive energy management initiatives."

The project

Outreach Engineering's current project is the Heal Baragwanath project, a project designed to improve the reliability and efficiency of the main operating theatre complex of the Chris Hani Baragwanath Hospital in Soweto. It is working closely with management at Chris Hani Baragwanath Hospital to revamp the hospital's backup power system and improve energy efficiency across its infrastructure. The work will help the hospital to keep operating throughout power outages as well as improve the quality of care it offers its many poor and needy patients

Enquiries: Email info@outreachengineering.co.za

About Outreach Engineering

Outreach Engineering is a youth-led non-profit organisation with a unique approach to tackling public healthcare problems in South Africa. The organisation works alongside the government to address infrastructural shortfalls in South African public hospitals, with a specialist focus on energy efficiency and engineering services. By helping public hospitals to operate in a more stable and reliable manner, it aims to improve the quality of patient care. Outreach Engineering has partnered with the University of the Witwatersrand and benefits from the experience of some of the most highly regarded electrical engineers in the country. Other contributors include industry leaders such as Werksmans Attorneys, Grant Thornton and Idea Engineers. Outreach Engineering is a registered non-profit company, non-profit organisation and Section 18A-approved public benefit organisation.

Jason Huang, director Outreach Engineering.

Students' solar car takes on the world's best

Engineering students at the **North-West University** will rub shoulders with the big names in solar energy when they take part in the Bridgestone World Solar Challenge in Australia. Following the NWU's successes with their participation in the local Sasol Solar challenges in 2012 and 2014, the team decided to build a better and faster vehicle propelled by solar energy. The first competition in which the NWU competed, covered more than 5 000 km and this team and that of the Tokai University in Japan shared the laurels.

According to Professor Albert Helberg, team leader, they have now harnessed new technology to make the new vehicle faster, lighter, more effective and stronger. This vehicle is propelled by the amount of energy used by a hair drier. The competition takes place from 18 to 26 October and starts in Darwin in the north of Australia from where 45 vehicles from 25 countries will be racing more than 3 000 km across the country to Adelaide. "We should cover the distance in seven days but we are aiming to do it in five days," says Helberg.

Enquiries: Johan van Zyl. Email johan.vanzyl@nwu.ac.za

Air preparation modular units - redesign

SMC, provider of pneumatics, redesigns its air preparation modular units, the AC series, thus ensuring its number one spot in the marketplace.

The AC series design review is part of SMC's ongoing investment in research and development to refine and improve the performance and functionality of its products, as well as developing new innovations to drive enhanced handling and space savings and deliver competitive advantages for customers. In this regard, the AC series brings a double layer structure bowl guard for better visibility and extended working life, while also bringing reduced time and space for maintenance. Much more space saving is achieved due to the compactness of the modular units and the integrated and selectable pressure gauges and switches. Moreover, the introduction of an in-bowl assembled element construction, together with a new bracket system that allows for initial tightening by hand, allows for easier control and quick in-hand maintenance and replacement of elements. Ideal for automotive, facility and machine manufacturing, these highly flexible FRL units also feature a simple to use bowl lock button and interchangeable, modular mounting.

Quick facts:

Better visibility and environmental resistance
Easy replacement of the element
The element and the bowl are in one piece
Replacement can be done in hand
Reduced required maintenance space: Max 46% reduction
Regulator: Set pressure 0,05 to 0,85 MPa, 0,02 to 0,2 MPa
Selection of pressure gauges
Square embedded type pressure gauge,
Round type pressure gauge,
Digital pressure switch

Enquiries: Email sales@smcpneumatics.co.za

Belt drift switch for field applications

The new belt drift switch from **ifm electronic** is designed for heavy duty application and used for drift monitoring of conveyor belt installations. The belt drift switches are used to protect the installations from damage or destruction in the event of belt drift and are positioned in pairs on both sides of the conveyor belt. The ball bearing stainless steel actuating roller is resistant to wear and is used for belt speeds up to approximately 5 m/s. The device features a robust aluminium housing and is equipped with two force-actuated changeover contacts with a snap-action function with two adjustable switching points. Inadmissible belt drift occurs when the belt edge approaches the end of the supporting rollers through lateral movement and surpasses it. Then the actuator (roller lever) is operated and displaced. In case of displacement of the actuator, the cam operating switches are activated. The switching angle can be set via an adjustable camshaft. In this way, a pre-warning can be implemented in addition to the safety shutdown. As soon as the belt moves correctly, the roller lever will automatically return to its home position.

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

Setting our sights on the sun

GEWISS has a comprehensive range of products for photovoltaic systems and has become a major player in the surprising growth trend of renewable energies over the last few years.

Today, photovoltaics is still an investment choice, not only for ecological reasons, but also for cutting energy consumption costs.

With government benefits being applied soon in South Africa, everyone can produce electricity and this is why photovoltaics, unlike other renewable energies, has evolved not only the industrial sphere but above all the commercial and residential sectors, calling for specific products for the development of plants and systems.

GEWISS has designed solutions to transport the energy produced by photovoltaic panels until it is put onto the low voltage grid. The solutions cover both dc and ac side requirements, meeting the most wide-ranging needs for system protection, isolation, distribution and trunking.

ACDC Dynamics is the sole distributor of the Italian designed Gewiss product ranges in Southern Africa.

Prewired string boards

The string boards have been designed for installation in photovoltaic systems with a capacity up to 1 000 Vdc.

Modular dc devices

Compact rotary switch disconnectors (only 3.5 modules) allow for dc side disconnection.

Ac side protection

GEWISS products for ac side protection can meet all system requirements in the residential, commercial and industrial sectors.

Modular sc devices

LST surge protection limiters are suitable for ac side protection from overvoltage generated by atmospheric discharges, for maximum inverter service continuity. Type B residual current circuit breakers, for protection from ac side indirect contacts, in situations where inverters without transformers are installed or the inverter is constructed to prevent direct current dispersion to earth owing to faults.

Empty, compact string or parallel enclosures

The range comprises 40CD_IP55 type 4 to 36 module enclosures, for numerous ac and dc side board configurations.and medium-scale photovoltaic systems are common.

Enquiries: Charlton Opperman. Tel. 010 202 3300 or email charltonO@acdc.co.za

CESA/Aon Excellence Awards – winners

In a celebration of innovation, quality, outstanding workmanship and professionalism in the consulting engineering sector, Consulting Engineers South Africa (CESA) held its prestigious CESA Aon Engineering Excellence Awards at Vodacom World in Midrand on 12 August, 2015. It was a feast of engineering talent and rewards an explosion of innovative engineering solutions, celebrating excellence in basic service delivery to our people.

The Awards sponsored by Aon South Africa are a platform to showcase the important role that infrastructure plays in the sustainable development of our country. They focus on consulting engineers and their clients who participate in or initiate projects that promote the advancement of our nation and the people of the continent.

The winners:

- Engineering Excellence with a value greater than R250 M: Moroff & Kuhne for WBHO's 'The Point'. The re-development of the old Galleria building at 76 Regent Road, Sea Point, into a 28 000 square metres shopping and lifestyle centre.
- Young Engineer of the Year: Geoff du Toit from Aurecon with Rudolf Le Roux from Arup receiving a commendation. The winner in this category must have leadership ability, and contribute to the image of the firm and the industry as a whole. Airports Company South Africa (ACSA) sponsored the Young Engineer of the Year Award.
- Engineering Excellence with a value less than R50 M: Royal HaskoningDHV for the New Microbiological Laboratory for the National Bioproducts Institute.
- Engineering Excellence with a value between R50 M and R250 M: Bosch Projects for the Bronkhorstspruit Biogas Project for Bio2Watt. The first project of its kind in Africa, it will provide green energy, in the form of electricity, to a private industrial consumer through a City of Tshwane and Eskom agreement
- Business Excellence: Bigen Africa. This privately-owned project-based group of companies specialises in infrastructure and has the vision of creating long-term development impact within the African economies and communities that it operates in.
- Best International Project: Bigen Africa for the Botswana North South Carrier 2: Water Transfer System (R6 billion) for the Botswana Ministry of Minerals, Energy and Water Resources.
- Mentoring Company of the Year: Bigen Africa.
- Mentor of the year: Colin Andrews
- Visionary Client of the Year: Development Bank of Southern Africa
- Publishing Excellence: 3S Media (Trade Publications)
- Publishing Excellence (Daily Newspapers): Independent Newspapers
- CESA Job Shadow Initiative: UWP Consulting (runners-up - Royal HaskoningDHV, Hatch Goba and Infraconsult)
- CESA Branch of the Year: KwaZulu Natal Branch

Enquiries:
Wally Mayne (acting chief executive officer)
Tel. 011 463 2022 or email wally@cesa.co.za

Dennis Ndaba (strategic communications)
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email dennis@cesa.co.za

Winners of 'CESA/Aon Engineering Excellence Awards'.

High Power Energy Harvesting takes shape

Plenty of kilowatts from no fuel. This dream ticket is a reality today from the rapid adoption of High Power Energy Harvesting (HPEH). Energy harvesting converts ambient energy into electricity where it is needed, off-grid.

HPEH typically converts short energy bursts in vehicles and other moving things. Think regenerative braking and planned torque assist reversing alternators (TARA) in cars and consider the latest elevators returning a surge of electricity as they stop. The swinging of the arms of Komatsu construction vehicles creates electricity grabbed by large supercapacitors. HPEH lasting for hours or more is seen with stationary applications in the main.

That can mean remote buildings and road signs having a wind turbine for bad weather and solar panels for good weather.

There is rapid progress in the application of HPEH and plenty of new technology is being prepared such 100 kW magnetostrictive wave generators and thermoelectrics and energy harvesting shock absorbers in cars, buses and construction vehicles providing up to 1,5 kW from each device. IDTechEx covers this large emerging market in its unique new report: High Power Energy Harvesting - Off-Grid 10 W -]100 kW – 2016 - 2026 and it will be a major part of its Energy Harvesting and Storage USA 2015 event November 18-19 in Santa Clara, CA.

Enquiries: Alison Lewis.
Email a.lewis@IDTechEx.com

Water trumps energy as a red boardroom issue

Water is now a key economic business risk discussed in boardrooms, rather than the 'green issue' it has been categorised as previously, said Dr Inga Jacobs of the Water Research Commission. Further, water drives crucial aspects of energy generation in South Africa.

"For the first time, water tops the charts for the highest global risk in terms of devastation, ahead of nuclear war or a global pandemic," she continued. Dr Jacobs was speaking at the 'Emerging Frontiers for Sustainable Water' trilateral conference between South Africa, India and the United Kingdom, hosted by the University of Johannesburg (UJ).

Physical and economic scarcity of water

"In South Africa, we are dealing with quite a severe physical scarcity of water, but also an increasingly severe economic scarcity of water."

Looking at countries with good economic water security, she says, several trends stand out.

"In those countries there is a robust, well-maintained water infrastructure. Water secure countries also tend to have smart, responsible water users. An example is Singapore, where if you visit, people appear to function as if they are living in a permanent drought. These countries tend to have sustained pools of highly-talented people managing and maintaining their water systems and national systems of innovation. They invest significantly in knowledge-based solutions and good partnerships with academia and research entities," she said.

Water-energy nexus

"This is why the Water Research Commission is now also considering funding late-stage research which requires substantial funding to take to market or to be included in government policy. One of our big initiatives is with Eskom, where we have identified a basket of water-energy projects being implemented or researched," said Dr Jacobs. The water-energy nexus becomes even more significant in the face of increasing urbanisation and population growth on a continent facing regional desertification.

"There are more than 1,2 billion people on the African continent today. In about 85 years, we can expect to have closer to two billion people in Africa," said Professor Tshilidzi Marwala, deputy vice-chancellor: Research from the UJ.

New approach needed

"How are we going to supply clean and safe water and sanitation to all these people? Studies show that South Africa will become dryer in the next 30 years and that we lose close to 30% of our water in distribution systems. Meanwhile we depend on water from an independent country, Lesotho. The effective utilisation of water resources, as well as efficient management and reducing waste is at the centre of the economy and politics of South Africa. No development can succeed without water."

New approaches will be needed to confront these challenges, said Prof Catherine Ngila, head of the Department of Applied Chemistry at the UJ.

"The issues we face are partly due to water pollution from increased activity in the agriculture, mining, manufacturing, pharmaceuticals and petroleum industries. These industries supply the demands of an increasing population. There is a growing need for developing and adopting new technologies to test and treat contaminated water and recycle waste water in an affordable manner."

Enquiries:
Dr Inga Jacobs. Tel. 012 330 9014,
083 401 7625 or email ingaj@wrc.org.za
Professor Catherine Ngila.
Tel. 011 559 6196 or email jcngila@uj.ac.za

Best and biggest in Brazil

WEG has received the prestigious Company of the Year Award for Brazil in the annual research survey undertaken by the financial and business magazine Exame. The well-respected publication issued the list of the 1 000 Best and Biggest companies in Brazil, highlighting the 18 winners by business segment. The awards ceremony took place on 1 July in São Paulo and recognised WEG as the best company within all business segments for its commitment to economic and financial growth and performance in 2014.

Harry Schmelzer Jr, chief executive officer of WEG, says: "This specific award reflects the efforts of the company's entire team. These are the cultural fundamentals created by our founders and have allowed us to grow WEG into a global player."

"The award stands testament to the **WEG Group** business philosophy of researching and defining solutions that are geared towards satisfying specific customer needs. We are proud to be a member of the WEG Group of companies and we will continue to leverage the advantages of belonging to a global leader, to the benefit of our local customer base," says Louis Meiring, **Zest WEG Group** chief executive officer.

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

Secret to great outdoor lighting

"EGLO is one of the leading suppliers of decorative lighting in Europe, with Eurolux having successfully represented them in South Africa for over 12 years," says Shaun Bouchier, director at **Eurolux**. "Innovative market research, attention to detail and a flair for the fashionable is what sets this company apart, and has helped establish EGLO as a firm favourite in the South African market."

The EGLO Roffia sets the tone for the range with its matching wall and post-lightsset in an aluminium and white finish. Being fitted with an LED, it is energy savvy and the aluminium adds to its durability. "Mounted to an external wall, often by the front door or over a garage, these wall lights are ideal to illuminate entries, so you can easily see locks and identify callers," adds Bouchier. "It is designed to be understated, placing the focus on the space it is illuminating, rather than becoming a feature in itself."

Another wall light that is set to compliment modern homes is the Lepus, featuring a galvanised steel and white finish. The galvanised steel extends in a half moon shape from the wall, ensuring that the light beams are cast downwards in a 12.5m projection range for evenly distributed lighting.

Enquiries: Shaun Bouchier. Tel. 021 528 8400 or email shaun.bouchier@eurolux.co.za

Electromagnetic drives – local suppliers and abroad

In addition to importing a range of electromagnetic drives exclusively from **Aviteq** of Germany, vibrating equipment supplier **Joest Kwatan**i also supports its range of locally, in-house manufactured SFH electromagnetic super feeder drives.

The SFH range of electromagnetic vibrating drives is designed for feeding bulk materials at a controlled rate from stockpiles and hoppers to bulk materials handling equipment such as belt conveyors, crushers and screens. Kim Schoepflin, managing director, Joest Kwatani, says that the company attained this product range through its acquisition of Lockers Engineers over two years ago.

Theresa Walton, general manager (service) says: "These are designed for use in medium to heavy applications such as quarries, coal plants, steel works and the chemical and food and beverage industries, as well as food-processing plants. The Aviteq range of electromagnetic drives is particularly suited to standard volumes where a high dosing accuracy is required. Joest Kwatani has been appointed the exclusive distributor for Aviteq, formerly AEG, products in Africa, including electromagnetic drives and controllers.

Enquiries: Kim Schoepflin. Tel. 011 923 9000. Visit www.joest.co.za

Bizz Buzz

Roadworks to disrupt Johannesburg traffic

The **Johannesburg Development Agency (JDA)** has started the implementation of the BRT roadworks along Louis Botha Avenue from Parktown to Wynberg (Section 15), and along Katherine Street in Sandton from Marlboro to the Gautrain station (Section 8). Construction works are underway on two new bridges over the M1 Highway which will continue for a period of 18 months until February 2017. These construction works are the beginning of a sophisticated network of public transport for the citizens of Johannesburg. The new developments include dedicated lanes for cyclists and pedestrians as well as an iconic bridge – The Grayston Pedestrian Bridge – linking Alexandra and Sandton. The JDA appeals to motorists to practise patience and caution on these routes and apologises for any inconvenience caused to motorists.

Enquiries: Siyabonga Genu. Email SGenu@jda.org.za

South Africa's manufacturing economy bolstered

Aberdare Cables, a Powertech company within the JSE-listed Altron Group, has launched a new production line within its existing plant in Pietermaritzburg, KwaZulu-Natal. The line, supported by the South African Department of Trade and Industry's (dti) designation programme, is specifically designed to manufacture locomotive cables for the Passenger Rail Agency of SA (PRASA) and Transnet. This investment in bolstering South Africa's manufacturing economy is especially significant because it supports the National Development Plan's priorities in two ways: Job creation and the focus on locally made products that support the revitalisation and upgrading of South Africa's critical rail infrastructure and services.

Enquiries: Visit www.aberdare.co.za

Cut cost of standby power system maintenance

In a bid to cut the cost of maintaining critical standby power provisioning equipment for its customers, **Powermode** has instituted a nation-wide 'flat rate' for those opting for preventative maintenance agreements covering diesel and petrol generators, uninterruptible power supply systems (UPS) and battery back-up systems. Aimed at companies with multiple sites across South Africa, the company's new maintenance scheme is complemented by a four-hour telephonic response for technical queries and priority on-site response for emergency call-outs. The national flat-rate preventative maintenance scheme comes with a 15% discount on labour and spares.

Enquiries: Email garrethj@powermode.co.za

Best Practice Days

More than 80 energy enthusiasts attended **Schneider Electric**'s 'Best Practice Days' at its Midrand Schneider Electric Campus recently.

The Best Practice Days are free events hosted by Schneider Electric, a global specialist in energy management, up to three times a year in South Africa, with the purpose of introducing customers to new technologies and innovative products that are available to them in order to achieve energy efficiency. A critical aspect of these events is equipping the delegates with a sensible approach to these new applications and a thorough understanding on how to fittingly deploy these solutions.

"Importantly, 'Best Practice Days' are not focused on product presentations or sales pitches, but provide a platform for Schneider Electric to create awareness of the latest developments in energy efficiency solutions. We have also found them to be an ideal events to assist people in changing their mindset from 'legacy technology' to the business benefits new technology can bring to an organisation – both from a cost and productivity point of view," continues Ernie Smith, southern Africa's vice president: Partner Business at Schneider Electric.

The latest event was structured around two main technical topics: surge protection devices (SPDs) and residual current protection. The day highlighted, in particular, how SPDs provide a degree of protection against transient over-voltage, a concept that was contrasted at the event against that of temporary over-voltage. The second topic emphasised protective devices that are aimed at mitigating the risks associated with electric shock, and dealt with both direct contact and indirect contact scenarios.

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

Ernie Smith, southern Africa's vice president: Partner Business at Schneider Electric.

Maintenance Workshop

Comtest, supplier of test and measurement and communications equipment and solutions from world leading manufacturers to the southern African market, are hosting a FLUKE Maintenance Workshop at COMTEST HOUSE, Linbro Park (Johannesburg) on Tuesday, 15 September 2015. The workshop is aimed at electricians and maintenance/electromechanical technicians and will address effective troubleshooting of motors and motor drives, with the goal of ultimately reducing machine down-time and savings on repair bills. At the completion of the workshop participants should be able to make critical decisions to quickly isolate a fault, down to component level, ensuring a quick and cost-effective repair. After passing a short examination, they will receive certification from the **Fluke Academy for Certified Training**. All participants will receive and attendance certificate. Limited to 15 participants.

Enquiries: Email francescopagin@fluke.com

African Centres for Lightning and Electromagnetics (ACLE) International Symposium, Lusaka, Zambia

Innopro directors, Ian McKechnie and Ian Jandrell, recently participated in, and contributed to, the 2nd African Centres for Lightning and Electromagnetics (ACLE) International Symposium: 'Strategic Interventions to Mitigate the Hazard of Lightning'. Both McKechnie and Jandrell are appointed as Research Advisors to the ACLE. McKechnie, also an Honorary Research Fellow at the University of the Witwatersrand, commented: "It was a pleasure to again have the opportunity to participate in the ACLE activities and to make a meaningful contribution towards lightning safety and protection on the African continent". Having previously also participated in the 1st symposium in 2014 in Entebbe, Uganda, his formal presentation to the symposium this year was on the topic of: 'A strategic and structured approach to effective lightning safety and protection'. He added that Innopro considered the opportunity to make a contribution of their team's specialist expertise and experience, and engineering leadership, in this field to be an important element of their social responsibility in Africa.

Ian Jandrell, who is the Dean of the Faculty of Engineering and the Built Environment, and CBI-electric Professor of Lightning, at the University of the Witwatersrand (Wits), noted that the opportunity was also used to initiate links between Wits and the University of Zambia and to start exploring the possibility of joint skills development activities in this space. Jandrell also made a formal presentation to the symposium on the "Physics of lightning".

Held from 11-13 August 2015 in Lusaka, Zambia, the event also saw the launch of the Zambian national ACLE centre. ACLE is a pan-African network dedicated to decreasing deaths, injuries and property damage due to lightning. The symposium and ACLE are supported and facilitated by the Non-Aligned Movement (NAM) Science and Technology Centre, and the NAM S&T director general Prof Dr Arun Kulshreshtha was also present, along with ACLE founding director Prof Mary Ann Cooper. The ACLE is hosted at the Makarere University in Kampala, Uganda.

Enquiries: Ian McKechnie. Tel. 012 663 4804 or email email innopro@gafrica.com

Participants at the ACLE International Symposium held in Lusaka, Zambia, are: Ms Foster Lubasi (Coordinator at ACLE-Zambia), Ian McKechnie (Innopro/Wits), Prof. Mohd Zainal Abidin Ab Kadir (Deputy Dean (Research & Innovation) Universiti Putra Malaysia), Prof Ian Jandrell (Wits/Innopro), Prof Mary Ann Cooper MD (Founding Director ACLE).

Generators for Nelson Mandela Childrens Hospital

Two Cat generators are being commissioned to provide standby power at the Nelson Mandela Children's Hospital (NMCH) located in Parktown, Johannesburg, to ensure that the hospital and its critical facilities are never without power.

- *A Cat generator powered by a Cat 3512B diesel engine (engine capacity of 1 360 kVA) was donated by Barloworld*
- *The NMCH ordered a second unit from Barloworld Power, a generator powered by a Cat C32 diesel engine, with an engine capacity of 1 000 kVA*
- *Fuel for the generators will be fed from two 1 000 l day tanks and one 9 000 l bulk tank – which combined, can supply the generators with over 18 hours of fuel when running at full load*
- *The overall project is being managed by SIP Project Managers on behalf of the NMCH Trust*

Enquiries: Shivani Naidoo. Email snaidoo@barloworldpower.com

At the Nelson Mandela Children's Hospital building site are Jabu Malindi (SIP Project Manager), Salaminah Boshomane (G5 Safety Officer), Helen Couvaras (Electricity + Control) and Siya Dokoda (Nelson Mandela Children's Hospital Trust PR and Communications).

Two recent launches for automation solutions provider

Festo recently opened a first of its kind (in South Africa) applications centre with state-of-the-art electric drive handling and vision systems (refer editorial on page 10 of this issue).

And... to mark the start of National Science Week 2015, the company partnered with the Sci-Bono Discovery Centre to launch the Mechatronics Lab in Newtown, on Tuesday, 4 August. The multi million rand facility is equipped with state of the art equipment and can now be utilised by Grade 10 – 12 learners. The aim of the lab is to address manufacturing, employability and STEM subjects (Science, Technology, Engineering and Mathematics).

Enquiries: Russell Schwulst. Tel. 08600 33786 or email Francois.gerber@sci-bono.co.za

Brett Wallace (Festo, managing director), Gift Thobejane (application and technical specialist and Thomas Hohls (technical support and application engineer).

WearCheck

Lea Bodenstein, diagnostician, Middelburg laboratory

Loshini Govender, manager, speciality laboratory (WSL), Johannesburg

Salisha Dhanasar, laboratory supervisor, Middelburg laboratory

Annemie Willers, reliability solutions lubrication consultant, LubriGard division

Legrand SA

Johan Bosch, general manager

Brian Ndlozi, export manager

SEW EURODRIVE

Johan van Graan, Drive Academy technical trainer

DIARY MUSTS

4th Annual Environmental Crimes Conference
Compliance, Enforcement, Prosecution
9 – 10 September 2015
Indaba Hotel, Fourways
Johannesburg
Enquiries: Email bookings@intelligencetransfer.co.za

Generators Conference and Exhibition
10 – 11 September 2015
Focus Rooms, Sunninghill
Enquiries: Tel: 011 325 2485
or email christophere@mogorosicomms.co.za

54th Annual Occupational Risk Management Conference and Exhibition: NOSHCON
15 – 18 September 2015
Champagne Sports Resort
Central Drakensberg, KwaZulu-Natal
Enquiries: Visit www.nosa.co.za

25th AMEU Technical Convention 2015
4 – 7 October 2015
Sandton Convention Centre, Johannesburg
Enquiries: Jean Venter. Tel. 011 061 5000

Environmental Management Systems Course
21 – 22 October 2015, Johannesburg
Carbon tax is coming, and the importance of an environmental management system is becoming more crucial than ever. The Energy Training Foundation (EnTF) is launching the ISO14001 environmental management systems standard training course to teach how the standard helps organisations identify, manage and control the activities that have an environmental impact.
Enquiries: Thieda Ferreira. Tel. 041 582 2043
or email info@entf.co.za

Green Building Council of South Africa's (GBCSA) Annual Convention
2 – 6 November 2015
Cape Town International Conference Centre
The convention will go beyond simply finding ways to cope with the country's current energy crisis, and help move South Africa towards more innovation and future-orientated thinking to 'Inspire Better Buildings'
Enquiries:
Visit www.greenbuildingconvention.org.za/

10th Southern African Energy Efficiency Convention (2015SAEEC)
11 – 12 November 2015, Emperors Palace
The Southern African Association for Energy Efficiency (SAEE) aims to become the Association in Southern Africa that brings all energy stakeholders in the region together. In order to achieve this synergy, the SAEE is hosting the 10th Southern African Energy Efficiency Convention (2015SAEEC), as an event serving the energy management-, environmental-, facilities building upgrades-, energy engineering-, cogeneration-, power generation-, and efficiency improvement industries.
Enquiries: Erika Kruger. Tel. 018 290 5130
or email convention@saee.org.za

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Namibian Subsidiary