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Comment

Ian Jandrell

I often have the privilege of visiting other universities – some in South Africa, and some abroad – with the specific objective of scrutinising their engineering education processes and outcomes in order to ensure that we all reach the agreed levels.

Indeed I have had the privilege of visiting a number of national bodies whose job it is to accredit engineering programmes in their various nations.

Well, what blows my mind is the openness with which these processes are carried out.

Imagine the scenario – you arrive, and want to see all the dirty laundry. And you are shown it!

Why? Because we are all interested in only one thing – improvement.

Let me be honest: none of us is perfect. Furthermore, especially in South Africa, state funding for engineering programmes is not what it should be if we are genuine about our national commitment to science and engineering education. But we are coping.

Improvement is a team sport. I learned many years ago that the best way to improve is to surround yourself with the smartest and most outspoken people – people who will not hesitate to point out faults and errors.

Some years after that I learned to listen to them…

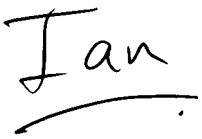
Genuine improvements come from two key ingredients: the will to achieve excellence, and the willingness to listen to criticism.

All South African universities have some way to go before they can really claim to be excellent - but let me assure you that they are all world-class.

The most rewarding aspect of any visit to other universities is to interact with students - even when this interaction requires the services of a translator.

South Africa is producing excellent engineering graduates. I defy anyone who speaks to any student in any of the South African programmes to not leave that experience a better informed and a highly impressed person. This is the nature of engineering education, and a spin-off of the desire to scrutinise ourselves and each other – and to allow that process to take place.

South Africa may face many challenges – but we continue to graduate world-class engineers.



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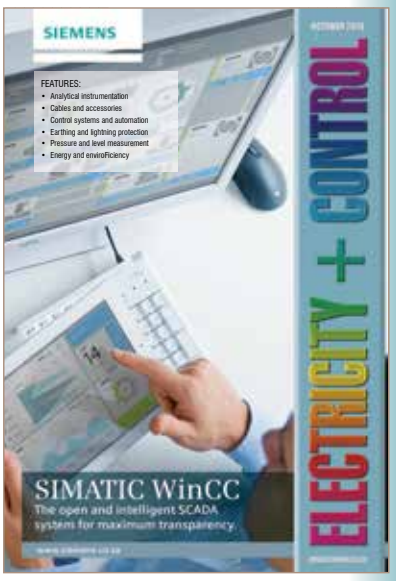

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Preventative role of PAT testing

By J Wallace, Seaward Group

There is an onus on the duty holder to ensure that equipment in the workplace is maintained to prevent danger. It is this obligation that introduces an implied requirement to perform periodic inspection and testing because without such actions, the duty holder will be unable to establish the potential dangers posed by faulty or unsafe appliances.

The recommendation of the recent Löfstedt Review that the health and safety executive further clarifies the requirement for portable appliance testing (PAT) promises to bring some much needed clarity to a situation that has long been the subject of debate and discussion.

In particular, any moves to encourage a sensible and common sense approach to PAT should also help to improve professional standards in the industry for the benefit of all involved in maintaining a safe working environment. The periodic testing of portable electric appliances has been performed in the UK for over three decades and within certain sectors it was common practice before the introduction of the Electricity at Work Regulations 1989.

The Electricity at Work Regulations 1989 sets out to raise the standards of safety within industry and commerce, but nowhere in the documentation is there a specific requirement for the testing of portable appliances. There is, however, an onus on the duty holder to ensure that equipment in the workplace is maintained to prevent danger. It is this obligation that introduces an implied requirement to perform periodic inspection and testing because without such actions, the duty holder will be unable to establish the potential dangers posed by faulty or unsafe appliances.

Existing guidance and practices

To clarify the issue of in-service periodic inspection and testing of electrical appliances, both the Health and Safety Executive and the IET (formerly IEE) have produced guidance documents, based on the advice and experience provided by experts in the various sectors.

Using a process of risk assessment, a duty holder is able to refer to these guidance documents to determine whether inspection and testing is appropriate and, if so, how often this should be taken.

This rationale is generally regarded as sound and realistic by the majority. However, there are some situations where misinformation and an over-zealous interpretation of the requirements have led to claims of over compliance.

Who performs PAT?

An analysis of the data associated with the purchase of PAT instrumentation shows that the type of users is broken down into two groups. Around 45% of users are individual organisations or companies who perform their own in-house testing and 55% are electrical contractors and specialist PAT companies providing a test service on a sub-contract basis. Further investigation of the differences in testing regimes between different types of user, shows that organisations that perform their own tests tend to integrate portable appliance inspection and testing into broader health and safety and asset management policies.

Rates of test failure

The extent of portable appliance test failure is illustrated by an industry analysis of 80 000 portable appliance inspection and test reports that have been performed by both in-house test engineers and contract test companies across a wide range of industry sectors.

Detailed analysis of 43 000 records from organisations in different sectors showed an average electrical appliance failure rate of 1,7% - indicating that the presence of over 1 300 potentially dangerous appliances in the full sample would not have been discovered if inspection and testing had not been carried out.

Office	Total Tests	Total Fails	% Fails
Housing Association	4 356	31	0.71
Local Authority A	8 713	41	0.47
Solicitors	752	8	1.06
Local Authority B	2 450	36	1.46
	16 271	**116**	**0,71%**

Industrial	Total Tests	Total Fails	% Fails
Process Industry A	1 539	167	10,85
Car Manufacturer	1 018	10	0,98
Engineering Company A	158	38	24,05
Factory Workshop	295	7	2,37
	3 010	**222**	**7,4%**

Education	Total Tests	Total Fails	% Fails
University A	9 039	296	3,27
Further Ed College	1 829	40	2,19
University B	3 305	22	0,66
University C	9 965	51	0,51
	24 138	**409**	**1,7%**

Table 1: Within different sectors the results also confirmed the presence of different levels of risk associated with the type of equipment being used, their patterns of use and the working environment (actual company and organisation names have been withheld).

Take note

- In-service testing of portable electric devices is important.
- Unsafe electric devices pose many risks.
- Often, equipment is not tested at all.

Abbreviations

ESC – Electricity Safety Council
FPA – Fire Protection Association
HSE – Health & Safety Executive
PAT – Portable Appliance Testing
WHS – Work, Health & Safety

These results (see *Table 1*) not only demonstrate the value of the inspection and test process but also confirm that the general advice and guidance provided by the IEE Code of Practice is an appropriate and realistic approach to this subject.

Nature of faults

Examination of the reasons for test failure show that there was a high proportion which failed visual inspection due to defects in the cable, appliance enclosure or the mains plug.

However, approximately a third of those items which failed had defective protective conductors or insulation and these faults could only be detected by carrying out specialist electrical testing or checking using an appropriate test instrument.

Initial and repeat inspections

The nature of portable appliance inspection and testing regimes means that the number of failed appliances recorded is always likely to be higher during an initial test programme – simply because items may have been in use for an extended period before testing has been introduced.

Clearly the rate of test failures is likely to decline during subsequent reviews, as more potentially defective equipment is routinely identified and rectified.

This is best illustrated by recent sequences of tests undertaken by trading standards officers in a programme funded by the Electrical Safety Council. In this programme the average proportion of defects discovered during 'first-time' appliance testing of a range of electrical equipment was 12%.

Consequences of electrical faults

There is considerable evidence that faulty electrical appliances continue to pose a real threat to people and property.

In the opening remarks on electrical safety included in the Löfstedt Review, reference is made to the 1 000 workplace accidents and 30 fatalities involving electric shock and burns that are reported to the Health and Safety Executive each year.

However electric shock and electrocution represent only part of the problem associated with faulty electrical items and full consideration also needs to be made of the contributory role of faulty electrical appliances in property fires which are also a major cause of deaths, injuries and considerable costs to businesses.

In particular, successive annual Fire Statistics show that faulty appliances and leads continue to pose the single most common problem as the main cause of accidental fires in other buildings (non dwellings).

In 2011 faulty appliances and leads were the cause of 25% of all accidental fires in non-residential buildings.

Between 2000 and 2011 (excluding 2010 for which no breakdown is available), each year faulty appliances and leads were identified as the cause of between 25% and 32% of accidental fires in non dwelling type buildings.

According to statistics collated by the Fire Protection Association (FPA), between 2000 and 2005, in 346 reported fires that were electrical in origin in business premises, the reported losses totalled over £178 M, with an average loss per incident of over £51 000.

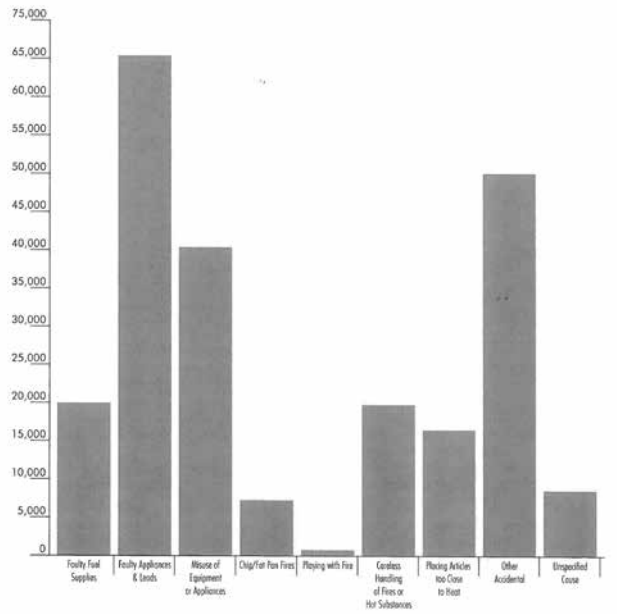

Figure 1: Causes of accidental fires in buildings other than dwellings from 1999/2000 to 2010/11. Courtesy: Fire Statistics, Great Britain).

Individual experiences

Other evidence demonstrating the dangers and hazards associated with the use of unsafe electrical appliances featured strongly at the Electrical Safety Council's 2013 Product Safety Conference, where a number of organisations reported on their own experiences.

Individual presentations included the following facts:

- London Fire Brigade reported 891 fires caused by large domestic appliances in the period 2008 - 2011.
- Statistics from Essex Fire and Rescue showed that from 2006 - 2008 there were 438 primary fires as a result of faulty electrical appliances, causing 75 casualties.
- An appliance testing programme carried out by the trading standards office of Suffolk County Council revealed that 26% of electrical items tested were non-compliant and 45% were unsafe.
- A safety campaign carried out by Essex trading standards officers revealed that 5,8% of the electrical items tested were found to be faulty. It estimated that if all the faults had led to fires, the total costs could have been as high as £88 M.

- As part of a fire safety campaign run by Bolsover District Council, 120 electrical appliances were tested and 47 faulty items had to be replaced.

Counterfeit electrical goods

Portable appliance inspection and testing is also one of the main ways in which dangerous counterfeit electrical equipment is identified.

BEAMA6 recently summarised the problems related to the infiltration of traditional supply chains by counterfeit electrical equipment that had not been subject to normal compliance testing and certification.

Approximately £30 M of counterfeit electrical products entered the United Kingdom market in 2010. Counterfeit electrical products include everything from domestic appliances to cables and leads, lighting products, power tools and wiring accessories. 12,9 million counterfeit products have been seized and destroyed in the last 10 years.

Cost of PAT

There is a great deal of recorded evidence that illustrates that electrical inspection and testing has identified many situations where defective equipment could have caused electrocution or fire.

In the vast number of cases, the cost of taking a reasonable approach to inspection and testing can be considerably lower than that associated with other forms of assessing health and safety risks – and certainly lower than the likely financial cost of any personal injury or fire damage to premises that can result from faulty appliances remaining undetected.

For example, a basic test instrument, with a training video and test record book, can be purchased for a few hundred pounds. Such a system should have a life of up to 10 years. A small organisation with 100 appliances should be able to perform the inspection and testing in less than a day each year. In such an example the company will therefore have a minimal cost associated with this aspect of its electrical health and safety policy.

With larger organisations the cost will be proportional to size and type of industry. However there are excellent test products, software and accessories available which can greatly reduce the time associated with the inspection and testing process.

Achieving compliance

In reality, a duty holder can demonstrate compliance with the regulations by a variety of means, of which inspection and testing is one, and it is up to the duty holder to determine how this can best be achieved in relation to the risk posed in their own particular environment.

In doing so, adequate electrical safety measures can be - and in many cases are already being - maintained without the imposition of an overly excessive test regime.

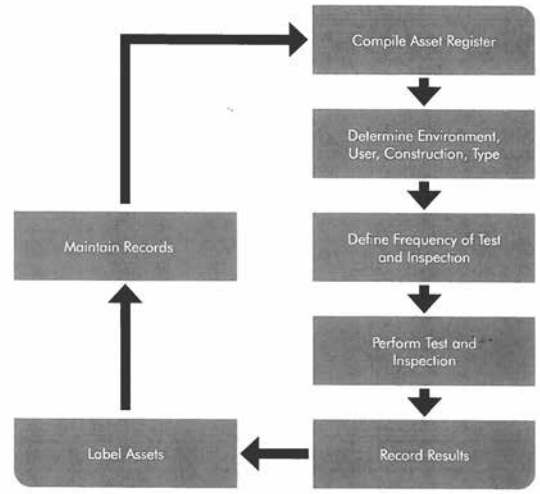

Figure 2: Demonstrating compliance.

The existing regulations and guidance notes have proved themselves as the basis of successful preventative maintenance programmes, although it is also clear that there are undoubtedly situations where there has been over zealous implementation of the inspection and test regime.

In an attempt to address this concern, two guidance booklets have been produced from within the PAT industry to help put the subject of inspection and test into perspective and to help duty holders act in a reasonable and practical manner.

'A responsible PAT testing business builder' is aimed at the PAT testing contractor and 'a common sense approach to electrical safety' is intended for use by in-house health and safety professionals.

Conclusion

There is indisputable evidence that the periodic in-service inspection and testing of portable electrical equipment saves lives and prevents fires that may otherwise have caused injuries, loss of life and serious damage to work premises.

In this respect the Electricity at Work Regulations 1989, HSE Memorandum of Guidance and the IEE Code of Practice provide sound advice based on industry experience and quantifiable evidence.

The process of electrical inspection and testing has therefore made a significant contribution to improving and maintaining safety in the workplace, although it is clear that there is a continuing need to both educate the contractors who provide this service and better inform those organisations who carry out inspection and testing on their own behalf.

Clearly a problem rests with the actions of unethical contractors and in this respect the industry needs to consider how higher levels of responsibility and professionalism among PAT contractors can be encouraged. This is an area where a number of the electrical trade organisations could play a significant role in helping to raise standards within the industry.

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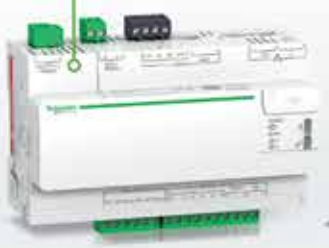

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The clarification on PAT recommended by the Löfstedt Review is therefore very welcome and should help to encourage a better and more widespread understanding of this vitally important area of health and safety.

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Jim Wallace is associate director of the Seaward Group, where he heads up the company's product development and new technology programmes. He has been with Seaward for approximately 15 years, during which, as engineering manager and product and technology manager, he was instrumental in the development and introduction of a range of advanced test instruments. Jim is also chairman of the Gambica Electrical Test Instruments Group and an active member of several IEC standard working groups. Enquiries: Email jimw@seaward.co.uk.

About the author

Counters with no moving parts

As a long-term user of mechanical sensors such as positive displacement meters or turbines for flowmetering applications, who better than you knows the serious disadvantages of these moving parts: they cause drift overtime, they are subject to wear and therefore require all too frequent maintenance in order to avoid the risk of breakdown - even the filters require attention.

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Enquiries: Frans van den Berg. Tel. 011 262 8000 or email info@za.endress.com.

Ground resistance tester

Test Instruments Africa (TIA) has launched a 600 V, rugged, safe (CAT IV), clamp-on ground resistance tester. Chauvin Arnoux's CA6416/17 is ergonomically designed specifically for ground measurements in urban areas - typically with limited access to set up ground stakes. The CA6416/17 ground clamps can be used to perform selective measurements on a parallel ground system without disconnecting conductors. The CA6416/17 ground clamps can be used in the following applications:

- Measurement of grounds in parallel on MV/LV installations
- Ground measurements in urban areas, and on buildings with Faraday cages
- Measurements on telecommunications lines
- Measurements in the railway sector
- Ground measurement on buried or surface pipelines

High-performance magnetic materials are used to limit the unit's weight. Minimal effort is required to keep the clamp open due to a new feature – a force compensation system installed on the trigger – which optimises the handling of the product while reducing user fatigue. A protective guard prevents the user's hand from slipping during measurements and a moulded-silicone rotary switch is can easily be operated even when wearing safety gloves.

Enquiries: Justin Clarkson. Tel. 011 608 8541. Visit www.testinstrumentsafrica.com.

New high temperature infrared thermometer

The **Comtest Group**, Fluke's authorised Test and Measurement distributor, has announced the arrival of the new highly accurate Fluke 572-2, high temperature, infrared thermometer for extreme heat conditions over long distances. Typical applications are:

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

The Fluke 572-2 measures between -30°C to 900°C with ±1% accuracy. Measurements from further away are accurate with a 60:1 distance-to-spot ratio with dual laser sighting for fast, accurate targeting. It displays current temperature plus MAX, MIN, DIF, and AVG temperature with adjustable emissivity and predefined emissivity tables.

The unit features a multiple language (user select) interface and is compatible with

standard K-type mini-connector thermocouple probe (KTC), and is shipped with a USB 2.0 computer interface cable.

Enquiries: Comtest. Tel. 011 608 8520 or email info@comtest.co.za.

Miniature sensor for accurate distance measurement

Baumer has made yet another move towards miniaturisation with the IWFM 05U9701/S05 inductive linear sensor. Thanks to its unique compact design (5 x 5 x 32 mm), it can be installed in the most confined spaces. The IWFM 05U9701/S05 is the smallest rectangular inductive sensor with linear output measurement available on the market. Taken together with its cylindrical counterpart, the IWRM 04, Baumer now has the smallest distance-measuring inductive sensors in the world, for both types.

The small size of the sensor makes it possible to measure distances in applications that has not been possible until now. That means anywhere where a sensor with a cylindrical housing would be too long.

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First in torque measurement

Lorenz Messtechnik has developed a digital torque transducer which interfaces directly with PC software to log and record torque, speed and angle measurements. The DR-3000 rotating torque transducers are available in capacities from 0,5 to 5'000 Nm, and are supplied with traceable calibration certificates and free PC data logging software.

Founded in 1985, Lorenz Messtechnik GmbH operates as a family-run company in Afldorf, Germany, specialising in the manufacture of torque and force transducers, as well as signal conditioning equipment.

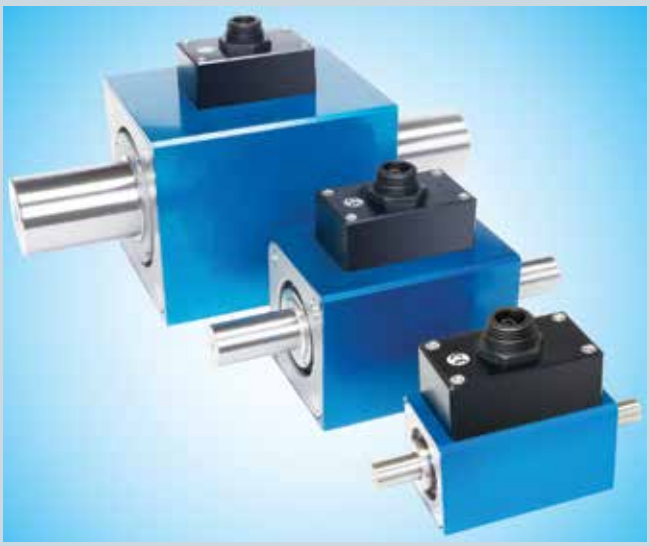
The Lorenz product range includes sensors for a wide variety of applications, including static and rotating torque transducers with various mounting options, such as flange, shaft, and hub-type sensors. The Lorenz range of measurement equipment is German-engineered, accurate, reliable, and affordable in comparison with other competing manufacturers.

Uses for torque measurement span across a number of industries, from analysing motor torque efficiency in test beds, monitoring assembly forces in automated processes, to measuring viscosity in quality monitoring applications.

The DR-3000 is the first of its kind in torque measurement. Lorenz has taken out the hassle of additional amplifiers, indicators and data logging systems by providing an elegant digital solution.

Elexsys supplies the entire range of Lorenz sensors and amplifiers, and is the sole representative for Lorenz Messtechnik in Africa.

Enquiries: George Chapman. Tel. 021 930 0214 or email sales@elexsys.co.za.



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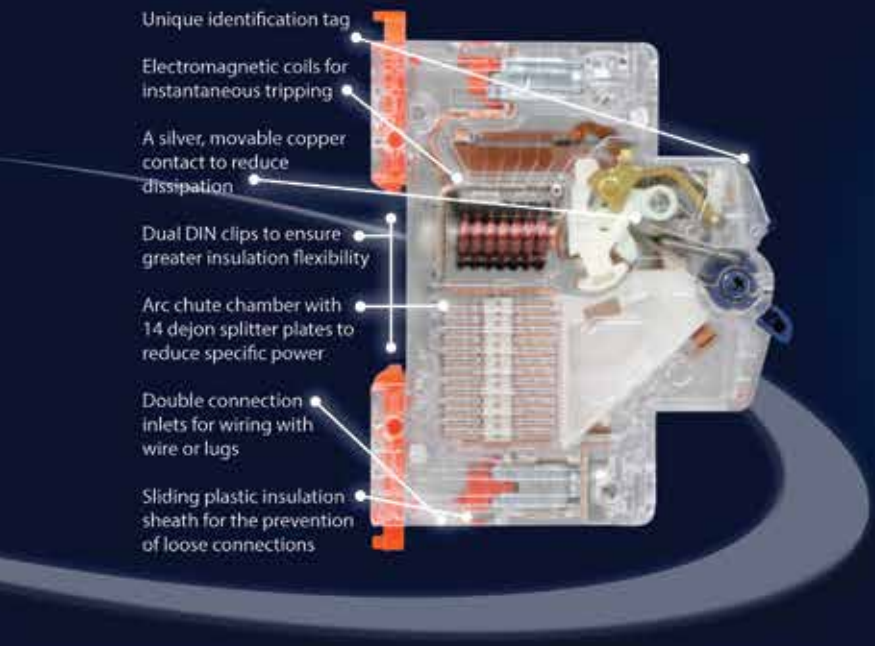

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Gammapilot FTG20, the latest instrument from **Endress+Hauser** for point level detection, combines all of the strengths of the brand – uncompromising quality, the highest degree of safety for users, more efficient processes and substantial cost savings over its entire lifecycle.

Based on Geiger-Müller technology, the Gammapilot FTG20 has the highest measurement sensitivity for the automation industry in its class.The Gammapilot FTG20 consists of two separate units. A detector which contains one to three Geiger-Müller counter tubes and a transmitter.

The latter, first converts the measured value into a switching command and then provides the switching in form of a relay or a 8/16 mA output. Both units (detector and transmitter) are connected via a cable which is available in lengths of 5, 10 and 20 m.This guarantees the highest degree of flexibility in installation.

The device features a modular design and can therefore be used with one, two or even three Geiger-Müller counter tubes with very high sensitivity. In addition, the concept permits the device to fit perfectly into any application and to reach very low radiation values even in the shortest switching time of 0,4 seconds.

The separate transmitter provides additional safety. The installation staff can commission the instrument without being exposed to the radiation path ie less radiation than in conventional radiometric point level detectors.

The Gammapilot FTG20 uses the HistoROM concept which has already been tried and tested in other product lines.

Factors such as ease of installation and commissioning due to the separate housing concept provide cost savings over its entire lifecycle.

The HistoROM system provides self-monitoring of electronics and all of the data relevant to the operation of the instrument is cyclically stored. This makes recalibration in case of the exchange of electronics superfluous. Normal decay is compensated for in the software.

Enquiries: Jan Gerritsen. Tel. 011 262 8000 or email info@za.endress.com.

New ultra-compact, multi-function, touch screen oscilloscope

Test Instruments Africa (TIA) has introduced the brand new, simple to handle, compact and lightweight, METRIX OX 6000 II models which combine the functions of a digital oscilloscope, a multimeter, a recorder and an FFT/harmonic analyser. With only 32 keys for direct access to the different modes and parameters, a universal 'Windows-like' menu is available in five languages. The keyboard on the front panel can be used for selection or immediate adjustments (time base, printing, etc). The touch screen and magnetic stylus allows users to modify settings directly on the screen, using graphic elements that are moveable, such as the position of the traces, the trigger level, the cursors or the zoom. In performance terms, the OX 6000 II models offer fast sampling and high resolution with their 10-bit / 1 GS/s converter, 50 GS/s sampling on periodic signals and 2 ns transient capture function to avoid undersampling. In oscilloscope mode, the OX 6000 II models offer a wide range of triggering possibilities: edge, pulse width, delay, count.

Equipped with two 4,000-count TRMS multimeters, the OX 6000 II models can be used for traditional voltage, resistance, continuity, capacitance and frequency measurements, as well as for diode tests. In this mode, the bandwidth is 200 kHz. In multimeter mode, triggering on measurement thresholds is available on both channels. Calculated on 2 500 points, the FFT analysis can be set automatically using the autoset key. The 10-bit conversion provides an improved dynamic range of 60 dB. The OX 6000 II models can record very slow signals with a recording rate in pt/s, min. or h over long periods. Their acquisition interval can be as little as 40 µs between two measurements.

Enquiries: Justin Clarkson. Tel. 011 608 8541. Visit www.testinstrumentsafrica.com.

High performance process controller – short case

RKC Instrument has introduced the FB100 high performance temperature/process controller with an accuracy of 0,1%.

The 1/16 DIN is housed in a panel saving 74 mm short case which has NEMA4X and IP66 waterproof and dustproof protection.

Sampling time can be selected as 50 ms, 100 ms, or 250 ms depending on the application. A special start-up tuning feature calculates optimum PID values and eliminates time that conventional autotuning or a more advanced Brilliant II autotuning feature which allows selectable PID control. Available from **Temperature Controls**, the FB100 has a universal input and three digital outputs. A multi-memory area function stores up to eight sets of control parameters and may be set easily through front key operation, DI, or communications. The multi-memory area may be used to create up to 16 segments of ramp/soak control.

A loader port comes standard to permit communication with a PC using its USB port. Win-UCI software is provided to make data monitoring/logging easy in setting control parameters or copying parameters to another FB series controller via PC. Communication capabilities include RS-232C, RS-422A, RS-485 and Modbus. Intercontroller communication is an available option using a second port. Other options include up to four event alarms, heater break alarm, analogue re-transmission output, remote setpoint, power feed forward function and feedback resistance (FBR).

Enquiries: Tel. 011 791 6000 or email sales@tempcon.co.za.

Contactless flow measurement

Developed for flow metering of dry bulk solids with high levels of flow performance, MaxxFlow HTC replaces complicated or expensive mechanical solutions, such as impact plates or measuring chutes. With its completely open profile and low installation height, MaxxFlow HTC from SWR, measures almost all dry solids from the exit of prefeeding devices such as screw conveyors, air slides, rotary valves, bucket elevators and other feeders. The Maxxflow HTC works without any mechanical system and requires no expensive, additional installation height, irrespective of the material to be measured in large mass flows. The device is suitable whenever large quantities of bulk solids have to be measured downstream of mechanical conveyor systems. There is no upper limit to the flow rate. Maxxflow HTC is ideal for mass flow measurement for flows in excess of 20 t/h and is pressure resistant up to 10 bar in temperatures of up to 120°C. The instrument can be installed on round pipes or ducts, and operates according to the latest microprocessor technology. The instrument is dust-proof, and can be installed at an angle if required. The mass flow measurement is independent of flow characteristics, and with no moving parts in the system, no maintenance is required. SWR Engineering is represented locally by **OEN Enterprises**.

Enquiries: Mike Andrews. Tel. 011 675 4447 or email mike@oenenterprises.co.za.

HD modular control system

RKC Instrument has introduced the new SRZ DIN rail mounted high-density modular system with a sample cycle time of 250 ms providing an accuracy 0,2%. Control method is selectable between position proportional control and cascade control in addition to the typical heat only and heat/cool methods. The Brilliant PID II algorithm with enhanced tuning achieves a quick rise/drop to setpoint and with greater protection from overshoot/undershoot caused by external disturbances. True universal input includes 10 thermocouples types, RTD, voltage or current. A single module may provide up to four channels of heat only or two heat/cool of which up to 16 modules may be connected. Four assignable CT inputs are provided for HBA including three phase. Numerous alarms choices include loop break alarm, heater break alarm and alarm interlock. CT modules and DIO modules may be used to provide expanded options. Additional functions include auto-tuning and start-up tuning, eight memory areas which can be used for ramp/soak applications, peak current limit, output distribution function, feed forward, differential setpoint and an auto temperature rise learning function so all channels reach setpoint at the same time, eliminating partial burns or thermal swelling.

Available from **Temperature Controls**, the SRZ is designed for mounting on the inside of an instrument panel to save space and to replace banks of discrete temperature controllers. Addition or removal of individual modules can be easily done without cycling power to the unit. It is an excellent solution for adding multi-zone PID temperature control to new equipment or retrofit existing control panels. This controller may also be connected to a PC, touch screen or PLC and linked together to operate as one system. It may also be connected to a third party machine interface already in operation on the machine. The flexibility of the SRZ series makes it an ideal instrument for both end-users and the OEM market in a wide range of industries including extrusion, semiconductor, test stands, environmental chambers, plastics, packaging and heat-related processes.

Enquiries: Tel. 011 791 6000 or email sales@tempcon.co.za.

Digital measurement made simple

Built for logging and recording measurement data, the Lorenz LCV-USB2 digital amplifier from Elexsys allows users to easily monitor and record measurement values from sensors such as load cells, force and torque transducers. The LCV-USB2 is available with strain, voltage, or current input, and includes free PC software for data analysis. The Lorenz LCV-USB2 digital amplifier may be coupled with virtually any analogue transducer to produce a digital output, and is supplied with traceable calibration certificates and free PC data logging software. The LCV-USB2 digital amplifier supports a range of applications across industries. From press fit monitoring, weighing applications, rope force or pulley measurement, capturing motor torque output, or measuring ball bearing friction, the LCV-USB2 in-line amplifier works with most measurement sensors to provide detailed measurement information. **Elexsys** supplies the entire range of Lorenz sensors and amplifiers, and is the sole representative for Lorenz Messtechnik in Africa.

Enquiries: George Chapman. Tel. 021 930 0214 or email sales@elexsys.co.za

Reducing failure in underground cables

By Y Wang, EA Technology Group

Launched in 2013, the 'cable data collector' is a test instrument which measures partial discharge activity in live distribution voltage cables, without the need to de-energise them.

When maintained in good condition, underground cable distribution systems provide an exceptionally high security of supply compared with overhead line systems, due to a low incidence of failure from external causes such as severe weather or external accidents. However, underground cables are subject to deterioration from a range of root-causes, and without dedicated asset management, the systems will inevitably under-perform.

As most cable failure root causes can be traced back to the manufacture, installation and operation phases, it is believed that utility cable asset management should start at an early stage and continue throughout the cable's lifecycle. Management involvement is required from the procurement phase, through installation and maintenance – right up to replacement at the end of the cable's service life.

Failure modes and root causes

Most cable types used for underground cable distribution networks are paper-insulated cable, oil filled paper-insulated cable and XLPE, with the trend of increasing the use of XLPE cable.

Paper-insulated cables with a lead sheath, and protected on the outside by steel armour tape have, in general, given very good service, as is evidenced in the fact that many of the pre-war cables are still giving satisfactory service. In New Zealand, for example, a service life of 70 years is expected for PILC cables. Failures on PILC cables are mainly age-related as these cables have reached the end of their service lives. The main failure mode is deterioration of the paper insulation over a long term due to partial discharge (PD).

Oil filled paper-insulated cables are known as PD-free in the paper insulation. This feature gives the cable insulation almost infinite life. However, many utilities have experienced oil leak issues and treat oil leaks as the main failure mode. It is easy to know if an oil-filled cable is leaking oil, but it is expensive to locate and repair the leak. The oil leak is usually due to metallic sheath corrosion caused by moisture ingression.

XLPE cables were first installed in the late 1960s; the first generation of XLPE cable had a poor service record with many having a far shorter service life than expected due to issues in construction, design, material quality and manufacturing processes. With development progress in manufacturing techniques and processes, XLPE cable has become the globally preferred cable for both transmission and distribution underground networks. Failure modes for XLPE cables include insulation deterioration due to natural ageing, water treeing, electric treeing and outer metallic sheath arcing. *Table 1* shows the link between cable type, failure mode, and root cause in different phases in the cable lifecycle.

Cable type	Failure mode	Root cause	Lifecycle
PILC Cables	Insulation deterioration over long term	Partial discharge	Natural ageing
	Thermal runaway	Local heating * Mutual heating from neighbouring cables * Cable surrounding material with high thermal resistivity * Overloading - incorrect design rating	
	Moisture ingress	Outer sheath damage	Installation Operation
Oil-filled Cables	Oil leak	Oil pipe corrosion due to outer sheath damage	Manufacture defect Installation
	Thermal runaway	As for PILC cable type	Installation Operation
XLPE Cables	Insulation deterioration	* Natural ageing mainly due to cyclic thermal * Mechanical aggression * Manufacture defects	Natural ageing Manufacture
	Water treeing	Moisture ingression * Outer sheath damage * Without water barrier * Outer metallic sheath corrosion * Fault joint	Manufacture Installation
	Electric treeing	* Defect in insulation * Thermal ageing	Manufacture Installation Operation
	Outer metallic sheath arcing	* Corrosion due to outer sheath damage	Installation Cable environment
	Thermal runaway	* As for PILC cable-type	Installation Operation

Table 1: Cable types, failures, root causes and phases in cable lifecycle.

PD – Partial Discharge
PILC – Paper Insulated Lead Covered Cable
VLF – Very Low Frequency
XLPE - Cross Linked Polyethylene

Abbreviations

For almost all cable condition-related failures, the root causes can be traced back to the manufacture, installation or operation phases in the cable lifecycle. With installation condition becoming more difficult and complex as 'green field' becomes less available, cable installation has become the predominant factor in building a reliable underground cable network. The following examples are related to cable installation and operation issues.

Figure 1: Local heating caused by cable installation configuration. (Substation exit cable photo courtesy AECOM).

In *Figure 1* multiple feeder cables are laid over each other without appropriate separation. The cables are poorly arranged in the trench with unsuitable material installed as the cable backfill resulting in overheating and accelerated ageing.

Figure 2: 220 kV Transformer cable buried in sand (photo courtesy AECOM).

Figure 2 was taken from a thermal survey that was conducted to assess cable trench soil and backfill material thermal resistivity.

The purpose of installing backfill around the cable is to help cable heat dissipation. Good cable backfill material should comprise well graded particles and have stable low thermal resistivity when it loses its moisture content, and at fully dried state its thermal resistivity can be expected not to exceed 1.2 Km/W.

Unfortunately an inappropriate material has been used as cable backfill in *Figure 2*, as the fine sand contains the opposite physical and thermal properties of a suitable cable backfill. It was found that the cable backfill thermal resistivity varied from 3.0 to 7.0 Km/W, thus exposing the cable to the risk of overheating.

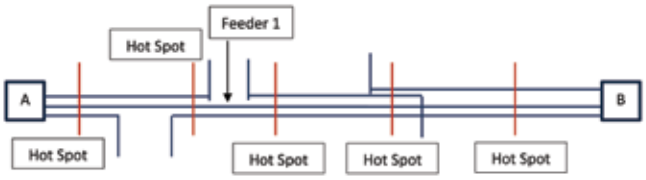

Figure 3: Mutual heating in multiple cables in parallel.

A feeder cable connecting two substations is always joined by other feeder cables at various locations along its route. Due to space limitation and the number of cables involved, the location where the multiple parallel cables share the trench can be a hotspot.

In these hot spots, a PILC cable, usually, will suffer more derating if it has XLPE neighbouring cables, as the maximum operating temperature is usually limited to 70°C at the conductor, compared with an operating temperature of 90°C for XLPE cable.

Cable asset management

The goal for utility cable asset management is to achieve highly reliable performance while keeping the cables in service as long as possible. This can only be achieved with dedicated asset management throughout the cable lifecycle, including the stages of procurement, installation, operation, maintenance, and replacement.

- Cables are reliable and offer a secure supply option.
- Cables must be managed over their lifecycle.
- Monitoring devices for cables offer a reliable way of condition management.

Take note

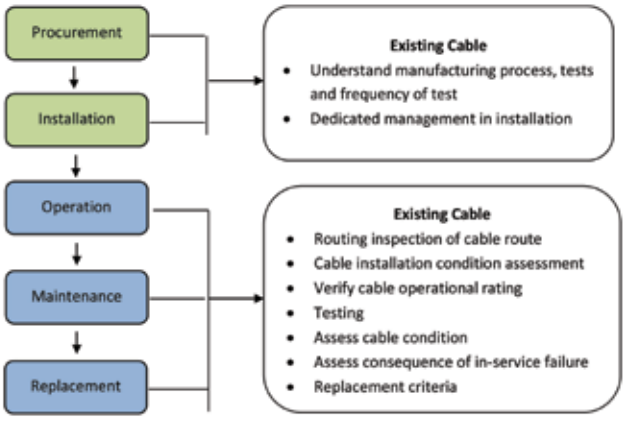

Figure 4: Cable lifecycle management.

Finding fault before failure

Launched by EA Technology in 2013, the Cable Data Collector is a new type of test instrument which measures PD activity in live distribution voltage cables, without the need to de-energise them. This is a major advantage compared with offline testing, which inevitably causes disruption.

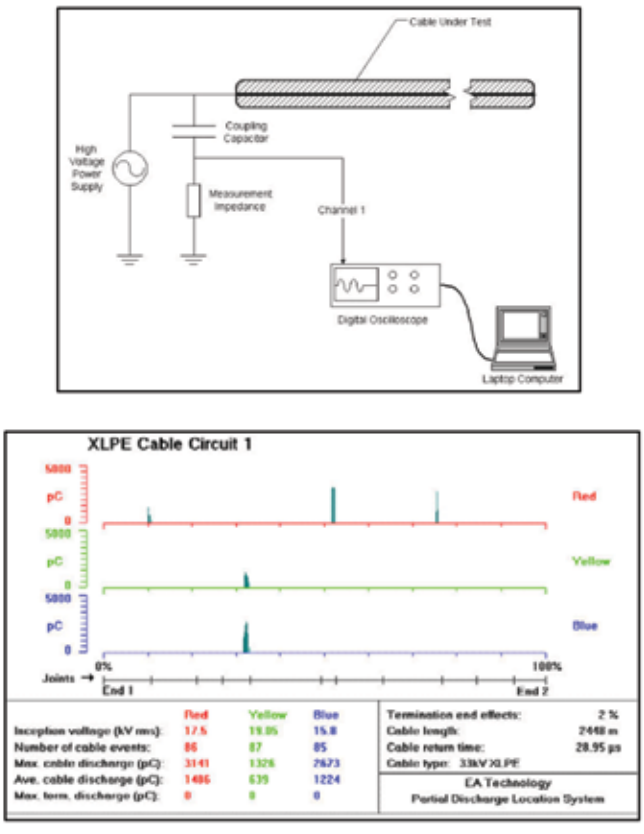

Figure 5: Offline VLF cable PD mapping with the Cable Data Collector.

The instrument detects and quantifies PD activity in cables by measuring radio frequency currents and works with most types of single and three phase insulated cables at distribution voltages, up to several miles in length.

The process of capturing PD data with the Cable Data Collector is quick and simple with expert analysis of the results which include cable condition reports and recommendations for action – provided by the author's company. The company also provides an offline cable PD mapping service, which is non-invasive and effective on underground cables up to 66 kV.

The technique involves energising the cables at very low frequencies. This allows the measurement of cable length, by time of flight measurements, as well as identifying any PD activity in the reflected waveforms. The company's software then analyses these results to produce a comprehensive report on the health of the cable and identify any areas that may require further investigation or repair.

Both the online and offline testing techniques offer many benefits compared with extensive and costly physical excavations, to inspect the condition cables visually. In addition to identifying the presence of potentially failure-causing PD activity, they are equally valuable at assuring operators when cables are functioning without PD being present, and thus at low risk of failure.

Conclusion

Cable failure rates can be reduced by dedicated lifecycle asset management, from cable procurement, through installation, operation, maintenance right up to replacement at the end of cable service life. In particular, they can be reduced by eliminating root causes from the installation phase for new cables, and detecting hidden failures on aged cables by VLF and PD testing in maintenance stage.

Acknowledgement

This article is based on a paper presented by Ying Wang at the EEA (Electricity Engineers' Association) Conference and Exhibition, New Zealand, in June 2013.

Following 13 years at AECOM as a principal cable engineer, Ying Wang joined EA Technology Australia in March 2012 as principal consultant (power systems), working on condition-based risk management in power systems' asset management for Australian and New Zealand clients. Based in New Zealand, she is an electrical engineer with 30 years' engineering consultancy experience in the electric power and coal mining industries. Enquiries: Email ying.wang@eatechnology.com.au; john.hartford@eatechnology.com. Tel. 011 432 6958 or email fred@ipiholdings.co.za.

About the author

Getting process cabling right

Helukabel has developed a wide range of cables for different applications and diverse operating conditions. These range from extreme temperature applications, to high vibration or corrosive environment applications amongst others. Similarly, its range of electro-magnetic current (EMC) cables and accessories has also been developed to withstand tough conditions with the addition of advanced EMC shielding to ensure the integrity of high speed data regardless of outside interference.

According to **Helukabel** South Africa managing director, Doug Gunnewegh, cable failures are a primary cause of stoppages on plants. Likewise, EMC interference is a primary cause of corrupted data that can slow a plant down. "Our carefully researched and developed cable solutions ensure that there is no interference and are also designed to be easier to install and more durable than traditionally used cabling.

"For example, our advanced EMC glands do not require the cable to be stripped to connect and are simply clipped-on to make a perfect connection. This eliminates errors on high value installations and once in place provides a strong connection that is completely shielded from the environment (moisture, gases), as well as from EMC interference," says Doug. The EMC glands provide a fast and safe means of connecting cables for plant and machine construction, robot construction and automation technology. They are quick and simple to assemble and can be mounted close together with no locknuts required. They are also designed to provide optimum strain relief for longer cable runs.

Cables are available for different applications with unique abilities for different industries and applications. Advanced EMC shielding is provided to ensure high performance of equipment at all times. The cables are specially designed in Germany with assistance from representatives from various industries including, machinery construction, automobile production, automation engineering and various other suppliers. Helukabel products are certified by leading global quality and standards authorities.

Enquiries: Doug Gunnewegh. Tel. 011 462 8752 or email doug.gunnewegh@helukabel.co.za.

Quality industrial cabling is critical to ensure plant reliability.

Test laboratory for flexible cables

The **igus test laboratory** has been operating for over 20 years. The chainflex laboratory focuses particularly on tests and experiments that are absolutely necessary for determining the service life and operation of moving cables, but not supported by the relevant standard norms and laboratories. There is an almost infinite variety of cable providers today, who also sell cables for the so-called 'chain-compatible' area but the question arises as to how appropriate these cables are for use.

The commonly used experiments and tests stipulated in the standards meet the special requirements of customers only in the rarest of cases, since these specific applications simply cannot be described in terms of standards.

It is these customer requirements that the igus laboratory prescribes. Beyond the standard norms or rules formulated by bodies such as VDE, UL and others, igus has also created testing and manufacturing standards for the chainflex cables, which meet the actual requirements of cables for the continuously moving area. igus considers different tests and reviews:

Material tests: New materials for conductors, insulation or jackets are developed according to customers' requirements.

Structural inspections: New superstructures, manufacturing processes and the related impacts on the service life are assessed systematically.

In-process quality tests: After the end of production and the standard tests customary for cable production, random cables are subjected to special igus tests according to certain selection algorithms.

Long-term service life tests: These test projects that need to run for up to four years, examine the actual maximum service life of the selected cables. The focus on continuous monitoring of the parameters occurs particularly to detect failure promptly.

Customer specific applications: These tests - based on the customer-specific movement sequences of the application and in particular on critical operations, provide the significant advantage of defining the limits resulting from the tests.

The chainflex lab: In order to implement these tests usefully, systematically and reproducibly, various conditions have to be met.

Enquiries: Ryan Hancock. Tel. 011 312 1848 or email mailing@igus.de.

Tailor-made cable – short lengths and time

Camuna Cavi is a **Lapp Group** Company that manufactures industrial cable and is ISO 9001:2008 certified. The factory is located in Edolo in Northern Italy. The product range includes control, instrumentation and data cables as well as extension/compensating thermocouple cables and low voltage control cables. Most of the cables are designed and manufactured to fulfil customer needs. Cables manufactured are devoted to measurement and control, to connect sensors and actuators and to be installed in dangerous areas such as intrinsically safe or explosion proof zones.

Industries served include the petrochemical industry, oil refineries and gas plants, off shore exploration and drilling, the energy industry, mining, iron and steel, shipbuilding and civil engineering. Camuna Cavi is able to manufacture tailor-made cable in short lengths and also in a very short time. Another advantage the company offers is that they can design and manufacture the AL/HDPE/PA technology as an alternative to the lead jacket cable.

Enquiries: Mark Dilchert. Tel. 0861 222 537 or email Mark.Dilchert@lappgroup.co.za.

Single cable lifeline

Becker Mining South Africa has extended its range of Tractel personal protection equipment to now include the new Travsmart lifeline system, which is designed for safe and reliable use by up to five workers at one time.

"Travsmart is a single cable lifeline which facilitates automatic travel through intermediate and turn anchors, with no need for manual intervention. A user can pass right or left of the lifeline, without having to unhook the system when changing sides. This is a key feature for enhanced safety during installations, cleaning or maintenance," says Charlotte Megannon, product manager for Becker Mining South Africa. "The flexibility of this system means it can be easily installed in all configurations, with inclinations of up to 15°. Travsmart can be mounted on traditional and low strength structures, including under ceilings, on walls, under an inclined surface, on the ground or on a post.

"This lifeline cable system, which is quick to set up without the need for heavy assembly tools, eliminates the risks of an incorrectly crimped cable end. Intermediate supports can be easily changed if necessary and in the event of a fall, components are replaced, without having to disassemble the entire lifeline."

Travsmart consists of a slider - which is an opening-type anchor point that slides on the lifeline cable and can be positioned and removed anywhere along the lifeline. For user convenience, this device can be opened with one hand only. This positive-locking safety slider prevents an unintentional release from the lifeline. Self-blocking end-pieces ensure the lifeline cable is always under tension (100 kg).

Other components include galvanised or stainless steel cable (5 strands x 19 wires, or 7 strands x 19 wires) with a cable thimble, INRS shock absorbers, as well as intermediate and angle supports.

Becker Mining South Africa's range of Tractel equipment, which includes lifting and pulling equipment, as well as personal protection systems, meets stringent international safety and quality specifications. The company offers a test, repair and maintenance service to ensure all equipment operates in perfect condition.

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

Connectors for renewable energy production

Modern wind turbines consist of a large number of highly specialised individual components. They control and regulate the systems and system parts, from the wind tracking system to the rotor blade placement equipment and the system for preparing and converting the electrical energy. The system's efficiency depends substantially on the interaction of all the integrated systems.

In addition, a number of safety devices are required and stipulated. A few examples of these are the brake system, fire and lightning protection equipment and beacon and lighting systems. They all have in common concepts for a modular configuration for the turbine as a whole.

The advantage here is obvious - individual components can be manufactured and tested completely in the factory and the transport to the installation site and the assembly are uncomplicated. When servicing is required, this concept allows simple replacement of individual components. This approach is complete when the interfaces between the respective components have been unambiguously defined and allow simple connection using connectors. New concepts can consequently follow the current trend which demands a lean and green product design.

For implementing powerful interfaces, **Harting** has introduced a connector series that is coordinated to the current and future requirements in the renewable energy production sector. The starting point for the new Han-Yellock 10 development was formed by the larger Han-Yellock 30 and 60 versions that have already established themselves on the market.

Like these, the new series also features a locking mechanism that is integrated into the connector housing. The encapsulation that this achieves offers two important advantages.

On the one hand, it keeps dirt and external mechanical influences from interfering with the locking function. On the other hand, it provides design leeway for the connector's moulding. The two housing halves lock together automatically and directly during the insertion process. Two stainless steel springs keep the connector locked securely. Simply activating the yellow latching button unlocks the connector. The patented mechanism decouples the two housing halves, which then can be separated effortlessly.

The integrated protection against unintentional unlocking is an important feature. Rotating the yellow pushbutton by 90° is sufficient to block the unlocking mechanism so that the actuating button cannot be pushed.

The functionally smart design also stands out from existing standard solutions. The connector is made of high-grade metal in two colours. The bulkhead-mounted housing has a shiny metal surface that is coordinated to the dark powder coating of the hood. The connectors are easy to clean and have no corners or edges that allow dirt to collect. In addition to straight models of bulkhead-mounted housings and hoods, angled versions of both housing types are also available. The new connectors make it possible to serve most common applications right from the start.

A further outstanding feature relates to the cable entry. In addition to the cable entry for M20 cable clamps common with this size, versions with an M25 opening are also available. This is not only significant for cables with larger core cross-sections.

Elaborately shielded data cables frequently also have outer diameters that push conventional connectors to their limits. Particularly in view of modern data transmission, the Han-Yellock 10 offers another innovation: The seal between the bulkhead-mounted housing and the switch cabinet/device is countersunk into the bulkhead-mounted housing.

The user benefits from the simplified assembly – the seal does not have to be held separately. Once the bulkhead-mounted housing has been screwed to the panel and held securely by four screws, there is a direct electrical connection between the connector and the panel. This guarantees good EMC properties.

In keeping with the demand for such properties, the hood slides over the bulkhead-mounted housing during the insertion process. This nesting supplies a further aspect for good EMC properties.

Enquiries: Errol Mann. Tel. 011 575 0017 or email errol.mann@HARTING.com.

Test and inspection products

AFL has appointed Comtest Technologies as its sole distributor in South Africa and selected countries in southern Africa, for its test and inspection products. AFL manufactures, engineers and installs the fibre optic products and equipment that communications providers need to provide quad-play solutions to their customers. AFL's test and inspection products consistently meet and exceed customer needs, delivering exceptional fibre optic test equipment and service. Nick Cole, AFL's regional sales manager for the test and inspection division, responsible for South Africa, has confidence that **Comtest** will take AFL sales to new heights and will quickly become a leading force in the test and inspection market in South Africa. "AFL's ISO certification and quality practices ensure you receive excellent products and documentation," says Cole. Gary Casper, the Comtest product specialist, will spearhead the sales and marketing for the new agency.

Enquiries: Tel. 011 608 8520 or email gcasper@comtest.co.za.

Gary Casper (left), Comtest product specialist and Nick Cole, AFL's regional sales manager (SA).

Connectors for signal, data and power transmission

Phoenix Contact has expanded its product line with new M17, M23, and M40 round-plug connectors. This means a full range of plug connectors from M5 to M58 are now available for signal, data, and power transmission.

The three new models M17, M23, and M40 add moulded round-plug connectors to the portfolio. The straight and angled plug connectors are available for signal transmission with up to 17 pins. Six and eight pins are available to transfer power of up to 70 A. The new molded, angled M23 can be rotated by 240 degrees, allowing conductors to flexibly and easily exit any device in various directions.

Another new addition to the range is the Advance product line with freely configurable, EMC-protected M23 round-plug connectors for signal transmission with up to 19 connections. All new plug connectors are also optionally available with the Speedcon quick-locking system for quick installation in just half a turn.

Enquiries: Sean Hadley. Email seanh@phoenixcontact.co.za.

Logic solver application software and operator interface

By RJ Perry, Control Systems Consultant

Correctly implemented and structured functional logic, together with operator interface displays, can improve overall functional safety management and reduce systematic failures leading to fewer process plant accidents.

A great deal of technical literature exists on sensors with associated self diagnostics and final element ESD valves with trip action diagnostics and partial stroke testing. However, there seem to be far fewer application examples available on the logic solver functional logic structure, including process operator graphics indicating the SIS status and operator/maintenance interface. IEC 61508 Part 3 [1] clearly defines the objectives of safety-related application software, but as with IEC 61511 [2], provides few practical examples.

Prior to 1998, there were few standards dedicated to functional safety management as applied to programmable instrumentation systems, and initially there was a reluctance to use 'software' in safety applications due to issues with reliability and systematic 'bugs'. A typical electromechanical trip relay system as shown in *Figure 1* was the standard design of the day, but although reliable with well defined failure modes, it suffered from many drawbacks such as system modification and lack of intelligent communications.

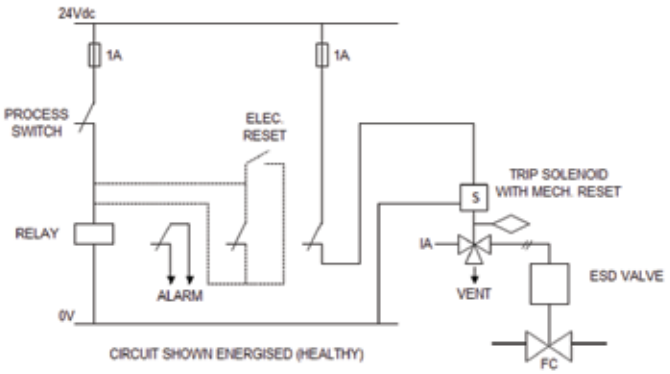

Figure 1: Trip relay.

One of the earlier functional safety publications in 1987 was the UK Health & Safety Executive 2 part guideline on 'Programmable Electronic Systems in Safety Related Applications [3]' and in 1989 the German DIN 19250 [4]. In 1996 ANSI/ISA published S84.01 – 'Application of Safety Related Systems for the Process Industries [5]', probably driven by their impatience of the time being taken by the IEC body in developing an international approved standard. However, at the end of 1998 the seven part IEC 61508 [1] – 'Functional Safety of Electrical/ Electronic/ Programmable Electronic Safety-Related Systems' started to be released. This was followed in 2003 by the three-part IEC 61511 [2]. These IEC standards addressed all aspects of functional safety from developing an overall safety instrumented system (SIS) safety requirements specification (SRS), performing a hazard risk analysis to determine the required safety integrity level (SIL), safety instrumented function (SIF) hardware and software design realisation, through to testing and maintenance. In all, these cover 16 Phases collectively known as the Safety Lifecycle Model. This article explores some key aspects of an application software safety requirements specification, which is part of the design realisation Phase 10, together with a typical control room operator SIS graphic display configuration indicating the status and health of the SIS.

Software requirements

IEC 61508 Part 3 [1] (mainly for safety equipment manufactures) and also IEC 61511 Part 1 [2], provide the minimum application software framework requirements and functional guidelines, they also allude to the need for a good operator interface, which is lacking with many current system designs. The embedded software which forms an integral operating part of the programmable electronics, and also ensures safety certification, will not be reviewed. Probably one of the first decisions to be made is which programming language to use for the safety approved programmable electronic system application software. This will normally be a limited variability language (LVL), being textual or graphical conforming to IEC 61131-3 [6] such as Ladder, Boolean including Function Block Diagrams or Sequential Flow Chart also referred to as State Transition Diagrams. The author's personal preference is Boolean with Function Blocks, which has a high degree of configuration flexibility and is well understood by most control systems practitioners. It is good practice to follow the external failsafe principle ie logic '1' or 24 Vdc being the normal healthy state and Logic '0' or 0 Vdc being the safe tripped state, right through to the functional logic. One of the prime requirements is that the software safety functions together with applicable software systematic capabilities are well specified to enable initial design; these are defined in the Software SRS. The software execution plan should define the strategy for procurement, development (normally by the SIS Logic Solver vendor), integration with other systems, verification, validation and any required modifications following a management of change (MOC) procedure. As with the overall SIS safety lifecycle, a specific software safety lifecycle is also followed, refer to *Figure 2*.

Verification and overall software validation testing will use the typical V-model, where each step is cross checked to ensure compli-

ance and correctness that the output requirements of the previous step satisfies the input requirements of the next. Software is often developed which consists of both safety and non-safety related functions and these should be segregated within the software structure wherever practical. An example would be the trip outputs to ESD isolation valves being safety related and the associated valve status limit switch feedbacks, which form no safety function perse, but provides the operator with indication of correct trip action. Should an ESD trip valve fail to operate on command, this would raise an Emergency alarm; if it fails with no command say on a trip solenoid coil failure, then a High priority alarm is raised. It should be noted that unless it can be demonstrated that failures of non-safety functions cannot adversely affect the safety related functions, then all software should be treated as safety related.

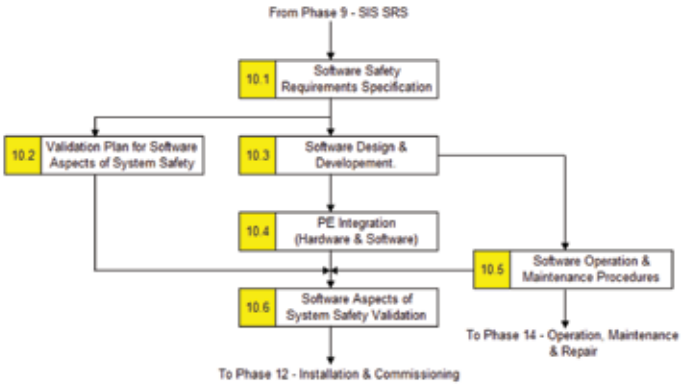

Figure 2: Realisation Phase – Software Safety Lifecycle.

The SIS objective is to provide the operational task requirements necessary to implement the safety instrumented functions consistent with the SIS architecture and specified SIL. The Logic Solver application software SRS provides the executable software functionality with operating properties, and specifies how the inputs condition the outputs together with associated communications, both internal and external. Where a physically separate SIS logic solver is used with a dedicated basic process control system such as a DCS, one should not underestimate the amount of inter-communications data

ANSI – American National Standards Institute
DCS – Distribution Control System
DIN – Deutsches Institut für Normung eV (German Institute for Standardisation;
ESD – Electrostatic Discharge
FAT – Factory Appliance Testing
FB – Function Block
FMC – Fixed Mobile Convergence
I/O – Input/Output
IEC – International Electrotechnical Commission
ISA – International Standards Authority
LVL – limited variability language
MOC – Management of change
MOS – Maintenance override switch
OOS – Operational override switch
SIF – Safety Integrity Function
SIL – Safety Integrity Level
SIS – Safety Integrity System
SRS – Safety Requirements Specification

Abbreviations

required and the integration testing time, this can be up to double that of a combined DCS/SIS equipment package. The software SRS as a minimum, needs to cover the following functions as applicable:

- How a safe process state is achieved and maintained
- Safety related communications
- Capacity and response time performance
- Online software modifications
- SIF structure partitioning
- Provide guidance as to application software configuration eg required function block (FB) library needs and FB linking
- Internal Tag conventions and notations
- Trip Reset requirements including interlock Permissives
- Sensor and final element fault handling including field wiring
- Online testing of SIF loop components (mainly sensors and final elements)
- Interfaces with other systems specifically the DCS
- Operator SIS display graphics with interaction requirements
- Invalid or potentially dangerous operator commands
- Sequence of events recording

Software configuration

The application software structure is partitioned into specific Group SIFs using certified or well proven function blocks selected from a library. These are interconnected with maybe a few discrete Boolean

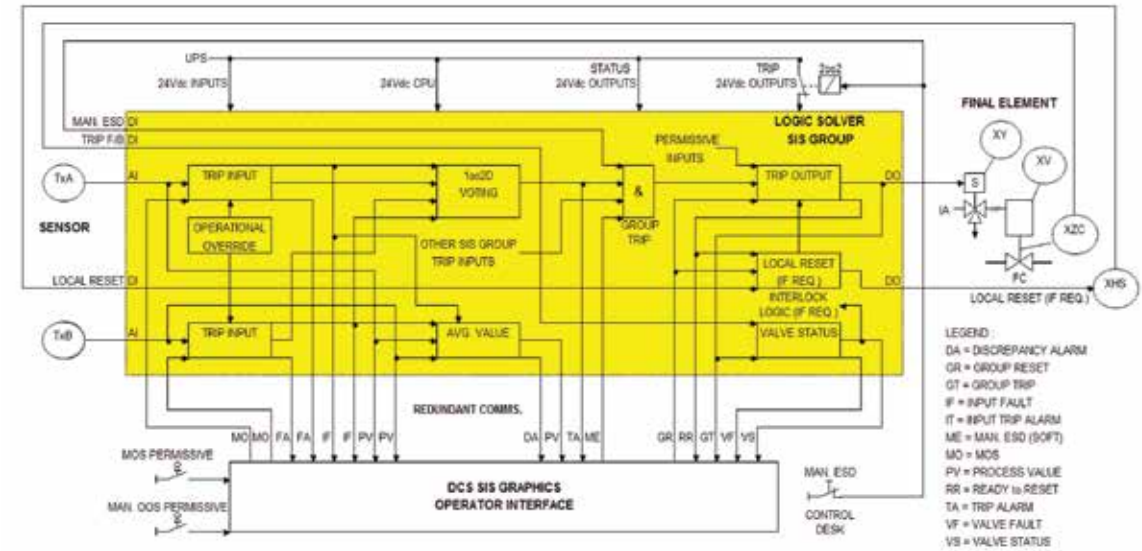

Figure 3: Typical SIF schematic.

logic elements to form the required functional safety application. The connections to other SIS SIF Groups as well as the external communication requirements with the DCS SIS operator's graphic page are also defined, refer to *Figure 3* for a typical schematic.

Implementing the SIF functional logic using standard function blocks as shown is very quick and also aids factory acceptance testing (FAT). The functionality within the function blocks contains various options, should any option not used be used, it will not prevent the correct operation of that block, all that may be required is to apply a dummy logic '1' on that option input. *Figure 4* shows a more detailed function block interconnection for a simplified SIF, ie no voting requirements. The following is a brief description of those I/O connections.

The smart sensor 4 – 20 mA input (analogue is always preferred), is connected to the logic solver analogue input module, this then transmits the digital value in engineering units to the trip value comparator. The input module also monitors for a faulty input signal, the sensor if a conventional transmitter, will use internal diagnostics to detect any malfunction and drive the output signal in a pre-determined direction using the NAMUR NE43 standard, which differentiates between a transmitter under/over range and an actual fault, refer to *Figure 5*.

FB 01 - any input fault raises an alarm and if Fault Tolerance (override) is selected, will initiate an automatic maintenance override switch (MOS) for a limited time eg four hours to enable corrective action. The Group Trip input is used to cancel the Input Fault MOS if in a tripped state. The Process Trip is the safety related function input. A Time Delay can be included which delays the trip function, this is always set to at least one or two seconds if Fault Tolerance is used to allow the sensor to drive to one end, but can be set longer if required such as on low flow trips, if the process safety time allows. The FO (first out) Reset is used to reset the 'hold' on a Process Trip. First Out holds any subsequent Process Trip inputs so that the operator can immediately see on the DCS Graphics what initially tripped the SIS Group (within one CPU cycle time).

The MOS Permissive is a master MOS switch controlled by the control room operator following a Work Permit enabling the testing of a SIF. MOS is for the activation of the individual SIF to perform testing or maintenance, which overrides the process trip but not its alarm. OOS is used for an individual SIF operational override switch to enable a SIF to pass through its trip value during process start-up mode; it is then automatically removed based on a time interval or process value or both. An output Fault Alarm is raised on a detected process input fault.

A 30 minute Trip Warning is given via the DCS if a manual MOS is not initiated within the four hours of an automatic MOS being initiated by an Input Fault. The Trip Input is the safety function for driving the Trip Output FB 08, it may be combined with other SIS Group trips via an '&' element. The Trip Status is the SIF alarm to the DCS (if a voting block is not incorporated). The MOS Alarm and OOS Alarm provides associated SIF status to the DCS, these alarms are automatically re-initiated after two hours (if still in operation), as an operator 'jog'.

FB 08 – a Trip Reset is normally manually initiated, this will reset the Group Trip Output if all Permissives and Trip Inputs are healthy. Permissive Input allows the Trip Output to be reset if all are healthy. The Trip Input is the combined Group safety functions which trip the output. The Trip Output trips the final element to bring the process to a safe state, a Group Trip alarm is also taken to the DCS.

A Ready to Reset, indication (if not automatic), is provided on the DCS so that the operator is aware that the SIS Group can be reset. The First Out is connected to all associated Group Trip input blocks to hold the first out trip alarm for operator acknowledgement. A SIS Trip Group connection is also provided to trip other designated SIS Groups, this is taken via a 1 second time delay to hold First SIS Group trip and may also incorporate a Mono element if any SIS Group is not required to be permanently tripped until the initiating SIS Group is reset.

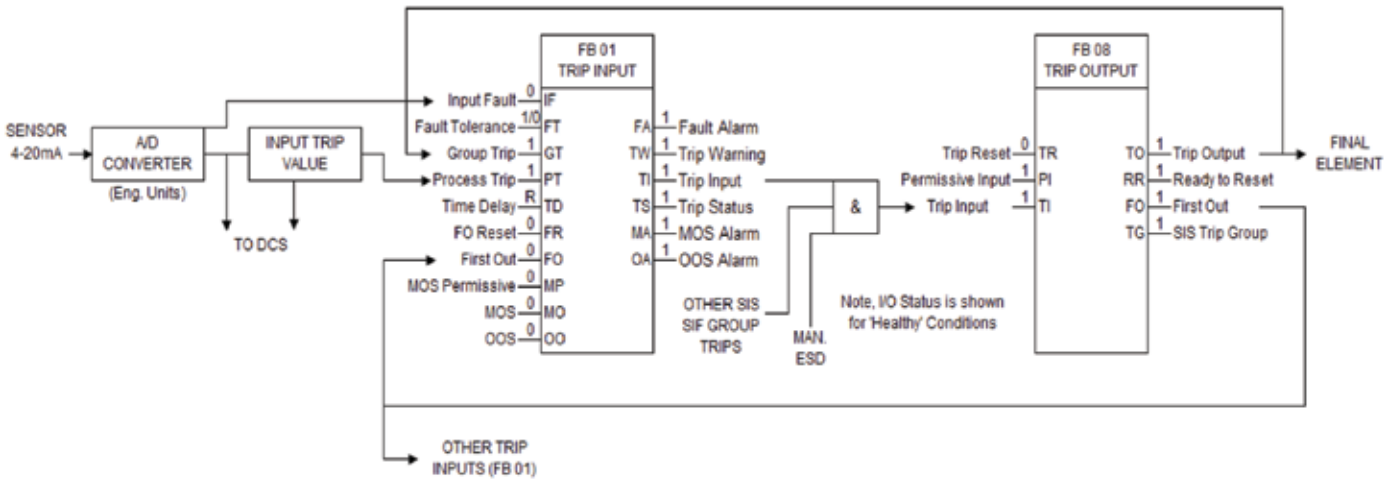

Figure 4: Function Block connections.

Namur NE43 Compliant Transmitter Alarms			
Output Signal	**Normal**	**Range Saturation**	**Inoperable Fault**
High	20mA (100%)	20.5mA	≥ 21.5mA
Low	4mA (0%)	3.8mA	≤ 3.6mA

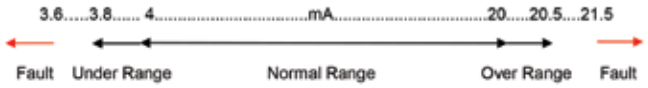

Figure 5: NAMUR NE43.

The limitation to this article prevents a description of the more interesting voting blocks and others such as 2oo3 Mid-Value to DCS for control purposes, but it is suffice to say that all voting function blocks automatically change their voting logic to the next safest state, eg 2oo3 to 1oo2, following a MOS or faulty sensor input on one leg. A MOS or fault on a 2oo3 Mid-Value will change to the Average of the remaining two good inputs. They also prevent a MOS being applied to 'healthy' inputs if a fault is present on any input as this would often trip the SIF, in addition, they only allow one simultaneous MOS to be applied on voted SIF 'healthy' inputs. An additional feature, if selected, prevents a spurious trip (for a short period) and much embarrassment from occurring, when a MOS is initiated and the technician starts to work on the wrong transmitter of a voted input. Another feature which prevents a spurious trip due to technician error is that the MOS will not be allowed to be removed if the trip input is still in a tripped state or has a fault, as this will also trip the SIF.

Operator Interface

In the past, little attention has been given to SIS operator interface and associated DCS Graphic display design, although recently this is being acknowledged as a very important aspect of process control and functional safety management. The operator SIS display, with associated response, needs to be well defined as a subsection of the SIS Software SRS. All SIS analogue input values together with trip setting values should be transmitted to the DCS over the communications link. The trip setting value should be displayed on the associated DCS controller, so if a MOS is applied on a 1oo1 SIF, ie no safety protection available, the pre-trip alarm automatically gets a higher priority and the operators can then clearly see if and when to perform a manual ESD action, otherwise how would they know? (See *Figure 6*).

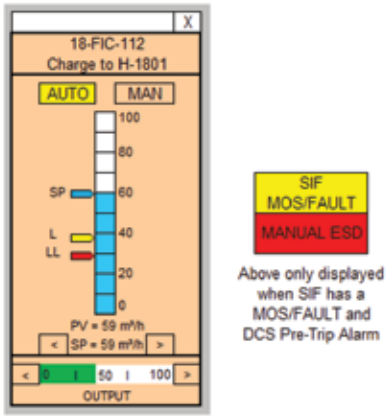

Figure 6: DCS Controller Faceplate.

The DCS interface must under no circumstances influence the safety integrity of the SIS. The operational state of the SIS needs to be monitored for potential problems, also the interface can perform vital system trouble shooting and maintenance activities such as MOS control. A number of display formats exist and a typical SIS interface Graphic example is shown in *Figure 7*.

- Software is ubiquitous in modern control systems.
- Plant safety can be affected by software on the plant.
- Safety requirement specifications can be implemented – but guidelines must be followed.

Take note

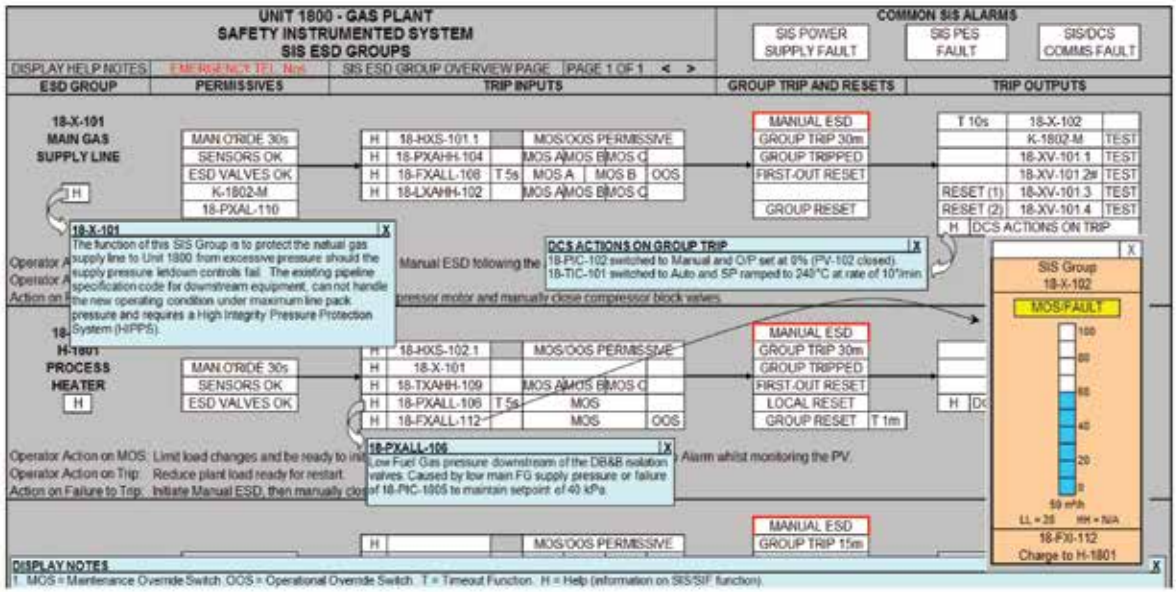

Figure 7: Typical DCS SIS display.

The basic display page takes the form of a 'flat' cause and effect diagram which helps the operator to clearly understand the SIS Group I/O functional relationship. At the top of the page is some general information and common SIS alarms. The display is divided into the different unit ESD or SIS Groups and the Groups contain the applicable SIF information split into the five sections. The first on the left gives the SIS Group identification, followed by the applicable Permissives, and then we have the functional Trip Inputs, this is then followed by the actual Group Trip and Resets information, and lastly we have the Trip Outputs. There are a number of 'Help' buttons which when selected pop-up a window to assist the operator with additional information. Under the ESD Group description a Help button describes the overall safety function of that SIS Group. The Permissives are displayed and need to be satisfied to allow a safe SIS Group Reset following a trip, once the Group is reset then the Permissives play no further part. Should any Permissive input be faulty, there is a short Manual Override of 30 seconds (under permit conditions), to allow the SIS Group to be reset, provided all Trip Inputs are healthy.

All the Group SIF Trip Inputs are shown each with a Help button which describes that specific safety function. Should any input be faulty, its respective Tag will start flashing. Clicking on an input Tag will pop up the respective process value faceplate, a good feature when performing loop testing and maintenance. Any trip time delay of five seconds or more will be indicated. Each SIF will have its own MOS for online periodic input testing and maintenance, it will flash on an Automatic MOS initiation from a faulty input (if Fault Tolerance is selected), and be permanently lit on a Manual MOS initiation. If the SIF has a process start-up OOS, this will also be displayed when in operation. The Group Trip and Reset section displays the overall SIS Group state, first there is a 'soft' Manual ESD (double click confirmation action), then there is a warning if the Group is about to trip following a time-out function, an actual Group Tripped indication is displayed, followed by a First-Out Reset command, indication when a Local Reset has been initiated (if applicable) and finally the Group Reset which will flash when ready to reset. The final section covers the trip outputs including the tripping of associated SIS Groups and any DCS controller FMC actions via the Help button, and the final element status. Some outputs may require an additional sequential Reset which has been catered for, and any valve fault will flash the respective Tag. A final element Test is available which allows for operating the valve during commissioning or following a Group trip under permit conditions, also any Manual valve partial stroke test can be performed when online.

Conclusion

It is hoped that this article, although only being a basic introduction to SIS logic solver functionality, has provided the reader with a useful insight in developing a practical Software SRS.

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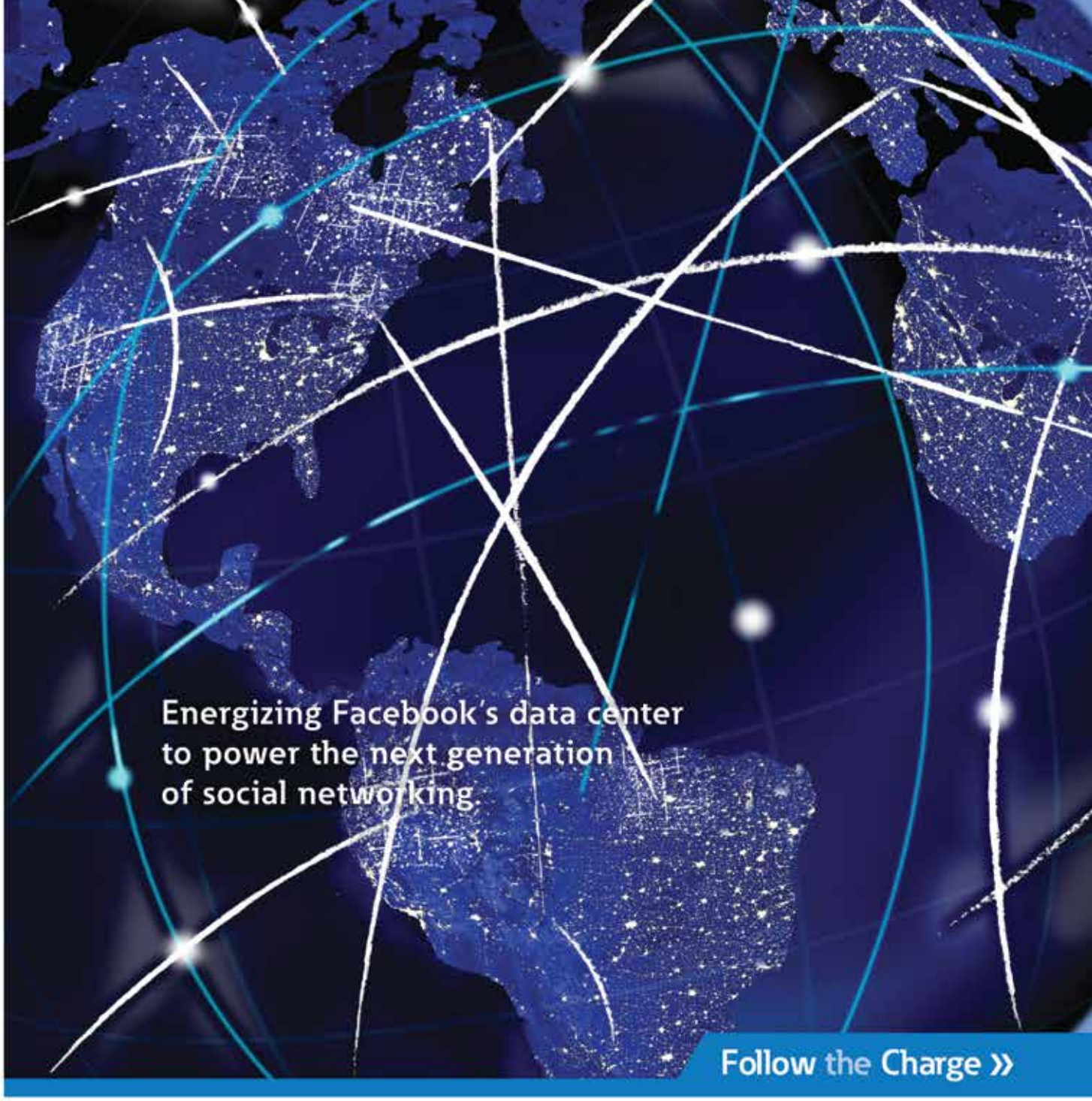
About the author



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- In whisky production, it is crucial that spirit cuts are done at the correct strength.
- An instrument has been developed that provides accurate and consistent process control points to ensure the quality of the spirit.
- The instrument can be used in conjunction with a control system to ensure efficient operation of spirit and wash stills.

Take note

Measuring malt spirit strength

By N Moffat, Rototherm Canongate Technology

One of the crucial points in the production of malt whisky is ensuring the spirit cuts are done at the correct strength. Since controls were introduced to discourage the production of illicit spirit in 1823, this has been done using a combination of hydrometers and thermometers in a spirit safe.

The first liquid to emerge from the spirit condenser is known as 'foreshots' which contains undesirable methanol or other unwanted low molecular weight compounds. Once the spirit strength reaches the predetermined strength typically 72 -74% ABV the liquid flow is diverted from the foreshots to the spirit receiver. The spirit runs to the spirit receiver until the strength drops below a typical value of 62 - 64% ABV, the precise switch point will vary depending on the distillery. Once this switch point has been reached the liquid flow is diverted to the low wine and feints receiver. The distillation carries on until the spirit strength reaches approximately 1% ABV - at this point the still is switched off.

Traditionally the samples are measured in the spirit safe by turning a control handle on the front of the safe which opens an internal valve and fills a glass test tube with liquid. The glass tube contains a hydrometer and thermometer which are read by the operator. The alcohol measurement is corrected back to 20°C using alcohol tables. The safe contains two hydrometers for each spirit still and one for the wash still.

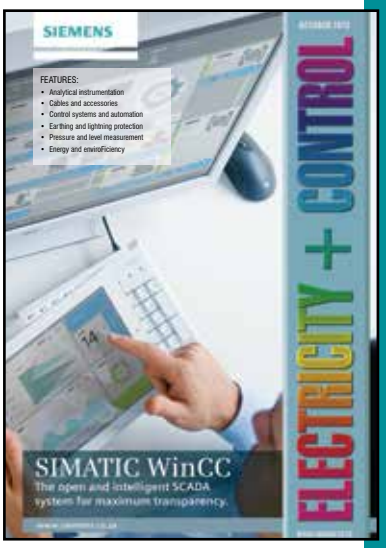
The Canongate DensiCheck TX can be used in conjunction with a control system to ensure consistent and efficient operation of both spirit and wash stills. The system uses high frequency ultrasonics and temperature to calculate the concentration of the liquid. The instrument is connected via a flange into a flooded section of the distillate pipeline. The stainless steel sensing element has a large measurement window and is unlikely to be blocked with verdigris deposits from the still or condenser. The strength indication from the instrument is typically read by the distillery's control system (PLC), using the Modbus serial communications link. The control system will either divert the liquid flow automatically by using a combination of valves or by turning the spout in the spirit safe.

Conclusion

The instrument provides accurate and consistent process control points to ensure the quality of the spirit. There is a reduction in the labour cost as the spirit safe does not need tending. With the current cost of energy it is important that the stills are switched off, before any benefits of spirit collection are out-weighed by the cost of the energy used to produce it. Installed successfully in over 100 malt whisky stills over the last 15 years, the Canongate DensiCheck TX has proven to be the ideal instrument for online alcohol concentration measurement.

Neil Moffat has 28 years' experience working with non-contact ultrasonic technology and inline CO_2 measurement, with an in depth knowledge and expertise of their application within the Beverage and LPG sector. He is currently responsible for the new product design, development and support of the Canongate Technology Instrument range. Enquiries: Scott Hunter. Instrotech. Tel. 011 462 1920 or email sales@instrotech.co.za.

About the author



SIMATIC WinCC from Siemens – scalable process visualisation

SIMATIC WinCC from Siemens is a scalable process visualisation system with powerful functions for monitoring automated processes. WinCC offers complete SCADA functionality for all industrial sectors – from single-user stations to distributed multi-user systems with redundant servers as well as for multi-site web solutions.

WinCC V7.2

Highlights

- SCADA system for global deployment in every sector
- Integrated Microsoft SQL server for data archiving and user developed databases
- High-performance long-term archive SIMATIC Process Historian
- Plant transparency with Plant Intelligence
- SIMATIC Information Server for comprehensive, web-based analyses and reports
- Efficient and user-friendly engineering and operation
- Full scalability – including web solutions, centralised historians and MES systems
- Maximum availability and security
- Open standards for easy integration
- Integral part of Totally Integrated Automation

SIMATIC Process Historian

The historian functionality of WinCC is built into each server, archiving data into the built-in MS SQL Server. Historical data from various WinCC servers can optionally be forwarded to a central historian to ease data access and extreme long term storage requirements. SIMATIC Process Historian acquires and archives data from any number of lower-level WinCC systems in real time. It is scalable and can be adapted to the required data volume at any time – without interrupting production. This supports rapid decisions on the basis of secure data and is, therefore, the first step to greater productivity.

Highlights

- Plant-wide long-term archive for any number of WinCC systems
- Archiving of process values and messages in real time
- Easy step-by-step configuration
- Retrospective scalability, without interrupting production
- Easy access to historical data through standard interfaces,

SIMATIC Information Server

The SIMATIC Information Server is the easy way to create and manage reports and analyses and make them available via web-based interfaces. Based on the Microsoft Reporting Services, transparent access to all data archived in WinCC or SIMATIC Process Historian is possible without the need for any programming knowledge. Depending on the task (management, quality assurance, service), the relevant plant metrics can be summarised in target-group-specific reports and evaluations. It is also possible to carry out evaluations in the familiar Microsoft Office environment in Word and Excel using add-ons. The SIMATIC Information Server can be implemented independently of the SIMATIC Process Historian.

Highlights

- Easily generated reports based on Microsoft SQL Reporting Services
- Web-based management and data provision
- Transparent access to all historical plant data (WinCC Archive and SIMATIC Process Historian)
- Integration in MS Word and Excel
- Automatic report distribution by email
- Easily combine standard SCADA type data (trends and alarms) with custom data from user defined databases implemented on the embedded MS SQL Server.

WinCC in the South African context

The winning combination of WinCC together with the SIMATIC S7 controller has been applied to all fields in the South African automation industry. Today this powerful combination can be found in the local mining, automotive, food & beverage, building automation, most of the major airfields and airports, manufacturing, energy, nuclear, pharmaceutical, harbours and materials management sectors, to name a few.

Enquiries: Keshin Govender. Email keshin.govender@siemens.com.

Full range photoelectric sensors and new security curtains

ACDC Dynamics, sole distributors of the Datalogic product range of sensors and safety products in South Africa and Africa, has introduced their full range of safety light curtains and the new S15 line of Universal photoelectric sensors.

Datalogic offers a complete line of type 2 and type 4 safety light curtains for machine safeguarding and access control in dangerous areas, with basic and advanced functions, such as integrated muting, override, blanking, cascadable, configurable models.

The new range of safety light curtains is a fully integrated series that perfectly combines the SAFEasy concept with applicative flexibility, reliability and performance. Offering the totally zero dead zone as a distinctive characteristic of all the models from 300 mm to 1 800 mm the range also offers high and low resolution for finger, hand and body protection and includes presence control.

With the growing demand for safety in the workplace, the S15 line offers the same safety features and sound designs and reliability as the other Datalogic sensors, however with its shorter barrel and IP69K protection rating on its protective plastic or stainless steel case, it offers a whole lot more.

Further benefits gained from using the S15 line would include:

- Trimmer models that can be used instead of the standard tubular sensors (S51, S50, S5 series) when a shorter housing is needed or better degree of mechanical IP protection is required
- Pinout compatibility with S51 series
- Space savings as the barrel is much shorter than the standard sensor length
- Cost savings, basic NPN or PNP output models
- It can be used in harsh environments with its enhanced durability
  - o These environments would include areas such as where there are water-jets present as well as where aggressive cleaning agents are required such as in the food industry
- The sensors will offer better performance with a greater sensing distance
- A better degree of protection being compliant to IP69K + IP67 + IP65 on all of the new models in the range
- A Johnson Diversey certification for use with detergents
- Atex II 3DG certification

Enquiries: Farrel Sher. Tel. 010 202 3300 or email info@acdc.co.za.

Largely automated engineering across consistent database

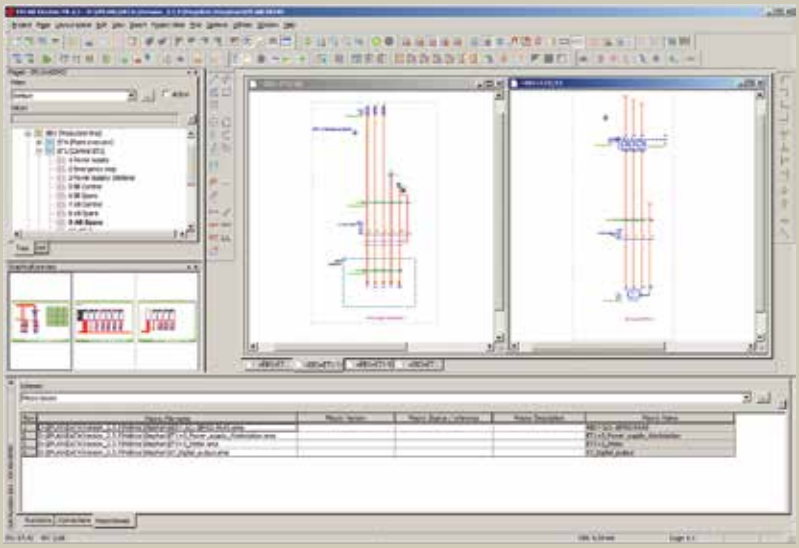
The latest Version 2.3 of the **EPLAN** Platform, available soon, is characterised by standardised and largely automated engineering across a consistent database. There is comprehensive support for new standard-compliant designations based on ISO/IEC 81346 and the safety values focused VDMA 66413 exchange format. The central administration of phased-out items and a new search function for system settings are additional new features of the CAE software to allow interdisciplinary cooperation and configuration. For example macros: Version 2.3 offers extensive options for handling macros/typical circuits and their variations. What is new is the fact that these macros can be edited and if needed be updated across the entire project within an incredibly clear table view. This means that comprehensive changes can be made within the project with just a few clicks of a mouse - potential error sources are reduced by means of central data storage.

Secure in accordance with standards: ISO/IEC 81346 and VDMA 66413: The definition of mechatronic solutions and the appropriate designations in the documentation are typical everyday designing tasks. The standard IEC 81346 'Industrial Systems, Plants and Equipment and Industrial Products - Structuring Principles and Reference designations' is widely accepted on an international level. The EPLAN Platform 2.3 allows project structures and project designations to be implemented on a user-friendly basis in compliance with this current standard. There is also the issue of fail-safety of components and safety function in line with machinery directive 2006/42/EU. EPLAN supports a consistent electronic data exchange format for the relevant safety-related values for automation components in accordance with VDMA 66413.

Central administration of phased-out devices: Phased-out items are generally replaced by a newer model, but are still used in existing projects and must be administered transparently. In Version 2.3, the EPLAN Platform makes the central administration of phased-out articles easier by allowing marking in the article administration system. There are also new check runs to give users even more safety in designing.

Easier searches, quicker results: The new Version 2.3 also incorporates a high-performance search function which makes it easy to find and adjust the system settings by means of keywords. For the project data navigators available in EPLAN, users can now define whether and which additional information is displayed in the tree view.

Enquiries: Gerhard Badenhorst. BLM Software & Service. Email gerhard.b@eplan.co.za.



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Minimise plant downtime and cost

Plants designed in document type applications with deliverables in document format only proved that plant downtime cost increased over time due to documentation not being kept up to date purely because too many documents have to be updated manually. With designs being done within a database application ensures that changes like tag changes only have to be made once in one place and all associated documents, list and reports would be updated simultaneously thus minimising plant downtime and cost throughout the plant lifecycle. The **DesSoft** application comprises hookups, datasheets, built in report-designer, racking and routing, cable block diagrams, auto-generation of loop and termination diagrams, template style diagrams in various formats like DWG, VSD, etc. Some benefits of database applications:

- As there is no duplication of information engineering is more efficient.
- Information can be accessed, edited by all users (with administrative rights) from a central database.
- Concurrent license management reduces total license cost.
- PLC code, SCADA graphic can be designed faster with our user tools.
- Documents, lists, reports are generated automatically from the database.
- Data can be imported and exported for re-use.
- Checking and rework limits most traditional documentation to much less accuracy where 100% accuracy is possible within DesSoft applications. Thus greater accuracy at less cost.
- More accurate design means less onsite delays and rework.
- Improves commissioning performance and handover.
- Impact of design changes can easily be assessed by accessing various lists and reports indicating spare capacity of cables, cores and terminals.

Enquiries: Justin Alberts. Tel. 012 644 2974 or email Justin@dessoft.co.za.

Robust Ethernet I/O for hazardous locations

Moxa has introduced Ethernet I/O ioLogik E1200 series with Class I, Division 2/ ATEX Zone 2 certification. This robust remote I/O meets the demanding requirements of a variety of hazardous applications, and enhances the safety and reliability for remote monitoring in harsh environments

In some hazardous areas fires and explosions could occur when a hazardous gas and energy source combine. Automation system components need to be properly designed to be installed in this kind of environment to eliminate the risk of an accidental explosion. Moxa's Class I, Division 2 ATEX Zone 2 Ethernet remote I/O products are designed to provide an industrial-grade solution to monitor remote devices used in harsh environments. Key features

- Active communication with patented Active OPC Server
- 2-port Ethernet switch for daisy-chain topologies
- Save time and wiring cost with peer-to-peer communication
- User-defined Modbus/ TCP addressing
- UL/cUL Class I Division 2, ATEX Zone 2 certification

Enquiries: Tel. 011 781 0777 or email info@rjconnect.co.za.

Easy automation - handling systems

A first for customers, Bosch Rexroth has developed the innovative EasyHandling system, which seamlessly integrates electro-mechanical axes, pneumatic axes and drives and controls in one pick and place system and is now available in the South Africa market through sole distributor of Bosch Rexroth solutions, Tectra Automation.

Rexroth's EasyHandling makes the automation of handling systems much easier, faster and more economical. This comprehensive handling system simplifies the automation process by integrating all drive and control technologies with linear systems, standardised mechanical and electrical interfaces and new commissioning assistants, all of which are perfectly matched.

"Previously separate technologies were required for the automation process. Now with the bundling of the technologies and expertise, the EasyHandling system can combine pneumatic axes with electro-mechanical axes, making it more than just a modular set of mechanical components," says Kevin Lombard, general manager of **Tectra Automation**.

EasyHandling is designed to simplify various phases of a project, offer excellent scalability and optimise the process from engineering right through to the operational phase, reducing the strain on resources across the board.

The system is available in three variants; basic, comfort and advanced, which provide outstanding solutions for all layers of assembly and handling automation.

Enquiries: Kevin Lombard. Tel. 011 971 9400.

Robust and compact: The Embedded PC with Intel® Atom™ for PC-based control.

The flexible CX5000 series from Beckhoff.

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The CX5000 Embedded PC series from Beckhoff for DIN rail mounting:
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- Intel® Atom™ Z530 CPU, 1.1 GHz (CX5010) or 1.6 GHz (CX5020)
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I/O
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Beckhoff Automation (Pty) Ltd
Randburg 2194, South Africa
Phone: + 27 (0)11 795 2898
info@beckhoff.co.za

New Automation Technology **BECKHOFF**

Switches optimise PLC network performance and management

Moxa has introduced EtherNet/IP and PROFINET-enabled managed switches, the EDS-405A/408A-EIP series and the EDS-405A/408A-PN series, for industrial PLC network applications. With the plug-n-play feature, users can directly integrate and manage the switches in existing SCADA systems without the need for additional configurations and modifications. Fast network recovery (under 20 ms at a 250-switch load) and 10 s fast booting time ensures high network availability and reliability. The EDS-405A/408A-EIP series and EDS-405A/408A-PN series provide advanced efficiency for PLC networks. These plug-n-play EtherNet/IP and PROFINET-enabled switches can be directly installed into existing PLC networks to reduce deployment time. Switches can also be visibly managed and monitored on existing SCADA systems. The EDS-405A/408A-EIP series and EDS-405A/408A-PN series support Moxa's Turbo Ring and Turbo Chain network redundancy technologies. When a connection failure occurs, they enable fast network recovery under 20ms (with 250 switches loads) for high network reliability. These switches also come with fast booting time in under 10s to ensure system availability and reduce maintenance costs.

All of Moxa industrial managed switches support EtherNet/IP communication for industrial automation applications, including 10GbE industrial core switches (ICS series), industrial high-port-density Ethernet switches (IKS series, EDS-700 series), and industrial compact Ethernet switches (EDS-600/500/400 series), which allow users to choose devices that are best-suited for each application requirement with the benefit of seamless interoperability for industrial EtherNet/IP systems.

Enquiries: Tel. 011 781 0777 or email info@rjconnect.co.za.

Decentralised drive system reduces CO_2 footprint

Leading glass bottle manufacturer Consol has managed to significantly reduce its CO_2 footprint at its flint glass manufacturing plant in Nigel, Gauteng, by adopting the Movi-gear decentralised drive system developed and by supplied by specialist drive engineering company SEW-Eurodrive.

The glass manufacturing process requires a considerable amount of energy and Consol, which has an estimated capacity to produce more than one million glass containers per year, introduced a number of environmentally friendly measures in its production process in 2011 to reduce its power consumption, and the Movigear drive system is among these energy saving solutions.

The SEW-Eurodrive Movigear mechatronic drive system offers advantages over traditional drive solutions, as it combines the gear unit, motor and drive electronics into one single housing. The integration and coordination of these drive components leads to an extended and reliable service life.

Consol manufacturing services manager Grant Bailey explains that the Movigear drive system at the manufacturing plant has over ten stations - each of which can be used to form four bottles simultaneously - and each station is operated using 18 servomotors. "The entire system is controlled numerically so that parameters can be accessed and stored quickly and easily."

According to Bailey, **SEW-Eurodrive** delivered the Movigear drive solution on time and within budget, and has provided excellent after sales service and technical support.

Enquiries: Rene Rose. Tel. 011 248 7131 or email rrose@sew.co.za.

Electricity+Control Features – November 2013

- Drives, motors and switchgear
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Battery Inverters

The Sunny Islands offer you first class possibilities in the installation of self-sufficient energy systems. In conjunction with a battery pack the devices form a self-sufficient AC voltage grid, which meets with the highest of quality standards.

Product Name	AC Voltage	Watt	Max AC	Battery DC input	Efficiency
SUNNY ISLAND 6.0H	230 V/172.5 V ... 264.5 V	6000W	20 A	48 V/41 V ... 63 V	95%
SUNNY ISLAND 8.0H	230 V / 202 V ... 253 V	8000W	26 A / 120 A	48 V / 41 V ... 63 V	95%
SUNNY ISLAND 5048	230 V / 202 V ... 253 V	5000W	21.7 A	48 V / 41 V ... 63 V	95%
SUNNY ISLAND 2224	230 V / 202 V – 253 V	2200W	9.6 A	24 V / 16.8 V ... 31.5 V	93.6 %

KACO new energy.

Battery Inverters

NEW NEW

The intelligent energy manager. Modular and flexible. The optimal upgrade for existing photovoltaic systems. A special highlight is the capacity to switch virtually without interruption to backup power in the event the public grid fails.

Product Name	Power GRIDSAVE ECO
Power	
Rated output and charging current (25 °C)	5 kW / 104 A
Peak output power (< 30 s)	12 kW
Max. recommended power of AC-coupled solar inverter	10 kW
DC side	
Battery voltage (nominal)	48 V
DC input voltage range	40 V ... 68 V

Max. recommended PV power 7.7kW
MPP Range 350V...600V
Open-circuit voltage 800V
Number of strings 2
Battery Voltage 48V

True Sine Wave

MEAN WELL Your Reliable Power Partner

Product Name	Watt	Input Voltage	Output Voltage	Efficie.
TS-200-212B / TS-200-224B TS-200-248B	200W	10.5~15Vdc 21~30Vdc 42~60Vdc	230Vac ±3% 200~240Vac adjustable by front panel	87% 89% 90%
TS-400-212B / TS-400-224B TS-400-248B	400W			87% 89% 90%
TS-700-212B / TS-700-224B / TS-700-248B	700W			89% 90% 91%
TS-1000-212B / TS-1000-224B / TS-1000-248B	1000W			90% 91% 92%
TS-1500-212B / TS-1500-224B / TS-1500-248B	1500W			88% 90% 91%
TS-3000-212B / TS-3000-224B / TS-3000-248B	3000W			88% 90% 93%
TN-1500-212B / TN-1500-224B / TN-1500-248B	1500W		200/220/230/230VAC selected by setting button S.W	87% 89% 90%
TN-3000-212B / TN-3000-224B / TN-3000-248B	3000W			87% 89% 90%

Steca AJ

The Steca AJ inverter series stands out with its wide range of available power classes and DC input voltages. This enables the optimal inverter to be used for any application.

	275-12	350-24	400-48	700-48	1000-12	2100-12	2400-24
Characterisation of the operating performance							
System voltage	12 V	24 V	48 V	48 V	12 V	12 V	24 V
Continuous power	200 VA	300 VA	300 VA	500 VA	800 VA	2,000 VA	2,000 VA
Battery voltage	10.5 V … 16 V	21 V … 32 V	42 V … 64 V	42 V … 64 V	10.5 V … 16 V	10.5 V … 16 V	21 V … 32 V
Max. efficiency	93 %	94 %	94 %	94 %	93 %	92 %	94 %

Also Available

IP65

Steca PLI-300
300W
12V

Steca SOLARIX PI
550-4400W
12/24V

Steca XPC
1400-2200W
12/24/48V

Steca XPC
1000-12 600W
12/24/48V

Steca XPC
1500-3600W
12/24/48V

Steca XPC
3000-72 000W
12/24/48V

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19” Telecom Back-up Inverters & Static Transfer Switch

STS118 - Static
19”, 1U Switch
“Hot plug-in“ design with backplane connection

STS207 - Static Switch
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CAN-Bus interface
“Hot plug-in“ design with backplane connection

IBF-DC/AC-INV (Inverter)
Compact design and simple installation.
House up to 3 Inverter modules

UPC4 Master
Extensive battery management
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OutBack

230VAC, 50hz output

Product Name	Vdc	VA
OutBack FX 230VAC Sinwave Inverter/Charger		
Outback FX2012ET	12Vdc	2000VA
Outback FX2024ET	24Vdc	200VA
Outback FX2348ET	48Vdc	2300VA
Outback VFX2612E	12Vdc	2600VA
Outback VFX3024E	24Vdc	3000VA
Outback VFX3048E	48Vdc	3000VA
Outback GFX1312E	12Vdc	1300VA
Outback GFX1424E	24Vdc	1400VA
Outback GFX1448E	48Vdc	1400VA

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OutBack

Fully-integrated solution compatible in both Off-Grid and grid-interactive applications, the Radian delivers 7.000 watts of pure sinewave continuous power with unsurpassed surge capacity. 50/60Hz and 220-240V

Cotek Inverters

Cotek Pure Sine Wave Inverter
- True Sinewave
- Advance microprocessor control
- Thermo Fan
- Tri-colour indicators display
- Power ON&OFF remote control

S-SERIES

S-Series Inverters 150-1500Watt, up to up to 94% efficiency

SK-SERIES

SK-Series Inverters 200-3000Watt, up to up to 94% efficiency

ST-SERIES *With Transfer Switch*

ST-Series Inverters 600-2500Watt, up to up to 94% efficiency

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Pure sinewave output, high peak power and high efficiency. Combined high frequency and line frequency technologies ensure the best of both worlds.

Phoenix Inverter 12 / 24 / 48 Volt
Phoenix Inverter Compact 12 / 24 Volt

Input voltage range (V DC) 9,5 – 17V 19 – 33V 38 – 66V
Output Output voltage: 230 VAC ±2% Frequency: 50 Hz ± 0,1% (1)
VE.Bus communication port Yes

MultiPlus 800VA - 5kVA

Input voltage range (V DC) 9,5 – 17V 19 – 33V 38 – 66V
AC Input Input voltage range: 187-265 VAC Input frequency: 45 – 65 Hz Power factor: 1

Quattro 3kVA - 5kVA - 8kVA - 10kVA

Input voltage range (V DC) 9,5 – 17V 19 – 33V 38 – 66V
Peak power 3000-10 000Watt

Two AC inputs with integrated transfer switch

DELTA Telecom Power backup inverters & static transfer switch

Delta's inverters and static switches, combined with our DC power systems, provide a modular UPS for AC power backup.

API 1500A Series

The Delta API 1500A Series inverter is high efficient, modular single phase inverter.

SSW Series static switch

The Delta SSW Series static switch provides uninterruptible AC power by acting as an electronic switch between the AC mains and the Delta API 1500A series modular inverters.

MidD APS 1500A-230-6 SSW

MidD APS 1500A-230-6 SSW Is ideal AC power system for space critical applications with high power density. The system includes up to six inverters with DC and AC connections. An integrated modular system allows flexible and adaptable installations. MidD APS 1500A-230-6 SSW is available with five or six Delta API 1500A inverters and SSW 7500A-230 static switch. The applications are modular UPS configurations either in indoor or outdoor containers.

JHB:
Tel: 010 591-1713
Fax: 011 462-0420

Bloemfontein:
Tel: 051 011-0158,

KZN:
Tel: 031 569-2854
Fax: 031 569-2864

Fax: 086 657-9836

CapeTown:
Tel: 021 300-1727
Fax: 021-300-1728

view our products online

Machine operation with smart phone convenience

One of Germany's most renowned controls and automation technology companies, Schleicher Electronic, is revolutionising the operation of machine tools, handling devices and industrial robots with the ProNumeric OP 50 M hand-held operating device. This is the first time that a machine can be controlled with smart-phone convenience.

"We are excited about being able to offer this game-changing operating device to our customers", says Karin Visser, managing director of Johannesburg-based **Anglo Allied Engineering**, the sole supplier of Schleicher control devices in South Africa.

The large touch display of the handy device visualises the individual user interface, which is communicated by the device controller via a web browser. Traditional operating elements such as the high-resolution hand-wheel that eases real-time interaction between the operator and the controller are provided at the same time. Best of all and unique at that, compared to conventional operating devices, the ProNumeric OP 50 M not only enables optimised handling but also supports problem-free interfacing with the leading machine networks EtherCAT and sercos III. A ProfiNet version is currently in the planning stage.

The powerful real-time Ethernet solutions EtherCAT and sercos III allow for construction of machine control systems with a single network for I/O, drives and operating devices. The ProNumeric OP 50 M is the first hand-held operating device of its kind that supports these two common protocol versions in an optimised fashion and the first that can therefore be connected to a wide range of controllers provided by well-known manufacturers.

A Schleicher gateway that is compatible with both real-time protocols is installed in the network for this purpose. The appropriate communication system can then simply be selected by flicking a switch. The economic viability of a ProfiNet version is currently being investigated.

The device was equipped with an integrated web browser to make it possible to disconnect the ProNumeric OP 50 M during operation from one machine and to reconnect it to another. It is therefore possible to program an individual user interface with all standard visualisation functions. The visualisation project is not stored on the hand-held device but on the mass storage device of each controller. The user interface can therefore be called up immediately once a new controller has been connected. Problem-free updates - and even remote services - are therefore possible.

Enquiries: Hilda Bouwer. Tel. 011 766 1180 or email info@angloallied.co.za.

Mini-controllers for mechanical engineering

Phoenix Contact has expanded the Easy Automation system to include ILC ME mini-controllers, designed specifically for mechanical engineering, and the compact, easy-to-configure TD 1030T HMI device from the Minitouch line. The ILC 191 ME/AN and ILC 191 ME/INC mini-controllers feature Ethernet, RS232, and RS485/422 ports as well as connections for pulse and frequency outputs. They also offer analogue and digital inputs and outputs, high-speed meters, and incremental encoder inputs. This makes them particularly well suited for activating drives by way of step motor drivers or frequency converters. The TD 1030T HMI device features a 2,8 inch multiline screen used to display data in alphanumeric format. Users interact with the device using four freely configurable buttons on the display, with PC Worx Express used to programme the device. Because several standard, predefined user interfaces are available, no visualisation software is required.

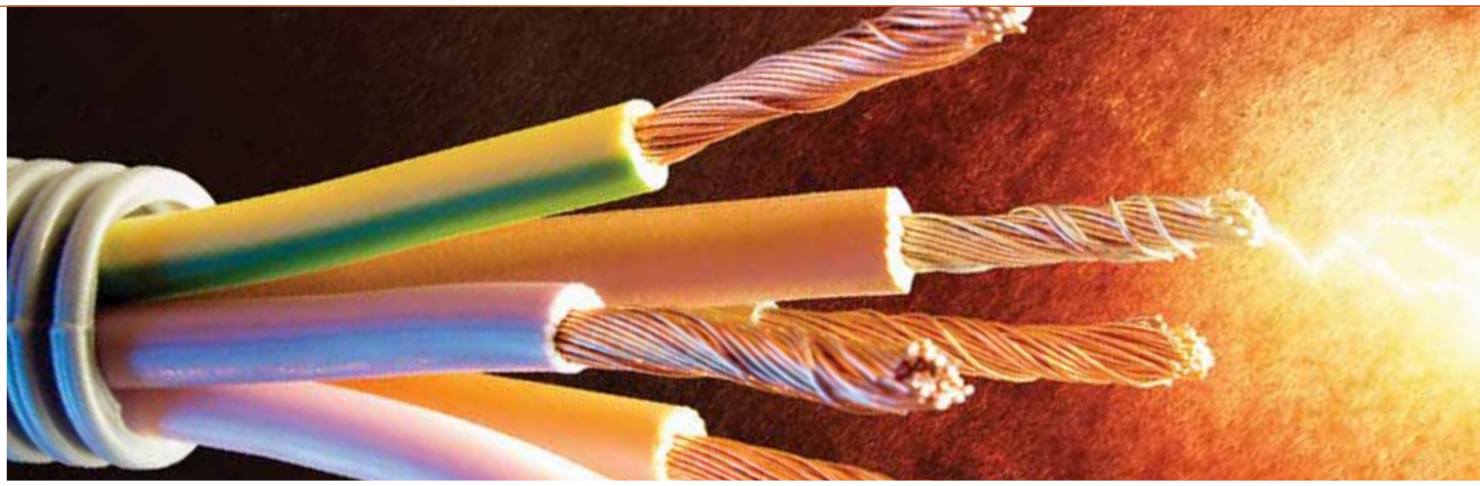
Enquiries: Andre Kemp. Email andrek@phoenixcontact.co.za.

Building systems – save energy, gain efficiency

Schneider Electric, a global specialist in energy management, has launched the 'lite' version of its SmartStruxure solution, providing a fast way to future-fit and retrofit small to medium-sized buildings for HVAC control, lighting and metering. With SmartStruxure Lite, users can save energy, gain efficiency, maintain a healthy and productive environment and access their building systems anytime, anywhere. According to Artur Socha, Buildings Division product manager at Schneider Electric South Africa, with the introduction of SmartStruxure Lite solution, small- to medium-sized commercial buildings now have an affordable building management solution to meet their needs. "By providing anytime, anywhere access to building information on a simple user interface, SmartStruxure Lite solution lowers energy costs without compromising on comfort," he says. As a simple web-based solution delivering one-click access to building system information, the product provides a single interface to connect HVAC, lighting and metering. It is customisable to fit the specific needs of the user's facility and is a scalable, high-performance system based on open protocols. "Up to 60% of energy costs in a building are related to lighting and HVAC," Socha explains. "This solution helps reduce energy costs and increase building performance while simplifying daily operations. It also provides users with remote access to their systems via a mobile device or the cloud."

Aside from reducing installation time, labour and cost, it is a suitable retrofit solution for HVAC, lighting and metering applications. Optimal environmental comfort also increases employee productivity. The product's ecosystem delivers open system functionality from basic control up to the cloud. It consists of a wireless site manager/ gateway, a universal controller, input/ output controller and room controller.

Enquiries: Belinda Aslett. Tel. 011 254 6400 or email belinda.aslett@schneider-electric.com.



Copper electrical wiring for safety

By E Swanepoel, Copper Development Association Africa (CDAA)

A serious electrical fire can cause the total loss of a building - commercial, residential or industrial - and its contents.

Electrical fires pose one of the more disastrous dangers involved in building ownership or property management. Fires caused by faulty or malfunctioning wiring can quickly get out of control and can be difficult to extinguish as they often begin hidden behind walls.

As urbanisation increases and more and more people congregate closer together, the risks associated with fire increase. Unfortunately this situation is exacerbated when imported, sub-standard cables and components are installed; the use of which the consumer is unaware. In the case of formal built-up areas, the National Building Regulations, SABS 0400-1990 Part T [1], first published in 1987 controls fire safety in buildings, considerably limiting the incidence and spread of fires in formal areas, as well as the damage caused by fires. In South Africa, our informal settlements seem to be most affected by fire due to illegal connections, with devastating effects on life, shelter, livelihood and possessions.

National fire statistics are unavailable in many countries, and where they are available they are, at best, inaccurate due to informal reporting, with data availability being worst in Africa and Latin America. The following statistics come from the Fire Protection Association of Southern Africa and pertain to South Africa.

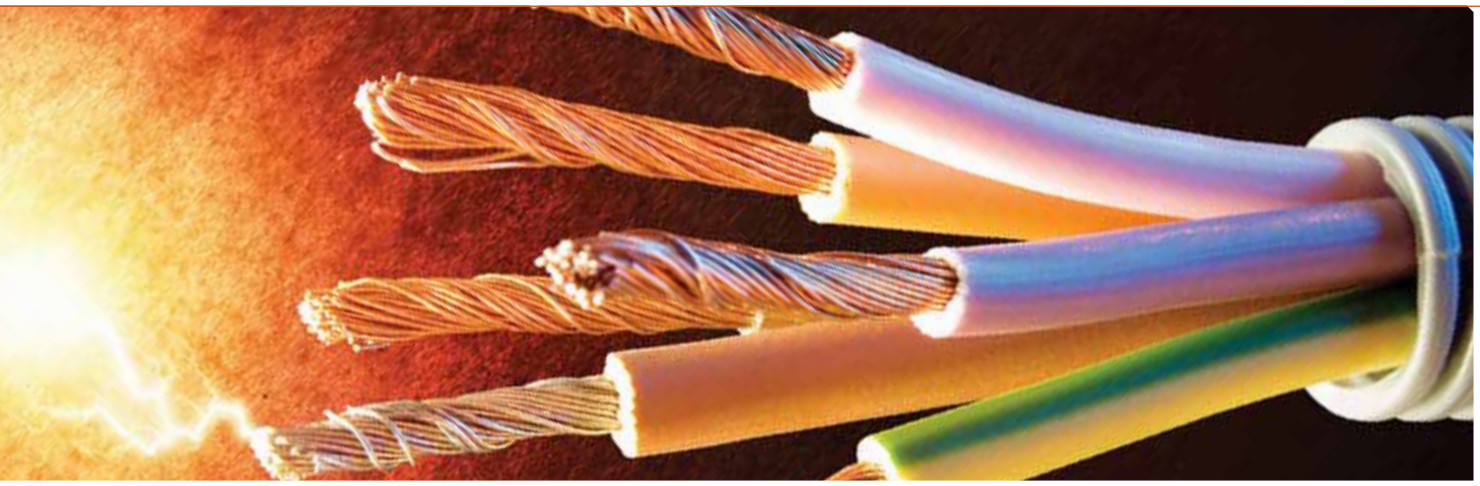
In 2011, fires resulted in 410 deaths and damage to property totalling over ZAR 2 085 M. Of the total number of fires in buildings (37 721), 9% were caused by electrical faults (3 261); however, this figure rose dramatically to 35% when looking at the common causes of structural fires in residential properties, making it the most common cause. In the 2009 statistics, the breakdown of the causes was given, with the main culprits being appliances, such as toasters and heaters; short circuits; and overloaded cables and conductors, which accounted for 26, 25 and 19% respectively. The remaining causes of the electrical fires were faulty devices, such as socket outlets, switches, circuit breakers, fuses (7%); contacts and connections (almost 6%); electrical distribution leads and wires (just over 3%); degradation of insulation (10%) with the remainder being classified as causes 'unknown'.

Causes of electrical fires

The three main groups of fire causes are accidental, natural and incendiary. Of the accidental fire causes, electricity often plays a major part. Electricity can also be involved in incendiary and natural causes. Three elements must be present in order for a fire to initiate: oxygen, fuel and heat. Electricity can play an important role in this process by providing the heat source.

One example of an electrical heat source is a short circuit. There exist two main types of short circuits; a dead short circuit and a limited short circuit. A dead short occurs when a live wire comes into contact with a common or ground wire (or the positive and negative wires are connected in a dc circuit) and the circuit is subsequently energised. In properly fused circuits this will cause the fuse to blow and the circuit to de-energise. This type of situation does not create sufficient heat to ignite combustibles. However, if the circuit is not fused properly, the current can continue to pass through the wires causing them to significantly overheat. This type of situation can ignite surrounding combustibles causing a fire.

The other type of short circuit is a limited short circuit. In this case, wires come into contact such that the volume of material through which the current flows is smaller than the fusible link. This will create a spark or flash and result in the melting of the wiring. This situation can also cause ignition of combustibles provided the mass of the combustibles contacting the heat source is small enough that the heat source can cause it to reach ignition temperatures and initiate a fire. It is difficult to ignite concentrated, solid combustibles such as wood, plastic and even paper with this type of heat source.



However, cotton products, sawdust, wood chips and combustible gases can be ignited.

Another electrical heat source can be created when a circuit is over-fused. Over-fusing of a circuit can result in high current flow through the wires overloading the circuit. Although electrical wiring is designed to carry current at much higher than its rated capacity, increasing current above this rated capacity causes the wire to generate excess heat. This is not a problem as long as the heat can be dissipated from the wire. However, if the wire is enclosed within a small insulated space, such as the holes through which wires run through floor joists in a building, the heat in these areas may not be able to dissipate as quickly as it is being generated. As a result, the surrounding combustibles can pyrolise and eventually ignite, causing a fire.

Fires can also be caused electrically through what is called leakage current. Leakage current occurs when water is in the presence of electricity. Exposed wiring, which exists primarily at connectors and switches, can come in contact with water. Since water conducts electricity, a current will flow through the water between contacts, or from the live to ground (common). Over time, the water will accumulate salts which increase its ability to conduct a current. This current can eventually develop to a point where it generates a significant quantity of heat which begins to pyrolise and carbonise the combustibles in the area. This can eventually result in a situation where a carbon bridge is formed, creating a continuous arc or significant generation of heat. Ignition of surrounding combustibles can result in a fire. Fires have also been known to initiate this way in electrical boxes which become damp or wet.

Additionally, electrical contacts can fail, resulting in uncontrolled heating. Each time a contact is opened or closed, a small spark is generated. This causes degradation of the surface of the contact. Contacts can fail 'open' in which case the circuit simply becomes inoperable. However, they can also fail 'closed' and weld together, resulting in uncontrolled heating.

A simple spark can initiate a fire or devastating explosion if a combustible gas/air mixture is located at the position of the spark. As discussed previously, a spark is usually created whenever a contact is opened or closed. For this reason, specially designed switches and contacts are required for installation in an environment in which you can reasonably expect combustible gaseous mixtures to be present.

How can copper help?

Almost no modern building material is more time-tested than copper electrical wiring. From generators and motors to electric lights, copper is recognised as the industry standard and is the only wiring material to be approved by all electrical codes worldwide. It is resilient, reliable, and most importantly, safe.

Copper electrical wiring is used commercially and residentially because it is easy to work with and can be easily, securely and safely connected to outlets and other electrical equipment. It requires less maintenance and its connections are much less likely to loosen and corrode over time. It is these advantages, not to mention copper's superior conductivity, that make this metal the preferred choice among professional contractors working on a building's wiring systems.

Electrical wiring is everywhere, nestled just behind every wall of your home or office. It is just not worth the risk to rely on non-copper wiring materials that can corrode or give under pressure. It is hard to find a material better suited than copper to prevent electrical fires and keep building occupants safe.

Copper wiring is known for withstanding an overload better than other materials because of its significantly higher melting point (1 984°F or 1 084°C), compared with aluminium's melting point of 1 221°F or 661°C. Additionally, repeated cycling is less likely to loosen

a copper joint. Corrosion is another major risk of using other metals and alloys in wiring. Commonly called a 'noble metal', copper is not susceptible to galvanic corrosion when connected to non-copper metals. It effectively resists moisture and humidity driven corrosion that can destroy other wiring systems, reducing the risk of power outages, system failures and fires. Copper wiring typically does not require the use of conductive greases at its connections, and torque is not critical.

The unique combination of strength and ductility allows copper electrical wiring to be bent further, twisted tighter and pulled harder, all without stretching, creeping, nicking or breaking. Such exceptional strength ensures that copper is the safest and most preferred wiring material available to electricians.

Avoiding electrical fires

Steps can be taken to prevent electrical fires, which will help keep buildings safe from this potential threat. The first is to avoid overloading the building's electrical circuits. This is the easiest step in reducing the risk of electrical fires, and it is also one of the most effective. Each circuit is only designed to deliver so much electricity, and stressing these circuits by drawing too much power can cause the wires to spark or deteriorate. The simplest way to avoid overloading circuits is by minimising the amount of electrical equipment plugged into each outlet. In particular, it is important to minimise the use of power strips as much as possible, trying instead to limit the use of each outlet to the two plugs it provides. If the building is very old, it may have very few plug outlets and circuits, as plug-in appliances and equipment were not as numerous when the building was erected. A costly, but effective, measure to reduce stress on each circuit is to have an electrician run new wiring and install new circuit breakers on the electrical panel.

Secondly, frayed wiring, either in an appliance power cord or in the building's wiring, poses a major risk of electrical fires, and must be discarded and replaced. While electrical tape can be used to provide temporary protection against arcing or melting of exposed conductors, it should not be used as a permanent solution.

Thirdly, it is important to remember that electrical wiring only has a lifespan of about 30 or 40 years, so buildings older than that may be relying on deteriorated wiring. In addition, older wiring setups were not typically designed to handle today's large electrical loads. Heavy reliance on extension cords, or if your circuit breakers trip often, means that more power is being drawn than the old wiring can handle, and a certified electrician must be called to inspect the wiring. Older homes may contain aluminium wiring which poses a more significant risk of degrading and causing fires than copper wiring. It is essential to insist on copper wiring for all electrical needs when wiring or rewiring buildings.

Having an electrician replace all or most of a building's wiring can be a costly upgrade, but will provide a virtual guarantee against electrical fires for decades.

Conclusion

Finally, it is critical that sub-standard imports are avoided and that only SABS compliant electrical components and appliances are installed and used.

Reference

[1] SABS 0400. Part T. 1990. Fire protection and fire installation.

- Standards are in place to protect the public.
- In 2011 in South Africa, 9% of building fires were attributed to electrical faults.
- Faulty electric wiring can be the cause of fires.

Take note

About the Copper Development Association Africa

The Copper Development Association Africa (CDAA) has represented the local copper industry in southern Africa since 1962 and now promotes copper usage throughout Africa. The CDAA's head office is based in Johannesburg and, on behalf of its members, the organisation is committed to promoting and expanding the use of copper and copper alloys throughout Africa.

Visit www.copperalliance.org.za

Evert Swanepoel is centre director for the Copper Development Association Africa (CDAA) - responsible for promoting and expanding the use of copper in Africa. His vast experience in managing large businesses has provided him with the skill and knowledge to promote both current and new copper projects that are positioned to increase the demand and utilisation of this ductile metal throughout Africa. Enquiries: Tel. 011 824 3916 or email evert.swanepoel@copperalliance.org.za.

About the author

ISDN - Integrated Services Digital Network
IT - Information Technology
LEMP - Lightning electromagnetic impulses
PC - Personal Computer
PV - Photovoltaic

Abbreviations

Lightning and surge protection for PV systems on solar plants

By A Barwise, DEHN Protection South Africa

Measures to protect the sensitive electronic system components from failure due to lightning flashes and surges are essential.

In recent years, photovoltaic (PV) systems have become a significant sector within the energy market, with the International Energy Agency in 2011 saying that: 'The development of affordable, inexhaustible and clean solar energy technologies will have huge longer-term benefits.

'It will increase countries' energy security through reliance on an indigenous, inexhaustible and mostly import-independent resource, enhance sustainability, reduce pollution, lower the costs of mitigating climate change and keep fossil fuel prices lower than otherwise. These advantages are global'.

Given that these costly plants are frequently subject to climatic influence, measures to protect the sensitive electronic system components from failure due to lightning flashes and surges are essential.

Lightning surges in the PV system can damage PV modules and inverters, leading to both high repair costs and considerable profit cuts for the operator of the plant related to system failure.

For a complex PV installation, such as a solar power plant, the aim is to protect both the operation building and the PV array against damage by fire (direct lightning strike) and the electrical and electronic systems (inverter, remote diagnostics system, generator main line) against the effects of lightning electromagnetic impulses (LEMP).

Air-termination system and down conductor system

For the protection of the PV array against direct lightning strikes, it is necessary to arrange the solar modules in the protection zone of an isolated air-termination system. According to the class of lightning protection system, the height and the quality of the air-termination rods required is determined by means of the rolling sphere method. Furthermore, it has to be ensured that the separation distance is kept between the PV supporting frames and the air-termination rods. Also, the operation building must be equipped with external lightning protection. Down conductors must be connected with the earth-termination system by using terminal lugs. Due to the corrosion risk at the point where the terminal lugs come out of the soil or concrete, they have to be made out of corrosion- resistant material or be protected by corresponding measures (applying sealing tape or heat-shrinkable sleeve, for example).

Earth-termination system

The earth-termination system of the PV system is designed as a ring earth electrode (surface earth electrode); whilst the earth-termination system of the operation building should be designed as a foundation earth electrode. The metal supporting frames, onto which the PV modules are fixed, must be connected to the earth-termination

system approximately every 10 metres. The earth-termination system of the PV system and the one of the operation building, have to be connected to each other via at least one conductor.

The interconnection of the individual earth-termination systems reduces considerably the total earthing resistance; whilst the intermeshing of the earth-termination system creates an equipotential surface that considerably reduces the voltage load of lightning effects on the electric connecting cables between the PV array and operation building.

Lightning equipotential bonding

In principle, all conductive systems entering the operation building from outside have to be generally included into the lightning equipotential bonding.

The requirements of lightning equipotential bonding are fulfilled by the direct connection of all metal systems and by the indirect connection of all live systems via lightning current arresters. Lightning equipotential bonding should be performed preferably near the entrance of the structure in order to prevent partial lightning currents from penetrating the building.

Surge protection measures in the PV array

In order to reduce the load on the isolation inside the solar modules at a lightning strike into the isolated air-termination system, thermally monitored surge protective devices are installed in a generator junction box as loosely as possible to the PV generator.

On the dc side, a surge protective device is installed in each generator junction box. The surge protective devices in the generator junction boxes assume the protection for the PV modules locally and ensure that no spark overs caused by conducted or field-related interferences come up at the PV modules.

Surge protection measures for IT systems

The operation building provides a remote diagnostics system, which is used for the quick and easy function check of the PV systems, permitting the operator to recognise and remedy any malfunctions at an early stage.

The remote supervisory control system provides the performance data of the PV generator constantly in order to optimise the output of the PV system. Measurements of wind velocity, module temperature and ambient temperature are performed via external sensors at the PV system and can be read directly from the acquisition unit. The data acquisition unit provides an Ethernet interface, which a PC or modems are connected to for remote enquiry and maintenance. Thus, the service engineers can determine the cause of a malfunction by tele-diagnosis and then directly eliminate it.

Conclusion

In order to provide a reliable trouble-free and continuous transmission of the measured data to the measuring unit, it is necessary to lead the sensor cables entering the building via surge protective devices. When choosing the protective devices, it has to be ensured that the measurements cannot be impaired.

Safety in the forwarding of the measured data via the telecommunication network per ISDN modem must be given as well in order to provide a continuous monitoring and optimisation of the performance of the installation.

- PV systems are being deployed rapidly in South Africa.
- PV systems require lightning protection.
- Comprehensive solutions are required for the protection of PV systems.

Take note

Alexis Barwise is the managing director of DEHN PROTECTION SOUTH AFRICA (a subsidiary of DEHN + SÖHNE GmbH + Co.KG). Prior to spearheading this new operation in Johannesburg, he filled the role as key vertical account manager at Schneider Electric. Barwise has an in-depth knowledge of electrical design and systems engineering and project management in the engineering, procurement, construction and information technology fields. He holds a Bachelors Degree in Electrical and Electronic Engineering from the North-West University. Enquiries: Email alexis.barwise@dehn-africa.com.

About the author

New standard set in motor control and power switching

The introduction of the new AF range of contactors completes the **ABB** portfolio of motor protection and control, which includes thermal and electronic overload relays and manual motor starters. By combining ac and dc with surge suppression in a single contactor and additionally controlling the coil electronically, ABB brings a product to the marketplace which offers multiple benefits over the conventional alternatives.

Meeting the requirements of all major national and international standards, ABB contactors provide unquestioned quality and an extensive range.These motor control contactors cover applications from 9 A to 1050 A, in all popularly installed sizes. Furthermore ABB's AF range enables a single contactor coil to handle 100 V – 250 V for both ac and dc applications. Flexibility of this nature enables these contactors to be included in designs destined not only for South Africa, but throughout Africa, Asia, Europe and North America. Coil energy consumption is reduced by 80%, which allows for the building of smaller panels and the use of more compact transformer designs. Design and assembly planning to take advantage of these improvements is assisted by easy access to ABB CAD drawings and coordination tables.

Advantages of the AF range are not restricted to the technical innovation; logistics aspects have also been considered. With only four contactor coil sizes across the entire range the number of product variants has been reduced by 90%, with a direct saving in administration and stock holding requirements. In environments where voltage fluctuations occur, motor stoppages are commonplace. AF range contactors ensure continued operation in unstable networks; voltage sags, dips and surges can be absorbed, keeping plants operational.

Enquiries: Sarel Erasmus. Tel. 010 202 5000 or email LP@za.abb.com.

New range of power circuit breakers

Schneider Electric, has introduced the South African version of the EasyPact MVS range of low-voltage power circuit breakers and switch disconnectors for applications from 800 to 4 000 A. As part of the EasyPact family of protection and control products, the EasyPact MVS range delivers a high current withstand rating (Icw) and a level of functionality unusual in its price range. "Precision engineered to meet up to 90% of common protection applications in medium and large-sized commercial and industrial buildings, EasyPact MVS circuit breakers are designed to provide superior value throughout their lifecycle and to make installations safer and more reliable," says Levy Moholola, low-voltage product manager at Schneider Electric South Africa. The EasyPact MVS range has been designed for reliability and extended service life, with the flexibility to meet a wide range of common applications. Suitable for systems up to 690 V, the entire range is rated for Ics = Icu = Icw = 50 and 65 kA, at 440 V for 1 s. A selection of electronic trip units enhance protection, while a fast 25 ms break time helps further reduce the stress on electrical networks. Locking safety shutters and various key lock and padlock options ensure safety for installers and technicians. A number of cost-saving features include copper and aluminium conductor compatibility and convenient horizontal or vertical terminal orientation.

Enquiries: Belinda Aslett. Tel. 011 254 6400 or email belinda.aslett@schneider-electric.com.

Programming and display unit for relays

NewElec's MA RDU 216 is a panel-mounted keypad entry display unit that can be used as a handheld programming and display unit for the company's MA range of motor protection relays. The MA RDU 216 permits the user to set all protection parameters and monitor the actual values while the motor is in operation. It also allows the user to view the fault alarms and real time clock logged faults.

A dongel connected in line with the serial communication cable is required in order to alter any settings, eliminating unauthorised alterations. If the dongel is not available, read only functions are tolerated by the device. All functions are accessible via a membrane keypad, while the 2 x 16 backlit LCD display is used to indicate the menu-driven requested values. It is also used to prompt the operator as to which key to press in the event of a multiple keystroke sequence.

The MA RDU 216 accommodates up to eight memory slots that are useful for storing information, even when the auxiliary power supply is removed, to allow the setting parameters to be downloaded to the appropriate MA motor protection relay. This benefits maintenance personnel who no longer require to use excessive time to set the relays up on site.

Enquiries: Luc Dutrieux. Tel. 012 327 1729 or email sales@newelec.co.za.

Insulated tools and equipment

HAUPA's 1 000 V insulated tools are manufactured and tested in accordance with the latest conditions set out in national and international standards. If the additional safety measures are observed, they offer the greatest possible protection when working with voltages of up to 1 000 Vac and 1 500 Vdc.

HAUPA's protective equipment includes 1 000 V insulated helmets and visors, insulated gloves from 500 V to 26 500 V, tested safety suits in accordance with DIN IEC 304 (500 V), 1 000 V insulated boots in accordance with VDE 0680/1 through to insulated mats in accordance with VDE 0303 = 20 000 V.

The HAUPA safety handle with sleeve should be used where the insertion and removal of NH safety inserts with disrupted arcs could be expected or when higher currents are to be switched. In these instances, the HAUPA visor with helmet holder or the electrician's protective visor should also be worn. The dip-insulated 1 000 V tools have an insulated multiple layer, red on the outside, yellow on the inside. The two-colour multiple-layer insulation clearly supports the relevant VBG 4 directive. The red exterior insulation on the handle makes defects easy to spot. HAUPA is represented locally by **Surgetek**.

Enquiries: Johan van Staden. Tel. 011 792 1303/4/5 or email info@surgetek.co.za.

Power factor correction and harmonic filtering

Power electronic devices that have rapid and frequent load variations have become abundant today due to their many process control related and energy saving benefits. They also bring a few major drawbacks to electrical distribution systems, such as harmonics and rapid change of reactive power requirements. Harmonics may disrupt the normal operation of other devices and increase operating costs. Symptoms of problematic harmonic levels include overheating of transformers, motors and cables, thermal tripping of protective devices, logic faults of digital devices and drives. Harmonics can also cause vibrations and noise in electrical machines - motors, transformers, and reactors. The lifespan of many devices can be reduced by elevated operating temperature. Plus, rapid reactive power changes demand timely reactive power (VAR) compensation.

An active harmonic filter (AHF) provides an effective means to mitigate harmonics, reduce process-related voltage fluctuations and improve equipment operating life and system capacity. It can be part of a power factor correction and harmonic filtering system.

Low voltage capacitor compensation systems can provide the similar benefit of a centralised solution at an attractive cost for most mid- and small industrial, commercial and institutional users.

Global specialist in energy efficiency, Schneider Electric provides a comprehensive power quality solutions portfolio, namely ReactiVar and AccuSine, to help companies improve their energy efficiency.

ReactiVar, a power factor correction fixed capacitor (PFCD), is ideally suited for power factor correction in applications where the load does not change or where the capacitor is switched with the load, such as the load side of a motor starter. Assemblies are available unfused or fused with three fuses and three blown-fuse indicators.

AccuSine PCS active harmonic filter (AHF) injects harmonic and reactive current to limit harmonic distortion and improve displacement power factor for the electrical distribution system. As a full spectrum product, AccuSine PCS measures the entire load current, removes the fundamental frequency component and injects the inverse of the remaining wave form for nearly complete cancellation of harmonic current.

Enquiries: Belinda Aslett. Tel. 011 254 6400 or email belinda.aslett@schneider-electric.com.

Phase angle meters – easy to use

Megger's PAM400 phase angle meters are compact, lightweight, fast and easy to use. They offer a convenient and cost-effective solution for a wide range of applications, including checking polyphase metering installations, testing protective relays, making comparative tests in electrical substations, and verifying phase angle deviation on power transformers.

The PAM400 range includes two models. The PAM410 provides facilities for accurately and quickly measuring the phase angle between two voltages, two currents or between one current and one voltage. Voltages up to 500 V and currents up to 25 A can be connected directly to the instrument, and the current range can be readily extended by using external current transformers. The instrument displays phase angle directly, with a resolution of 0,1° with no need for calculation or interpolation.

The second instrument in the range, the PAM420, provides phase angle measuring functionality identical to that of the PAM410, but adds facilities for two-channel voltage, current and frequency measurement. It also has a high-accuracy timing function that can be triggered by voltage signals or volt-free contacts, and can measure times up to 999,999 s with a resolution of 1 ms. The PAM420 has a built-in rechargeable battery, allowing it to be used in almost any location.

Supplied complete with a carrying case, test lead set and, in the case of the PAM420, a mains-operated battery charger, Megger's new compact phase angle meters feature robust construction to ensure long life even in tough operating conditions. They have a CAT III 500 V/CAT IV 300 V safety rating, except for the timer inputs on the PAM420, which are rated CAT II 250 V. Both models can be calibrated locally – full instructions are given in the user manual – which eliminates the inconvenience and cost of having to send them to a specialist calibration facility. Megger is represented locally by **Surgetek**.

Enquiries: Stuart Ashton. Tel. 011 792 1303/4/5 or email info@surgetek.co.za.

Motor protection for three-phase LV motors

NewElec's KE / KD range of motor protection relays are designed to protect low voltage 3-phase motors with an accent on pumps. The relays self-record every setting alteration, every event (2 000 off in a rotating buffer) and the last 60 faults. The current value at the time of the fault occurring, the minimum voltage present at the time, the circuit interruption time, as well as date and time of occurrence are also recorded. KE/ KD relays will also record the running hours of the motor, the number of starts and trips, apparent and real power usage and thermal utilisation of the motor for the last 10 start sequences. Protection features are embedded into the relay, and the free accompanying software permits selective activation of each protection attribute so that the user may choose what is appropriate for the application. The relays require no additional current transformers right up to 50 A but are available for use up to 400 A with the use of separately installed interposing current transformers.

Enquiries: Contact: Luc Dutrieux. Tel. 012 327 1729 or email sales@newelec.co.za.

Process calibration tools for pressure

By G van Rooy, Comtest

Process Calibration Tools (PCT) is a family of tools that enables users to calibrate temperature, pressure, flow and electrical sensors, transmitters and gauges in-situ and in I&C and I&E shops.

A complete pressure calibration system includes components to generate, control and measure pressure (and normally to log data from some or all of these functions). Some systems include two or all of these functions in a single unit. A procedure to adjust the unit is also usually required.

Pressure monitors and references are digital readouts or gauges that convert the pressure into numerical pressure units.

Pressure sources generate either pneumatic (gas) or hydraulic (oil, water or alcohol typically) pressure. For PCT field applications, a hand-pump or comparison test pump can be used, in conjunction with a reference calibrator; these normally provide sufficient control for field applications. On the bench, for higher pressures and where a greater degree of control or automation is required, a gas bottle or shop air can be used with a controller.

Deadweight testers and the related electronic deadweight tester are portable systems that provide all three functions - generation, control and measurement - in a single unit, and are suitable for both field and bench use.

Figures 1 and 1a: A pressure calibration system needs to accurately measure pressure and may also need to measure pressure transmitters.

Applications

Analogue and digital pressure gauges are often used to monitor pressures in processes. Gauges have an internal mechanical or electro-mechanical mechanism to convert input pressure to a reading.

Sensors and transmitters comprise both a sensor assembly, to detect and measure the pressure, and a transmitter, which converts the pressure into an electrical signal, typically a 4 - 20 milliamp signal, that can be transmitted to a control panel, PLC or other readout. In this case, there are two items to be calibrated.

The first and most important step is to calibrate the pressure-to-resistance (or pressure-to-voltage) relationship of the sensor, and the second step is to calibrate and verify the linearity and offset of the conversion of electrical signal from the sensor into a 4 - 20 milliamp signal. Calibrating the sensor requires a pressure source such as a handheld pump and a reference calibrator such as a Fluke 700G if the sensor can be removed from the circuit or a reference calibrator placed in circuit adjacent to the sensor. Calibrating the transmitter requires a multi-function calibrator or documenting process calibrator.

If the sensor or transmitter is found to be out of tolerance, the span and offset have to be adjusted on the transmitter. If the transmitter uses a digital communication protocol the span and offset is adjusted through a digital communicator or with a documenting process calibrator capable of digital communication. Otherwise, trim pots on the transmitter are used to adjust the span and offset.

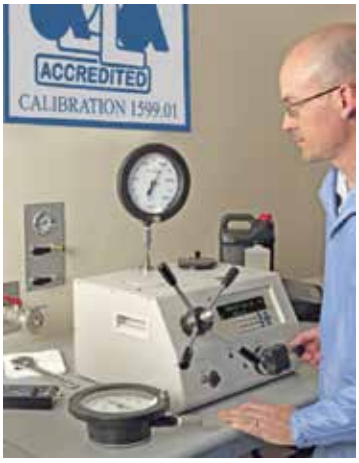


Figure 2: Electronic deadweight tester.

DUT – Device Under Test
PCT – Process Calibration Tool
PLC – Programmable Logic Controller
TAR – Test Accuracy Ratio
TUR – Test Uncertainty Ratio

Abbreviations

- Process calibration tools enable calibration of industrial instruments.
- No instrument can be used without being calibrated – and maintained.
- Properly calibrated equipment can save money.

Take note

Why calibrate?

The need to achieve consistent results is one of the most important reasons why we calibrate. Accuracy is an important feature of a calibrator. You may need a particular level of accuracy to comply with standards that specify a test accuracy ratio (TAR) or test uncertainty ration (TUR). For example, many standards require a 4:1 ratio between the specified tolerance of the device under test (DUT) and the accuracy or uncertainty of the calibration equipment.

Figure 3: Deadweight testers generate and control pressure in a calibration system.

Figure 4: Analogue pressure gauge.

Figure 5: Digital pressure gauge.

Conclusion

Accuracy is also important because when accurate standards are used most of the time, downtime only needs to be long enough to verify that the instruments are still in tolerance. However, with inaccurate calibration standards, more borderline and out-of-tolerance indications are found. This means that a routine verification turns into an additional adjustment procedure and a final verification at each of the test points to prove the 'as left' condition is in tolerance. This more than doubles the downtime and the technician time involved in completing the calibration. This is because inaccurate standards tend to not be consistent with each other causing us to make more adjustments to correct phantom errors.

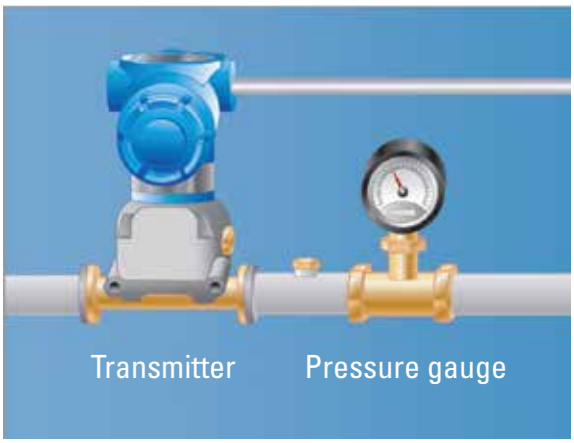


Figure 6: Pressure transmitters convert signals from pressure sensors

Gavin van Rooy has sold Fluke products for the past 18 years and has been with Comtest for the last 10 years. Aside from looking after the local Fluke dealers, he has travelled extensively in Africa, assisting new Fluke dealers with set-up and on-site training. For the last two years, Gavin was assigned to the Western Cape region, offering support to the local agent and dealers. Always involved in the full Fluke portfolio of electrical/ process/ thermal/ power quality/ scopemeters, on his return to Gauteng he was given the opportunity to focus on the Fluke Process Tool range of instruments. Enquiries: Tel. 011 608 8520 or email gvanrooy@comtest.co.za

About the author

Most efficient way to measure compressed air

For efficient machine and plant processes, compressed air must be analysed and monitored as thoroughly as possible while being optimally integrated into the control system. A compact all-in-one solution for this is the EP3744 EtherCAT Box. The IP 67 rated module combines compressed air measurement, EtherCAT connectivity and digital I/Os for use directly in the process, outside of electrical cabinets. In addition to six digital inputs and two digital outputs, the EP3744 EtherCAT Box has four pressure inputs with integrated 6 mm fittings. The pressure is measured as the difference to the fifth pressure connection, which is fed via a hose into a protective housing for IP 67 conformity. The measured data is provided in the form of 16-bit values which are transmitted in an electrically isolated manner to the controller. The measuring range is 0 to 1 bar (15 psi), with a resolution of 1 mbar per digit.

This all adds up to a compact stand-alone device for the direct measurement and monitoring of pressure in the field. On the one hand, long routes or hose connections from the process to the control cabinet are eliminated. On the other, the frequently stipulated isolation of electrical and pneumatic systems is incredibly simple to achieve. Further advantages of this system- integrated solution are the short reaction times - due to local measurement using only one A/D converter - as well as the EtherCAT connection and additional digital I/Os, integration into the control system is particularly efficient.

In addition to control or regulation, analysis and diagnostics are indispensable wherever pneumatic systems are used. For example, the operating pressure can be monitored using the EP3744 EtherCAT Box and an altogether better transparency of the machine is achieved.

Enquiries: Email K.MCPherson@beckhoff.com.

Trimming the inventory

Endress+Hauser's standardised instrument platform for pressure measurement not only helps save costs in production but also in the warehouse. Measurement instruments fitted by plant builders on skids and other pieces of process equipment can often overly complicate the field instrument installed base and spare parts supply system. As a result, inventory warehouses contain far too many instruments from too many suppliers. This offers the procurement manager considerable cost-cutting potential, as it costs money to maintain material master data for every storage point and every instrument in storage. The following pressure measuring instrument example clearly illustrates how inventories can be significantly slimmed down by adopting the standardised instrument platform from Endress+Hauser.

Regardless of the measurement parameter, every company is looking to standardise its instruments and keep the number of different types and models to a minimum. To ensure that at least the 'mechanics' fit, it makes sense to define a factory standard that specifies uniform process connections, lengths and communication protocols.

Standardised spare parts, such as electronic inserts and display units, make for short repair times. The electronic insert is always the same, regardless of whether you are measuring pressure (Cerabar), hydrostatics (Deltapilot) or differential pressure (Delta bar) or if you are working in an Ex or SIL application. Therefore all you need are just a few spare electronic units.

Enquiries: Natlee Chetty. Tel. 011 262 8000 or email info@za.endress.com.

Digital valve controller with stainless steel housing

Emerson Process Management's Fisher Fieldvue DVC6200 digital valve controller family gains added capability with its all stainless steel housing that withstands the corrosive atmospheres often experienced in chemical plants, pulp and paper mills, as well as near-shore and offshore oil and gas installations.

All DVC6200 series instruments utilise a patented linkageless, non-contact feedback design to detect valve position. This valve positioning technology eliminates any travel feedback issues caused by corrosion, high cycle or high vibration applications.

In addition to external protection, corrosion resistance is found within the stainless steel housing with the digital controller's fully encapsulated printed wiring boards. Internal component protection is further enhanced by a separate, weather-tight field wiring terminal box that isolates the field wiring connection from other areas of the instrument.

With over one million units installed worldwide, Fieldvue digital valve controllers prove highly suited to difficult process environments, where they provide unmatched valve operation.

The DVC6200 series is offered with CSA, IECEx, ATEX and FM hazardous area approvals as well as other certifications/approvals. It is also listed in the Lloyd's Register for industrial, marine and offshore use.

Enquiries: Email Danielle.Aychouh@emerson.com or mark.tapson@emerson.com.

Efficient, consistent pressure sensors

IO-Link is a simple, point-to-point, communication protocol between an IO-Link enabled device, typically a sensor or actuator, and an IO-Link master. This technology has now been implemented in **ifm electronic**'s PN7 series pressure sensors. If the IO-Link functionality is not used, then the sensor operates as a pressure switch with two switching outputs. Values above or below the ideal system pressure are reliably prevented resulting in increased machine uptime and consistent operation.

The PN7 pressure sensor offers a choice of switchpoints or analogue values and parameter setting, diagnosis and transmission of process values via IO-Link. The sensor features high switchpoint accuracy and switching frequency. Its overload-resistant ceramic measuring cell is designed for more than 100-million switching operations. Different versions are available with pressure ranges between -1 and 600 bar.

When connected to an IO-Link master the sensors can benefit from additional features. For example, IO-Link allows the process measurement data, parameters and diagnostic information to be transmitted via the standard connection cable. This information is then made available to the host PLC allowing, for example, the transmission of the pressure as a digital value, rather than going through a digital to analogue conversion for transmission and then the opposite conversion on reaching the PLC. This allows a more accurate value, free from conversion errors, on which to base plant control decisions. Additionally, IO-Link masters to specification 1.1 store the setup parameters of the connected sensor. If ever a replica sensor is installed (eg due to mechanical damage of the original), the IO-Link master recognises it is a 'blank' replacement and automatically copies the stored setup into the newly connected sensor. The need for complex re-parameterisation is eliminated.

Enquiries: Chris Cronjé. Tel. 012 450 0370 or email chris.cronje@ifm.com.

Preventing storage tank overfill

Storage tanks in the oil and gas industry are used for environmentally damaging liquids which could cause serious incidents including personnel injuries, if not properly monitored. A simple faulty fuel gauge can fail to alert operators that fuel storage is being filled to an alarming high level, causing large quantities of petrol to overflow. As a consequence, vapor clouds are formed leading to explosions and fire that can last for days. Overfill prevention systems are a must for obvious reasons but they can be costly, tedious to implement and difficult to maintain if custom-built. Endress+Hauser's pre-configured solution package reduces project costs by up to 20% and lowers implementation risk as it is based on a standard approach with repeatable designs that have been tested and documented.

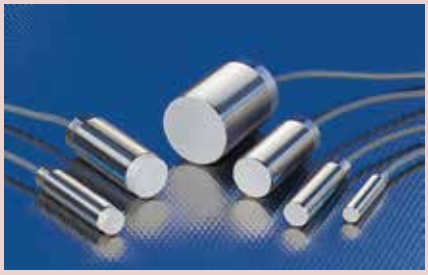
The system was developed with **Rockwell Automation** and resulted in a complete and integrated solution able to address the entire safety loop, from measuring and monitoring to correcting elements. Devices are pre-integrated which means there is only a need for on-site parameterising, but the whole solution itself is modular and can be easily extended. **Endress+Hauser** delivers market standard compliance and ensures:

- Scalability to your needs
- Suitability for manual and automated operated facilities
- Up to SIL 3
- Display of detailed warning and alarm messages on both text display and operating panel
- Possibility of FailSafe high warnings and high high alarms
- Integrated automated proof-test procedure (patent pending)
- Automatic recording of all events for better transparency and traceability
- UPS for 30 minutes operation
- Free tank selection by the user to simplify alarm assignment

Enquiries: Ivan De Waal. Tel. 011 262 8000 or email info@za.endress.com.

Inductive sensors for extremely high ambient temperatures

The new high-temperature IF6074 range of inductive sensors from **ifm electronic** is designed for the steel and glass industries.



They are also suited for other hot environments and applications, such as industrial furnaces, burners and incinerators.

Standard sensors are not suited for temperatures above 100°C as electronic components and tin solder would be damaged. Thanks to the special mechanical construction and the use of select materials and electronic components, the ifm sensors are perfectly suited for temperatures up to 180°C. With a compact and sturdy design, the new series offers maximum long-term stability and reliability even under the most challenging operating conditions.

The sensors have a compact design since sensor and evaluation electronics are housed in one unit and they provide greater flexibility thanks to their M12, M18, M30 and M50 stainless steel housings. In addition, their 5 m silicone cable allows terminals to be outside the critical area.

Enquiries: Chris Cronjé. Tel. 012 450 0370 or email chris.cronje@ifm.com.

Mass flowmeter for bulk materials

The MF 3000 is developed for online mass flow measurement in metallic pipes from a few kg/h to many t/h. The system is suitable for on-line measurements of powders, dust, pellets, and granular from 1 nm up to more than 2 cm in pneumatic or free fall applications. Mass flow of a few kg/h up to many t/h can be measured accurately.

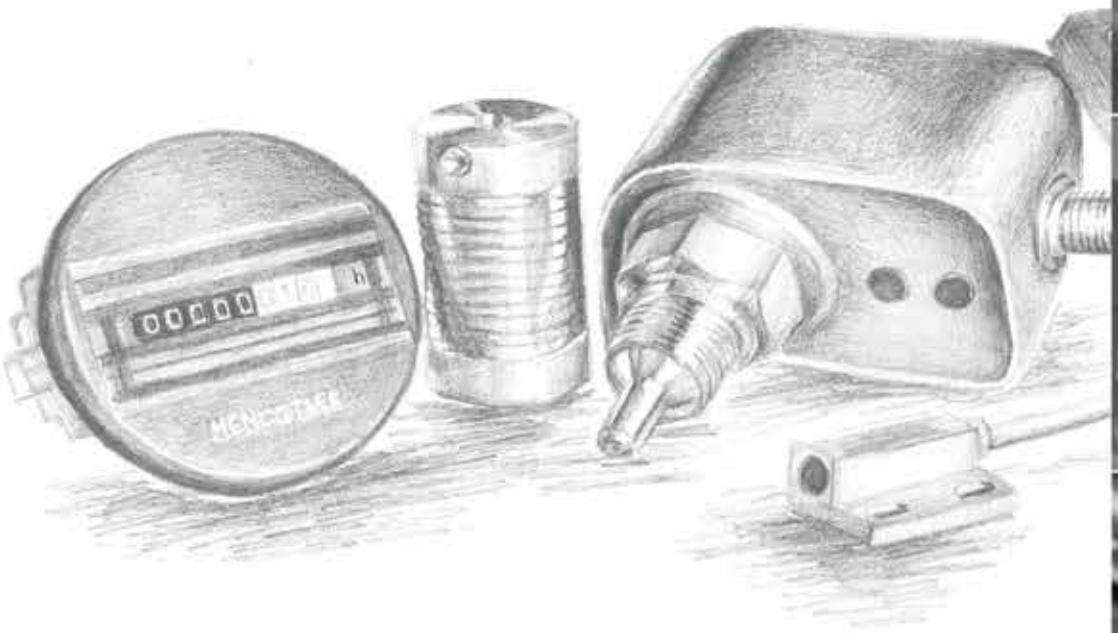
The measurement principle of the MF 3000 is based on the physical Doppler-Effect. The sensor generates a uniform microwave inside the pipe. These microwaves are being reflected by particles passing through the pipe and the reflected waves are picked up by the sensor. Calculation of frequency and amplitude changes allows for accurate determination of solid flow. Non-moving particles like dust accumulation are excluded from calculations. The measurement is very fast and therefore also sudden fluctuations in mass flow are detected. The installation is simple and cost effective via a weld-in socket, i.e. a robust stainless steel version, through which the sensor is screwed flush with the inside of the pipe, which enables contactless measuring. There are no armatures protruding into the pipe and the device is abrasion and maintenance free. The sensitivity adjustment makes it possible to measure with the MF3000 in very small or very large pipe diameters. The sensor is connected to a galvanic separated DIN-rail mounted transmitter with limit alarm monitoring including alarm contact. Measurement values can be output either as analogue 4...20 mA or digital RS 232 and RS485 signal for connection to a process control system. The distance between sensor and transmitter can be up to 2 000 m.

Start up and Calibration is simple, quick and cost effective by using a notebook with the MF–SMART software. For the calibration process either one or multiple reference flow amounts are required. Twenty-four different products can be calibrated and stored in the system. An ATEX-version for Ex-applications is available for zones 20 and 2.

In addition to the MF3000 Mütec Instruments offers a wide range of sensors for flow monitoring and moisture measurement for solids.

Mecosa is the sole agent for Mütec Instruments GmbH in South Africa.

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



Technical innovation is what drives best practice.

And this is exactly what you will get with a sensor solution from **Countapulse Controls**.

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Transparency in compressed air networks

The number one choice for measuring compressed air and technical gases in the bulk solids processing industry is the **Endress+Hauser**'s t-mass 150 thermal mass flowmeter, specially designed for use in compressed air and supply networks.

Compressed air networks with leak rates of 30% and more are normal in many plants around the world. Quite startling, considering that energy conservation and reduction is top of nearly every company's agenda. For this reason, more and more attention is being focused on compressed air and supply networks. A detailed insight into a system is needed to locate and minimise leaks in the network. By using several low-cost measuring systems in one line instead of one more accurate and more expensive main measurement, users can get a far clearer picture of their compressed air network. Endress+Hauser has the instruments to make this possible.

While small leaks in the overall gas flow go unnoticed when a primary-measurement system is used, measurements on a line reliably indicate an increase in the measured value. Experience shows that 3 - 6 line measurements are typically required for one primary measurement. Here, reproducibility is often more important than absolute accuracy in order to achieve long-term savings in the extensive distribution networks. In addition to minimum pressure loss, reliable operation is also a decisive factor for successful instrument deployment. This is because the measuring point, once commissioned, can often only be accessed with a great deal of effort.

The device is supplied as a completely preconfigured device in line with the client's requirements. The t-mass comes with an integrated 'gas engine'. At the device, users can directly select air, argon, nitrogen or CO, as the gas. By using the 'gas engine' no recalibration onsite is required.

Enquiries: Frans van den Berg. Tel. 011 262 8000 or info@za.endress.com.

Level control in the wood chip silo for cellulose production

Monitoring and control of levels are part of all production industries, whether the product being monitored is a liquid or a solid. The pulp industry is no exception and is one of the many industries to which

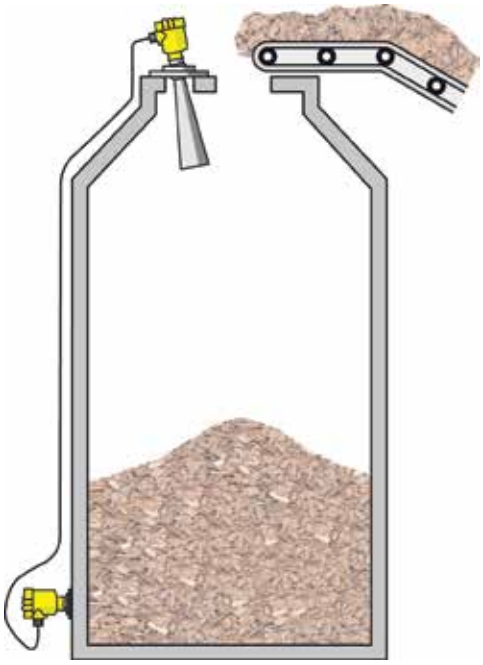
VEGA, a leading manufacturer of level instrumentation, supplies precise and innovative measuring sensors.

Wood chips are the raw material for producing cellulose and mechanical pulp. Made from debarked logs, they are shredded on chippers or bought in as sawmill waste. The chips are fed via conveyor belts into silos up to 25 m high. After that they are sorted by size and quality and transported to the pulp digester or the TMP (Thermo Mechanical Pulp) system. The wood chip silos are filled and emptied in batch quantities, which create material cones, large amounts of dust and bridges that can collapse during emptying.

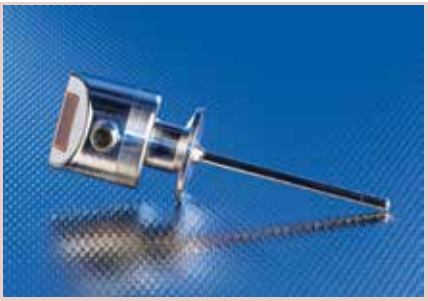
The optimal solution for level measurement is the radar sensor VEGAPULS 68, designed for continuous measurement of bulk solids under difficult process conditions. Compared with conventional radar sensors, the instrument has a considerably higher signal sensitivity, which ensures that the measurement works reliably even during filling. The sensor is not in contact with the product and its function is independent of the dust and noise which are generated during the filling process. This continuous monitoring also means dependable logistics planning is possible.

Further applications for VEGAPULS 68 are in the bark silos as well as the blowing tank following the pulp digester. The sensor is a cost-effective and reliable measuring instrument which is easy to install and wear and maintenance-free.

Enquiries: VEGA Instruments SA. Tel. 011 795 3249 or email info.za@vega.com.



Temperature transmitter with display and IO-link



The new TD temperature transmitter from **ifm electronic** is the first transmitter with display and IO-Link for food applications. With its bright, 4-digit LED display for optimum readability, the transmitter has a fast response time of T05/09 = 1 / 3 s and is available in various probe lengths from 30 to150 mm.

The integrated clamp and G1/2" process adapters allow quick and easy installation. No complex set-up is required as the transmitters are supplied with a pre-scaled measuring range. For special applications the temperature range can be conveniently scaled via IO-Link 1.1.TD temperature transmitters are characterised by a compact and hygienic design with integrated adapters as well as a display for local temperature indication. Protected to IP 69K standards and featuring a fully welded high-grade stainless steel housing, the transmitters are designed to operate in particularly harsh applications.

Enquiries: Chris Cronjé. Tel. 012 450 0370 or email chris.cronje@ifm.com.

Increased combustion performance

M&W's ACFM-2200 is a fully automatic coal flow monitor, which collects pulverised coal samples from pneumatic transport pipes between mills and burners. It provides increased combustion performance and fuel savings. The measured results are transmitted to the control room for evaluation and control of the coal flow. The sampling operation is carried out according to the international ISO 9931standard. Typical applications include routine flow measurements, adjustment of fuel distribution, sampling of coal, monitoring of pulverising distribution settings in connection with low-NO_x burners and test firing of new coal types. The sampling unit consists of a motorised rotating sampler arm with four coal extraction nozzles. The measuring unit separates the coal particles from the extracted gas stream and collects them in a measuring tube where the volume is measured by a fibre optics measuring device. The control unit supervises the function of all components and converts the measuring signals for display on the operator's panel (facilities for remote indication is available). The control unit can operate up to eight sampling and measuring units according to requirement. M&W Asketeknik is represented locally by **OEN Enterprises**.

Enquiries: Mike Andrews. Tel. 011 675 4447 or email mike@oenenterprises.co.za.

IO-link sensor for position and level detection

The new capacitive KQ sensor from **ifm electronic** allows easy parameter setting via IO-Link before installation. The sensors are ideal for position and level detection and the IO-Link allows versatile data processing. The sensor features a clearly visible display of the switching status with a freely selectable NO/NC function. Mounting adapters as well as cable ties guarantee easy and fast installation.

Capacitive sensors detect bulk materials or liquids through non-metallic vessel walls. Typical applications for the detection of these products can be found in the semiconductor, paper and wood industries.

The parameters can either be set via the buttons on the sensor or via the IO-Link interface. This can be done using a USB interface or a memory plug. A standard M12 cable transmits process data, parameters and diagnostic information to a connected IO-Link master. When IO-Link is not in use, the sensor works with one switching output.

ifm's existing capacitive sensor range was enhanced with the IO-Linkfeature, and data as well as the order numbers remain the same.

Enquiries: Chris Cronjé. Tel. 012 450 0370 or email chris.cronje@ifm.com.

Modular sweep angle control valves

Sweep Angle Control valves from **PSV Mitech** are ideally configured for service with highly erosive liquids where pressures and/or temperatures are too high for pinch valves or similar slurry valves. They are also ideal for applications where severe flashing is expected. Modular in design, the valves are available in sizes from 1"to 16" and larger sizes are available on request. The Sweep Angle Control valve has flange ratings of up to #2500. The plug and seat can be manufactured in hard material, up to and including tungsten carbide or other ceramics, and the body can be bronzed or coated with high velocity spray coated tungsten carbide in critical areas. The Sweep Angle control valve has a flow-to-close configuration with few components in the flow path eliminating any sharp changes in direction. The seat ring is clamped between the valve body and the downstream pipe work, so there is no need for a traditional retainer or cage.

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

Enquiries: Greg Walker. Tel. 011 657 6000 or email sales@mitech.co.za.

Reliable dust measurement

SWR Engineering's ProSens dust monitor operates on the 'triboelectric' principle. If the dust to be measured is constant, then the generated measuring signal is proportional to the dust concentration, even if there are dust deposits on the measuring probe. This measuring method provides accurate results with little maintenance.

The measuring device provides measurement values for dust concentration, either as a trend signal or as absolute values for emission measurement. ProSens is used when the dust concentration is to be output as an absolute value in mg/m3, or for exact measurements even with large channel diameters, as well as for applications in hazardous explosion zones (GasEx-Zone 1, DustEx-Zone 20). The instrument is ideally suited for the measurement of dust concentration even at high temperatures. The measuring system consists of a welded casing to serve as a sensor receptacle, a PMS sensor and the PME 100 transmitter. The unit can be supplied in a field housing with touch panel display or as a DIN-Rail version. In the case of a DIN-Rail version, software for parameter setting is supplied. SWR is represented locally by **OEN Enterprises**.

Enquiries: Mike Andrews. Tel. 011 675 4447 or emailmike@oenenterprises.co.za.

Pressure reduction and noise control in process plant

Steam is normally produced in industrial boilers at high pressures and temperatures, since in this superheated condition it carries more energy and results in more efficient production of power in the turbine. This high pressure also allows the steam to be transported around the plant in smaller lines with less heat loss. For use in a process plant, both the pressure and the temperature have to be reduced. A letdown station solves this problem. It comprises a pressure reducing valve and the temperature reducing apparatus. The solution is to use a valve with a special trim that is engineered to solve the complex requirement of both pressure reduction and noise control. A **PSV Mitech** energy dissipating disk stack that fits into the company's range of standard Globe valves is one of the best methods to achieve this. The pressure is dropped across many stages. The disk stack combines the concept of many restrictions in series (along each passageway) with multiple paths in parallel (several passageways in each disk and many disks in a stack). This enables the valve to handle low flow rates as well as the maximum flows. One or more diffuser plates may be installed downstream of the valve to create back-pressure to enable a smaller valve to be used. Reducing the pressure of the superheated steam does very little to reduce the temperature. To reduce the temperature of the steam a desuperheater is utilised to add water to the superheated steam. To vaporise the water a large amount of energy is required to overcome the latent heat. The high temperature steam provides this. The result is an increased flow of steam at a reduced temperature. By varying the amount of water added, the temperature can be controlled.

Enquiries: Greg Walker. Tel. 011 657 6000 or email sales@mitech.co.za.

Detect limit level of dry bulk solids

SWR's Pro Gap microwave barrier is designed to detect the limit level of all types of dry bulk solids or to position objects. Pro Gap assures simple and uncomplicated retrofitting and reliable fill and limit level detection. With its process adapter, up to 220°C and 20 bar pressure can be realised, and with ceramic mounting, temperatures up to 1 100°C is possible.

The microwave barrier uses a contactless measuring procedure. It can be installed in containers, pipelines, shafts or free-fall sections. The range, depending on the model, is either 0 - 4 m or 0 - 18 m, and if required, larger ranges can be supplied.

During the detection process when container walls, housings or pipelines are not metal, it is possible to measure the object from the outside. This makes it possible to completely uncouple the measurement from the process through suitable windows made of non-metallic materials. This is especially interesting in the use of aggressive, abrasive or coarse materials or in cases of extreme pressures and temperatures. The use of microwaves also ensures a high level of insensitivity to any caking on the sensor window.

Pro Gap is compact in design and no separate electronics are required. The Pro Gap S model can also be applied in Ex-zones by means of a process-adapter.

Enquiries: Mike Andrews. Tel. 011 675 4447 or email mike@oenenterprises.co.za.

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Looking Forward

VEGA

VSDs – power saving in cooling pump systems

By A Chalmers, Irri-Gator Products

If VSDs are applied correctly, substantial power savings can be realised. However, find the right person, suitably qualified, to undertake a thorough investigation of any pumping plant, before embarking on the capital outlay for this machinery.

Numerous production facilities around South Africa make use of conventional centrifugal end suction-type pumps to circulate water through their production cooling systems. Often these pumps are either running unnecessarily at full speed while the production plant is operating well under maximum production capacity or regulating valves are employed to throttle back the system's operating pressure in an oversized pumping system resulting in a huge wastage of power consumed.

By replacing conventional ac motor starter equipment with variable speed drives (VSDs) and a simple control system, it may well be possible to unlock substantial energy savings in the production plant's energy bill.

End suction centrifugal pumps deliver a fixed performance curve at a constant operating speed when fitted with a specific impeller diameter. An example of this is shown in a typical pump curve as illustrated in *Figure 1* where the pump is operating at a constant speed of 2 900 RPM (using a normal 2 pole motor at standard 50 Hz frequency) and fitted with a 259 mm impeller.

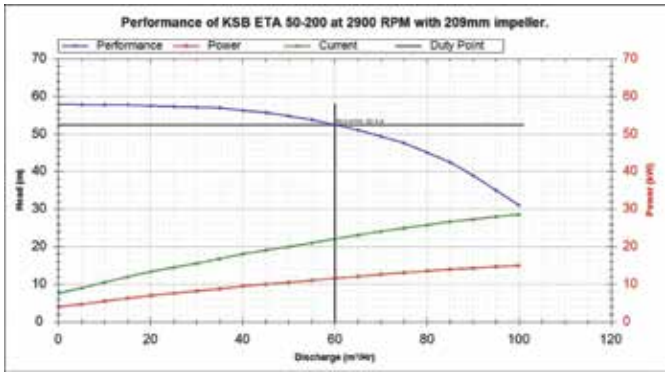
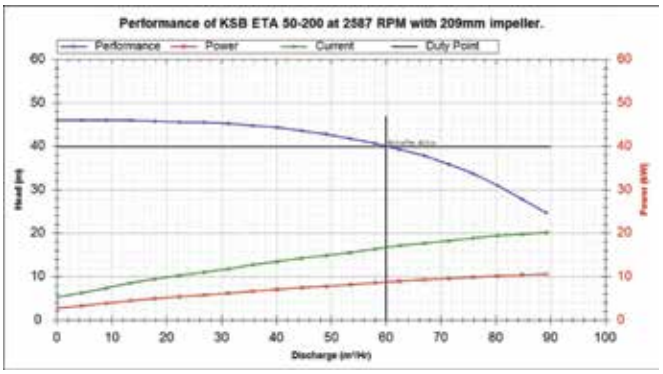
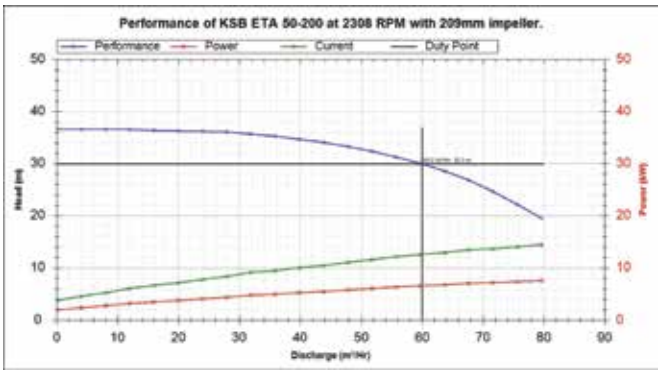


Figure 1

By altering the pump's motor speed it is possible to change this performance curve and thus meet the required system's operating pressure or flow. *Figures 2 and 3* show how the same pump's performance curve changes with a change in motor speed. The same flow is capable of being delivered at the reduced speed yet the system's operating pressure is reduced accordingly.





Figures 2 and 3

The important factor to note is that that the power consumed by the pump has reduced substantially with the reduction in motor speed as is evident in the red curves as shown in *Figures 2 and 3*. This principle of operation is known as the 'Affinity Law' is briefly described as follows:

Laws of Affinity with a constant impeller diameter:

* Change in flow rate proportional to change in impeller speed
* Change in head proportional to the square of change in impeller speed
* Change in kilowatt proportional to the cube of change in impeller speed

PID – Proportional-Integral-Derivative
RPM – Revolutions Per Minute
VSD – Variable Speed Drive

Abbreviations

By providing real time system pressure feedback to a VSD, you are able to make use of a PID (proportional-integral-derivative controller) control loop. This allows the pump's motors speed to be regulated based on the actual pressure in the system versus that which is required (reference point). In layman's terms what this means is that the more production machinery there is in operation, requiring higher system flow, the faster the electrical motor will run in order to meet the required preset system pressure (reference point). The opposite is also true that when production demand is lower and less machinery is operational, requiring less cooling water, the system will reduce speed to meet the required preset system pressure (reference point). By using the principle of having a preset system pressure, it is also now possible to fully open all regulating valves in the system that are being used to throttle back the high operating pressure experienced in the system when flow demand is lower. Power is now being used more efficiently by the cooling pumps and it is possible to unlock energy savings.

Case study

Let us look at a typical real life application in the cooling pumping plant of a plastic's conversion factory and understand the level of energy savings that are achievable. In our case study an existing Rapid Allweiler 65/250 pump equipped with a 214 mm impeller and coupled to a 30 kW 2 pole (2 900 RPM) motor was in operation. At best efficiency point (68,5%) this pump is capable of providing a flow rate of 110 m³/Hr to an operating pressure of 5,5 Bar. Currently the plant requires considerably less flow due to lower production output and as such the operating pressure increases to as much as 6,1 Bar. The additional pressure being generated by the pump is throttled back to 4,0 Bar using a regulating valve on the delivery side of the pump.

In order to provide realistic power calculations with which to carry out comparisons between full speed pumping versus VSD controlled pumping, five different flow rates were selected that could represent the changes in the plant's flow requirements as and when production machines were utilised. *Table 1* provides a summary of the comparisons and the potential power savings that can be unlocked by pumping with a VSD.

	Motor Speed (RPM)		Motor Frequency (Hz)		Operating Pressure (Bar)		Power Absorbed (kW)		
Flow Rate (m³/Hr)	Full Speed	VSD Speed	Full Speed	VSD Speed	Full Speed	VSD Speed	Full Speed	VSD Speed	Saving
40	2 900	2 355	50	40,6	6,1	4.0	13,2	7,7	5,5
60	2 900	2 361	50	40,7	6,1	4.0	16,1	9,6	6,5
80	2 900	2 413	50	41,6	6,0	4.0	18,6	11,9	6,7
100	2 900	2 506	50	43,2	5,7	4.0	20,8	14,6	6,2
120	2 900	2 633	50	45,4	5,2	4.0	23,2	18,9	4,3

Table 1: Comparisons and potential power savings.

- If correctly applied, VSDs can provide substantial power savings.
- Pumps are commonly used, and combining them with a VSD may result in savings.
- No VSD should be installed without a proper investigation.

Take note

If a flow rate of 100 m³/Hr was used as the average flow rate required by the plant, and pumping took place over 6 480 hours annually (six days per week x 24 hours per day x 45 weeks per year), a potential saving on the running of the pump would be R 26 114,40 based on an electricity tariff cost of R0,65 per kW/Hr. As one can deduce from *Table 1* the potential savings are substantial if the plant production output was reduced beyond the 100 m³/Hr flow requirement, which is evidently the current situation.

Conclusion

During this investigation, it was concluded that the original pump selection could have been more optimal, but after consultation with the plant manager, it was understood that the pump was originally oversized to cater for additional plant growth and is thus currently under-utilised at the expense of additional power being consumed.

With the year-on-year increase in the cost of electricity in South Africa, it remains imperative that any quality plant manager would be searching for feasible processes and products to achieve energy savings. It goes without saying that a VSD is a fantastic tool and, if applied correctly, can unlock substantial savings on the power bill - but it is imperative that a thorough investigation of any pumping plant is conducted by a suitably qualified person before embarking on the capital outlay for this machinery. Where the system flow rate and system operating pressure can change from time to time during operation, it is well worth investigating the feasibility of implementing VSDs as an energy saving measure. VSDs offer many other benefits such as enhanced motor protection and, if lower operational machinery speeds are achievable, less plant maintenance is likely to be required.

Alister Chalmers joined CL Cameron Planned Irrigation in 1981 where he started out as a system installer, later becoming system designer. In 1986 he joined Gili Irrigation and in 1987 he became area manager for the Overberg region where he promoted the concept of automated irrigation. In 1989, in Malawi, he worked on large scale irrigation projects for coffee and tea plantations. Returning to South Africa in 1991, Alister joined forces with Eppie Steyn and the late Pieter Fouche and together they grew and developed Agriplas, which was later sold to the WPK group. In 2003, Alister and Martin Giles formed Irri-Gator Products with the focus on providing automated irrigation control solutions. Enquiries: Tel. 082 490 5922 or email alisterc@irrigator.co.za.

About the author

Project management for Cape Town solar plants

EES, an ISO 9000 certified company, which provides management, engineering and technical auditing solutions, has embarked on a contract in the renewable energy sector, applying its engineering project management techniques to two solar Photovoltaic (PV) plants in the Cape. These plants form a significant part of the extensive solar energy developments currently being undertaken in South Africa.

"South Africa, a country beset by dire power capacity challenges, is increasingly turning towards renewable energy, and this new era of renewable energy generation, while still in its early stages, is nevertheless fast gaining momentum," states Bradley Hemphill, managing director of EES. "It is also vital that the country moves away from its reliance on coal-fired power and reduces its carbon footprint. The use of alternative clean energy sources is a natural step in the right direction."

The Cape, where the two PV plants are situated, and its surrounding areas have some of the highest Direct Normal Irradiance (DNI) values globally, comparing favourably with Brazil, a country where multiple solar energy plants have recently been constructed very successfully.

The projects are an outcome of the first round of the Department of Energy's (DoE) Renewable Energy Independent Power Producers Programme (REIPPP), which reached financial close in late 2012. Integral to the REIPPP is a structured policy framework helping facilitate the country's Integrated Resource Plan (IRP), which is expected to change the power generation paradigm forever.

Enquiries: Email Bradley.hemphill@eeslive.com.

Highly commended

Magnet has won a best product award - highly commended – at the 2013 Green Supply Chain Awards held in Johannesburg recently.

"The installation of a 100% locally designed, engineered and manufactured energy efficient lighting control system at Unilever's Distribution Centre (DC) in Johannesburg, combines two technologies for lighting control – passive infrared and radio frequency," says Stephan Allen, Magnet's technical director. "This programmable lighting control system has reduced the kilowatt hour volume of the total utility bill by an average of 43%."

This project involved the installation of the control systems for the warehouse lighting, occupancy sensors control for outside lighting beneath the canopies and a reduction in the number of luminaires in over-lit areas, for example the inbound, outbound, storage and cages areas inside the warehouse.

Unilever was the winner in the best project category, between R1 M and R10 M, for this energy saving project.

Enquiries: Tel. 031 274 1057 or email sales@magnetgroup.co.za.

Magnet's Stephan Allen receives the award from Susan Custers, Promech Publishing.

2013SAEEC

13 - 14 November 2013

Urged on by an energy crisis and global warming Renewable and Alternative Energy is quickly emerging as the fastest growing industry globally. With a Carbon Tax on the horizon and the Renewable Energy Independent Power Producer Procurement projects coming online South Africa has invested billions of rand into this industry with a lot more to come.

With this global attention the 2013 SAEE Convention has dedicated a day track to Renewable and Alternative Energy. Twelve 30 minute sessions focusing on opportunities, obstacles, financing and case studies in the renewable and alternative energy industry, will be showcased as part of this year's annual convention.

As opening speaker, Dr Stephen Roosa, business development, Energy Systems Group, US, will enlighten the delegates on renewable energy policies and technologies looking at mega solutions and net zero buildings while Dr Tobias Bischop-Niemz, chief engineer for energy planning in the renewable unit at Eskom will be looking at the regulation and potential for embedded PV generators in South Africa.

Other confirmed speakers in the renewable and alternative track include, but are not limited to, Gregor Küpper, the managing director of Solarworld Africa, Trevor de Vries, managing director for sub-Saharan Africa at AEG Power Solutions, Phumzile Tshelane, chief executive officer of The South African Nuclear Energy Corporation (Necsa), Johan Cilliers, regional director for sub-Saharan Africa at First Solar South Africa, Lehlohonolo Tinte, programme manager, Eskom.

Join a network platform of more than 500 delegates engaging with 78 industry leader speakers over two days in parallel sessions.

Enquiries: Tel. 018 290 5130 or email convention@saee.org.za.

CSP plant for Northern Cape

Construction of a 50 MW concentrated solar power (CSP) plant began on 12 August 2013 on the farm Bokpoort, near Upington, in the Northern Cape, with a projected completion date of 2015.

The project will employ up to 600 people from the surrounding communities during construction and 53 people during its operation. Of the people employed during construction 30% will be previously disadvantaged people from the area.

Handling the independent Environmental Impact Assessment, which includes an Environmental Management Plan (EMP) as well as Environmental Control and Monitoring during construction, is international consulting engineering company Royal HaskoningDHV.

Compared with most CSP plants which only have a storage capacity of up to three hours, this installation at Bokpoort can store eight to ten hours of electricity.

This technology enhancement of large scale energy storage creates the reality of being able to release the power to the national grid for a period of eight to ten hours after the sun goes down, enabling the use of solar electricity even at night.

Royal HaskoningDHV (then SSI) was appointed in 2010 for the inception phase of the project, to undertake the EIA process for the plant. The work also included amendments to the Environmental Authorisation due to the plant's design. In addition the company was responsible for the compilation of a Basic Assessment for the pipeline abstraction of water from the Orange River and assisted in applying for the water-use licence.

The availability of water for the power plant was a critical consideration in terms of securing water allocations and extended to ensuring that the design of the plant's cooling system guaranteed the optimal use of water, whilst still achieving the desired generation output and, subsequently, profitability levels.

Amendments to the project's water-use licence had to be made, owing to the importance of the agricultural sector to the economy of the Upington area and their dependence on the Orange River as a primary source of water. Climatic changes added to the pressure on water resources leading to a challenging project where these different environmental components had to be merged in a sustainable way.

Wastewater is also used in the process of photovoltaic (PV) power generation and will be treated at an on-site wastewater treatment plant and then returned to the CSP system.

Enquiries: Hillary Erasmus. Tel. 011 798 6511or email hillarye@rhdhv.co.za.

Efficient fossil-fired power

Siemens Energy and its partner, **GS Engineering & Construction (GS E&C)**, handed over the most efficient fossil-fired power plant in Asia to the South Korean power utility GS EPS Co. The handover of Dangjin 3 (formerly Bugok 3) combined cycle power plant took place twelve days ahead of schedule. Thanks to the main components, Siemens' world record-breaking H-class gas turbine and the special steam cycle, the power plant has a gross efficiency of almost 61 percent and an electrical capacity of 415 MW. The Dangjin 3 power plant is located in Dangjin-City, Chungchong Nam-do Province, approximately 120 km south of Seoul. As the head of a consortium, Siemens built the plant as a turnkey project together with GS E&C and supplied a SGT6-8000H gas turbine, a SST6-5000 steam turbine, an SGen6-2000H hydrogen-cooled generator, a Benson heat recovery steam generator as well as parts of the electrical equipment and the SPPA-T3000 instrumentation and controls system. The company was also responsible for commissioning the power plant. "We are proud to have built the most modern and most efficient combined cycle plant in Asia," said Roland Fischer, chief executive officer of Siemens Energy's Fossil Power Generation Division. "Thanks to our advanced H-class technology, our customer saves both fuel costs and the cost of maintenance and repairs. So far, eight of the 24 H-class gas turbines we have sold to date have been sold to South Korea." "At the moment, Korea's biggest challenge is to even out the imbalance between power consumption and demand," emphasised WK Lee, chief executive officer of GS EPS. "Our Dangjin 3 power plant uses Siemens technology for maximum flexibility. It is the best available on the market. Thanks to Siemens H-class technology, our plant operates safely, efficiently and economically."

Enquiries: Hulisani Nemaxwi. Email hulisani.nemaxwi@siemens.com.

Copper in aquaculture

Much has been written about the depletion of natural fish stocks in rivers, estuaries and the oceans because of overfishing. Aquaculture, an industry that has emerged only in recent decades, has become one of the fastest growing sectors of the world food economy. Aquaculture already supplies more than half of the world's demand for fish; a percentage that is predicted to increase dramatically over the next few decades.

In March of this year, South Africa's Department of Trade and Industry (DTI) launched a R800 M incentive programme for marine and freshwater fishing projects aimed at growing the country's fledgling aquaculture industry. The Aquaculture Development and Enhancement Programme, launched by Trade and Industry Minister Rob Davies, intends to stimulate investment in this relatively untapped sector.

But, this industry is not without its challenges. According to **Copper Development Association Africa's (CDAA)** centre director, Evert Swanepoel, the damage inflicted by predatory species can lead to both fish and economic losses. The principal predators include aquatic mammals, for example otters and seals, reptiles like crocodiles, invertebrates, such as crabs, and birds.

Predators may cause damage to livestock or farm facilities either directly, indirectly or both. Direct damage results when the fish or other cultured organism is killed or seriously maimed by the predator and is therefore lost from production. Indirect damage is highly variable, and includes: non-lethal wounding of fish; chronic stress with a consequent reduction in feeding efficiency or health; transfer of harmful disease-causing organisms; and sometimes even physical damage to the animal enclosure system leading to escapement.

"Often, the indirect damage caused by a predator can result in a greater economic loss than that caused by direct damage. For example, a crocodile that tears a hole in a net-cage and eats a few fish is a small loss compared to the pending escape of potentially large numbers of the remaining fish," says Swanepoel.

Various materials including nylon, polyester, polypropylene, polyethylene, plastic-coated welded wire, rubber and galvanised steel are commonly used for netting in aquaculture fish enclosures around the world. "All of these materials are selected for a variety of reasons, including design feasibility, material strength, cost, and corrosion resistance," explains Swanepoel. He continues: "Recently, copper alloys have become important netting materials in aquaculture. What sets copper alloys apart from the other materials used in fish farming is that they have strong structural properties. Attacks on nets by predators are not uncommon and to prevent damage to holding nets made from traditional materials, additional predator nets often have to be installed. Globally in fish farms where fish have been secured in copper cages, it has been found that there is no need for an additional predator net. Copper also demonstrates corrosion-resistant properties in marine environments, which has made it the material of choice for decades in traditional applications such as condenser tubing, water intake screens, ship hulls, offshore structure and sheathing.

Additionally, in the marine environment, the antimicrobial and algaecidal properties of copper alloys actually prevent biofouling, making them a viable alternative to chemical biocides.

"It is the combination of all of these properties –high strength, corrosion resistance and antifouling – that has made copper alloys a desirable material for marine applications, with the aquaculture industry now actively deploying copper alloy netting and structural materials in commercial large-scale fish farming operations around the world, and more recently on the African continent too," concludes Swanepoel.

Enquiries: Copper Development Association Africa. Tel. 011 824 3916 or email evert.swanepoel@copperalliance.org.za.

Solar solutions partnership

In a logical step to offer turn-key energy management and engineering solutions to its clients, 14 year old South African energy management specialist company **Energy Cybernetics**, has embarked on including PV solar as an option to further expand the energy savings possibilities for clients as part of a comprehensive energy solutions offering.

SUNCybernetics culminates a combination of German quality, know-how, and extensive renewable energy project experience which resides in SUNfarming, with the energy management expertise within Energy Cybernetics. Clients enjoy maximum ROI on renewable energy investments as sizing can be appropriated according to actual requirements once energy management is under control, which means less renewable energy needs to be acquired to supplement or replace grid-tied energy. This sets the offering of SUNCybernetics apart from it fellow PV solar suppliers as a more holistic approach to renewable energy as part of an overall energy solution is the core of Energy Cybernetics' business. **SUNCybernetics** is able to offer competitively priced, world-leading solar PV typically ranging in size between 3 kW up to around 1 MW directly to customers. SUNfarming in Germany ensures quality controlled manufacturing and shipping of its high-performance mono- and polycrystalline silicon solar cell modules which are all TÜV-certified.

Enquiries: Yolanda de Lange. Tel. 041 367 1041 or email y.delange@suncy.com.

SUNfarming Headquarters in Germany.

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OBITUARY Tony Farah

The death of Tony Farah on 10 August 2013 was a great shock to the electrical engineering and high technology business fraternity. The large turnout at a Memorial Service held in Woodmead, Johannesburg was a fitting example of the popularity of such a fine gentleman. Friends and family who had had the privilege of working and being associated with Tony gathered at an extremely moving service at 'Our Lady of the Cedars' church on 17 August.

To almost the last minute of chatting with his entire family in his home in Bakoven near Camps Bay in Cape Town, he was relentlessly full of humour - but he passed away peacefully in his sleep after an uncomfortable period of cancer and bone-marrow degeneration.

Tony was born in Johannesburg of Lebanese parents on 12 November 1948. He matriculated at Marist Brothers Observatory and went on to complete a BSc Electrical Engineering degree in 1972 and MBA in 1974 at the University of the Witwatersrand.

In 1990 he took a sabbatical from Spescom to complete an Advanced Management Programme at Harvard Business School. This tertiary education stood him in good stead for the continued development and success of the multinational and JSE-listed Spescom Group which he founded in 1977.

Prior to the founding of Spescom, Tony was an executive director at Hubert Davies Electrical Engineering from 1974 to 1977.

During the period 1988 to 1992 Tony served as vice-president of the Electronics Industry Federation. From 2001 to 2007 he served on the Presidential National Commission for Information and Development as well as Public Administration and Defence.

In 1997 Tony was nominated Lebanese World Businessman of the year by the Lebanese Cultural Union.

On Tony's retirement, after 30 years at the helm of Spescom, this popular and highly respected entrepreneur reminded an interviewer that the group had developed and patented many technologies over the years including 'tokenless' prepaid metering, a technology that is now successfully marketed internationally. But during the latter years of his leadership as Executive Chairman and Group CEO, Tony admitted that he found, particularly over those last few years, that the added administration and red tape required by more and more strict corporate governance rules, made it much more difficult to react quickly to market conditions and hindered his entrepreneurial expertise – but, in his words - 'it's all been a great journey'.

He was MSAIEE until the time he resigned from Spescom. On his retirement to Cape Town, Tony established a new Farah investment company – New Investment Creation. This new entrepreneurship involved advising and investing in new innovative ventures as well as a host of financial, marketing, strategic planning and business advice activities. Finally he was investor and advisor on a new venture at Zulustar – a new Farah family growth company - the activities of which became very close to his heart. The late Tony Farah is survived by Judy, five adult children and families. Tony's legacy and spirit lives on.

By Ken Baker
CompSAIEE; HonFSAIMC; LtCdr SANR (Rtd)

50 years in business

To mark the celebration of its 50th anniversary this year, **ACTOM** Power Transformers held a cocktail party at its Wadeville (Germiston) premises on 28 August to which it invited a number of its customers, including Eskom, municipalities, consulting engineering companies and project management contractors. Other guests who attended the function included Willi Felber of Felber Engineering of Austria, an internationally renowned company of power transformer design consultants that ACTOM Power Transformers uses regularly to assist with designing new products, as well as Ben Jansen, a high voltage test expert who is a director of an international electrical and industrial management consultancy and assists in the design of ACTOM Power Transformers' advanced test facilities.

The 50th anniversary function coincided with the official opening of the company's recently upgraded test facility, following the latest expansion of its plant capacity to include production of 315 MVA generation and transmission transformers for Eskom. The new test facility, established at a cost of over R30 M as an addition to the company's existing test facility, is the most advanced facility of its kind in Africa and one of the best in the world.

Addressing guests at the 50th anniversary function, ACTOM's Group executive director Andries Tshabalala said: "During the 12-year period since being acquired by ACTOM, the company's turnover has increased 5,8 times or 600%. The company has long been recognised as one of the leading local manufacturers of power transformers. It has greatly enhanced its status in this respect through the technological advances and production capacity expansions it has achieved – especially within the past six years."

Ronnie Russell, ACTOM Power Transformers' Divisional CEO, is by far the longest serving of the three CEOs who have headed up the company since its inception, having served for 28 years in this capacity. "He has also been with the company for almost as long as it has existed - 47 years," Tshabalala commented.

Enquiries: Tel. 011 824 2810 or email ron.russell@actom.co.za.

ACTOM Power Transformers' Divisional CEO, Ronnie Russell (right) and quality manager Mohamed Alli stand beside the 2,4 MV impulse generator in the company's new world-class test facility.

Centre of excellence

Illustrating its commitment to being both a solutions and services leader, Schneider Electric South Africa has established a Solutions and Services Execution Centre.

According to Mark Marucchi, who heads up the new Execution Centre, Schneider Electric South Africa prides itself on being able to offer holistic solutions to its clients in both the private and public sectors.

"As a global specialist in energy management, **Schneider Electric** has, for many years, offered a number of products and solutions to its clients. Recently, it has simplified its organisational structure and now offers its all encompassing solutions under one Schneider Electric brand, across various sectors such as energy, industry, buildings, data centre, networks, and residential customers," he says.

Of the new execution centre Marucchi says: "As a one stop solutions shop, the Solutions and Services Execution Centre leverages the capabilities, skills and competencies of Schneider Electric South Africa's resources. By doing so, it expands its portfolio of high value systems and services in order to meet the specific need of its customers in targeted customer segments. It is also aimed at strengthening cooperation with the front office and designed to develop key competencies around solutions and services in order to drive growth for the company."

Enquiries: Belinda Aslett. Tel. 011 254 6400 or email belinda.aslett@schneider-electric.com.

POWER-GEN Africa and DistribuTECH – March 2014

The co-located POWER-GEN Africa and DistribuTECH Africa exhibition and conferences will take place from 17 – 19 March, 2014 at the Cape Town International Convention Centre, South Africa.

Free seats

PennWell Corporation, the organiser of these events, is offering two free three-day conference seats at both POWER-GEN AFRICA and DistribuTECH Africa 2014. For updated news and opportunities in Africa's energy and distribution sectors, and to stand a chance to receive one of the FREE three-day conference seats, 'Like' the POWER-GEN Africa and DistribuTECH Africa Facebook pages by 15 October 2013 and email your name to Stephanie@tradeprojects.co.za .

Visit www.powergenafrica.com and www.distributechafrica.com for more information.

Fit for a King

The DuraLabel 9000 label and sign printer in conjunction with the MPS 150T print station were crowned the 2013 winner of the American New Equipment Digest King Awards in the packaging equipment and supplies category. The King Awards competition, named after long time chief editor Bob King, was established to honour superior industrial product innovations. The print and digital readers of the New Equipment Digest determine the winners by voting for the best products in 10 specific industrial categories. More than 2 100 votes were cast! The readers were proud to bestow these awards on significant and inventive products that enable all involved in manufacturing to do their jobs more efficiently and effectively. DuraLabel is represented locally by **Aspercon**.

Enquiries: Gavin Pletschke. Tel. 011 918 8340 or email sales@aspercon.co.za.

Bizz Buzz

LEM has a new catalogue

LEM has released a new 100 page catalogue describing its industrial voltage and current transducers. The catalogue provides an outline on applications, technologies and specific industry sectors. The first section outlines transducers optimsed for drives, welding, renewable energy and power supplies. The next section is for railway traction and trackside applications, ie onboard current transducers for locomotive propulsion systems, as well as for substation and signalling equipment. There is a section dedicated to the high precision industry with very high accuracy transducers, ranging in current from 12,5 A up to 24 kA and a section describing transducers manufactured specifically for the automotive industry.

Enquiries: Denver Technical Products. Email denvertech@pixie.co.za.

Australian company assists in Ibhubesi gas project

Wood Group Kenny (WGK) Australia has been awarded a contract to provide engineering and project management services to **Sunbird Energy** for the Ibhubesi gas project, off the west coast of South Africa. The initial phase of WGK's work involves the concept and definition phases, with the objective of moving the project into front end engineering design (FEED) in 2014. The project is likely to include a subsea gathering system, an offshore processing facility, a subsea pipeline, approximately 400 km in length, and an onshore plant. Sunbird Energy executed an agreement to acquire a 76% stake in the Ibhubesi gas field in 2012. The Ibhubesi gas project has multiple development opportunities to supply the high value South African energy market. Sunbird's joint venture partner in the project is PetroSA (24%), the national oil company of South Africa.

Enquiries: Email bobbie.ireland@woodgroup.com

Medupi boiler supports 'steel' the show

The main frame and boiler grid supports project at **Medupi Power Station** is the Mining and Industrial category winner as well as overall winner for Steel Awards 2013. The judges said: 'The boiler support structures really exhibit excellence in the use of structural steel. It is a classic heavy engineering project of spectacular proportions. It is heavy engineering at its best. The structures look so clean and simple, especially before all the rest of the steelwork, platforms, boiler casings and piping bundles, and other equipment enclose them. These four legged braced monsters soar 105 metres into the sky!'

Enquiries: Renee Pretorius. Tel. 726 6111 or email info@saisc.co.za.

Partnership brings HV solutions to Africa

Africa's economy is growing faster than any other continent, and one-third of Africa's countries have GDP growth rates of more than 6% annually, according to the African Development Bank (AfDB). With tremendous economic and population growth comes a greater need to build out reliable, safe and efficient electrical infrastructure.

Building on their commitment to be closer to customers in Africa, **GE** and XD Electric Group today announced the formation of a new partnership that combines GE's intelligent controls with XD Electric's comprehensive portfolio of high-voltage equipment. Originally announced in May 2012, the partnership expands GE's capabilities as a leading provider of transmission and distribution (T&D) solutions and creates a new global competitor to provide utilities and energy-intensive industries with high-voltage (HV) solutions.

"In Africa, we're focused on grid expansion projects and greenfield network interconnections as we continue to create a modern power grid that is stable, resilient and energy efficient," said Amen Saeed, senior product manager for GE's digital energy business, Luis Perez, general manager for EMEA, GE's digital energy business (Africa). "Adding high-voltage capabilities will help our utility customers to transmit power with minimal losses over long distances and rough terrains - from the generation point to the consumers in large cities. We'll also continue to eliminate power islands, creating energy reserves and allowing us to more efficiently use a greater supply of energy."

Enquiries: Thulisile Phiri. Email Thulisile.phiri@ge.com.

For engineers designing with open source hardware

RS Components (RS), the trading brand of Electrocomponents plc, has launched its 'Open Source Design Centre', a comprehensive free guide to open source electronics design hosted on designspark.com - the company's online resource for electronics design engineers.

The Open Source Design Centre brings together all of the elements involved in open source design in a single, easy-to-access reference point. It provides reliable information on matters ranging from open source licensing guidelines to advice on hardware and software management. Its aim is to educate engineers in open source design, and to aid and encourage their active participation in open source design projects.

RS has developed the Open Source Design Centre in cooperation with Andrew Back, a leading industry expert in open source hardware and founding member of the Open Source Hardware User Group (OSHUG), the UK's leading open source hardware group established in 2010.

"While open source hardware has until recently been at the low end of the electronics design spectrum, it is steadily increasing in interest as the opportunities for industry, education and experimentation become apparent," commented Back. "By working with RS, we are tapping into a vast global base of engineers on designspark.com, many of whom will be the key players in taking forward open source hardware into mainstream electronics design."

Enquiries: Samantha Swanepoel. Email samantha.swanepoel@rs-components.com.

Businesses move forward

Concor Engineering and **Wade Walker**, both wholly owned Murray & Roberts subsidiary companies operating with the Group's Engineering Africa Platform (EAP), are poised for growth in sub-Saharan Africa as the synergies between these two companies are increasingly extracted to meet the individual needs of customers in the region.

Companies in the EAP business platform are primarily focused on the Group's core competence in industrial engineering which, if properly applied in the early design and feasibility phases of projects, offers significant value to customers.

Wade Walker is an integrated electrical, instrumentation and control solutions company with a focus on the mining and minerals and power generation sectors, while Concor Engineering offers integrated structural, mechanical, platework and piping solutions to the mining and minerals sector. Both companies are housed in same building in the Murray & Roberts Group precinct in Skeen Boulevard, Bedfordview, affording personnel easy interaction and open communication.

Concor Engineering managing director, Milé Sofijanic was also recently appointed managing director of Wade Walker and regards this development as being expedient to the shared objectives of both companies.

Enquiries: Anishca de Beer. Tel. 011 372 8558 or email anishca@wadewalker.co.za.

Next generation fire suppressant

3M's Novec 1230 Fire Protection Fluid has distinguished itself as the only sustainable fire extinguishing fluid that will not damage the materials it is sprayed on, and has the greatest margin of safety, with no adverse effect on humans and zero ozone depletion potential. "Novec 1230 is a remarkable fire extinguishing fluid and is the epitome of sustainable technology, as it has the largest margin of safety among chemical clean agents for use in occupied spaces," says Yemi Fatunla, electronics and energy business group country leader, 3M South Africa.

Novec is a fluoro ketonea proprietary 3M technology that offers a number of important advantages over conventional halocarbon-based suppressants. It works as a gas, yet is a liquid at room temperature and extinguishes fires via its cooling effect. A unique and world-first feature is that Novec 1230 will not damage the materials it is sprayed on, making it particularly beneficial for spaces which house high-value electronic equipment as well as environments such as libraries, document warehouses, government departments and cultural facilities where valuable items such as artworks or documents would usually be damaged by other fire-suppressing agents.

Enquiries: Clinton Hodgson. Tel. 011 806 2069 or email chodgson@mmm.com.

HA Mofutho bridge wins SAHDGA Awards

Consulting engineers **Royal Haskoning-DHV** received accolades for a recently completed project - the HA Mofutho Pedestrian Bridge in Lesotho – from the SA Hot Dip Galvanizers Association at their awards function, held recently at the Montecasino complex in Fourways, Johannesburg. Not only did the HA Mofutho Bridge win its category - Infrastructure and Community development, but was awarded the overall prize, winning the coveted WGS Barnett Trophy. The Kingdom of Lesotho, Ministry of Public Works and Transport appointed Royal HaskoningDHV (then SSI) to carry out engineering investigations, detailed design and preparation of detailed drawings and tender documents and the site supervision of the construction of a pedestrian bridge across the Senqu River near the village of HA Mofutho in Quacha's Nek District, a very remote area in Lesotho.

The footbridge provides access for pedestrians and domestic animals between the villages of Tsoelike (also known as Auplus) in HA Makhaola and HA Mofutho. Previously, river crossing took place by small boats or directly through the river during low flow conditions, but access during the rainy season was hazardous due to fast flowing and high water levels. The engineering team met and exceeded the client's objectives of the project: The footbridge had to be an economic suspension bridge and incorporate:

- Involvement of local community participation and serve to transfer skills to emerging local contractors
- Be acceptable by the local community, usable and safe
- Aesthetically and environmentally acceptable
- Durable and easy to maintain

The HA Mofutho Pedestrian Bridge provides an important link between the villages of Tsoelike - Auplus in HA Makhaola and HA Mofutho improving the quality of life of the local residents and livestock and will also save lives of future generations that no longer have to cross the dangerous Senqu River by boat. The bridge has been appreciated by the local travelling public and is well used.

Enquiries: Hillary Erasmus. Tel. 011 798 6511 or email hillarye@rhdhv.co.za.

Industrial rack PC with performance boost

The **Siemens** Industry Automation Division has equipped its new 19-inch industrial rack PC, Simatic IPC547E, with powerful fourth generation Intel Core processors and the latest PC technology. Core i7 four-core processor, HD onboard graphics and fast work memory reduce the power loss by one third as compared to the previous version and offer 30% higher computing performance and almost three times better graphics performance. Raid hard disk configuration with additional hot spare hard disk and automatic restore in the event of a fault guarantee high system availability and data security. Up to five monitors can be connected for control centres and multi-monitoring applications. The new industrial PC is particularly suitable for use as a compact workstation or server for the fast acquisition and processing of large data volumes, for example in industrial image processing and process visualisation.

The new rack PC Simatic IPC547E is compatible with its predecessor model in terms of installation, interfacing and software. The minimal housing depth of 446 mm allows for space-saving installation in 19-inch control cabinets with depths from 500 millimetres. A version with a housing depth of 356 mm will be available soon for control cabinets from 400 mm.

Enquiries: Keshin Govender. Email Keshin.govender@siemens.com.

St John's College – first in 2013 Siemens Junior Cyber Junk Yard Challenge

St John's College (Johannesburg) received top honours, on Tuesday (10 September 2013) in the final round of one of South Africa's most popular science and engineering competitions – the Siemens Junior Cyber Junk Yard Challenge.

Learners were required to design, build and programme a fully functional home energy management system. They had to implement principles of load balancing, power usage calculations, basic logic control and cost management. St John's College was one of five technical high schools and further education and training colleges which went head-to-head in their design and model of an energy-saving house.

The five teams were selected from 25 schools and colleges which participated in the regional round of the Siemens Junior Cyber Junk Yard Challenge in July.

Enquiries: José Machado. Tel. 011 652 2160 or email josemachado@siemens.com.

From Siemens: Hugo du Plessis (project leader) and Kenneth Naicker.

Winning team, St John's College (Johannesburg): Chris Maree, Carl Beekhuizen, James Allsop and Mitchell Terblanche.

Hoër Tegniese Skool (Technical High School) Daniel Pienaar (Uitenhage, Eastern Cape): Tristan Zaaiman, Eben van Zyl, Omri Jacobsz and deputy principal, Sampie Marais.

Brackenfell High School (Western Cape): Aldo Siegling, Bennie van Eerden, Angelique le Roux, Joshua Elliott, Educator Johann Nieuwoudt.

George Campbell School of Technology (Durban): Daniel van Niekerk, Timothy Leask, David Kellermann, Mfundo Dhlomo.

Hoër Tegniese Skool (Technical High School) John Vorster (Pretoria): Educator D Breitenbach, Phillip Greeff, Michael Maritz, Inie de Lange and Brian Champion.

Eaton (South Africa) Product Showcase Open Days

An Eaton product showcase event took place over two days - 6 and 7 August 2013 - at Eaton Electric (South Africa) in Wadeville, Gauteng, South Africa. The latest developments and innovations of electrical power management for any industrial application were introduced. Suppliers, end-users, engineers and contractors enjoyed hands-on practical demonstrations and participated in actual working scenarios.

Enquiries: Email AdriVogel@Eaton.com

Eaton's Gert Jonker (Eaton Training manager).

Jason Loock (Eaton automation and sales support).

Trevor Sansom (Eaton PDCD business unit manager).

Rockwell Automation - Automation University

Rockwell Automation brought top local and international management, associates and colleagues together for two days - 14 and 15 August 2013 - at Emperors Palace.

This impressive manufacturing exhibition gave delegates the opportunity to experience Rockwell Automation solutions through hands-on labs, live demonstrations, seminars and industry sessions.

Rockwell Automation's technology partners participated in a large central exhibition area, where visitors could see products and technologies come to life. During a special presentation executives provided insight on the automation industry from a leading-edge and global perspective.

Rockwell Automation executives: John McDermott (senior vice president, global sales and marketing), Urs Marti (regional sales director, South region EMEA), Hedwig Maes (president, Europe, Middle East and Africa), Barry Elliott (managing director, sub-Saharan Africa), Hein Hiestermann (business manager, global solutions division South Africa).

New uniforms for Kingsway School Choir

VEGA Instruments SA, a sponsor at Kingsway School, has been actively involved for many years in helping the children who attend this primary school and recently sponsored uniforms for the school choir. The Kingsway School caters for disadvantaged children from the Honeydew area in Johannesburg. The choir was formed to help many of the musically talented children who attend the school develop their gift. The children are between 11 and 13 years of age and meet once a week to practice with the teachers involved.

Enquiries: Chantal Groom. Tel. 011 795 3249 or email info.za@vega.com.

VEGA Instruments SA managing director, John Groom, with Kingsway School choir members: Mzwethu Sonjani, Thabang Seisa, Tsholofelo Mokgatsi and Ayanda Ngwenya.

6th SA Innovation Summit

'Innovation goes viral – catch it for growth'

The 6th Innovation Summit took place at the Industrial Development Corporation (IDC) of South Africa from 27 – 29 August 2013. Those who attended participated in inspiring discussions and received practical tips on how to put their innovative ideas into practice. They were given many opportunities to network with successful individuals. The 'inventors' garage' was fascinating... these are some of the exhibitors.

Enquiries: Email info@innovationsummit.co.za.

Tshepo Thulo and Kenneth Miya of Goll with their mobile security 'eNotify' cellphone. Enquiries: Email kennethmiya1@gmail.com.

Chris van Zyl of 'eChaja' with Tiyani Nghonyame (Tshwane University of Technology, Limpopo). 'eChaja' is a commercial solar powered cellphone charger. 'eChaja' is fully portable and may be set up as a small business for instant income. Enquiries: Tel. 084 072 7078.

Mashka Taylor and Crosby Menzies of SunFire Solutions with the SunFire Solar Dish (and other fuel efficient appliances). Enquiries: Email Crosby@sunfire.co.za.

Pretoria High School for Girls was one of many schools well represented at the Summit.

Danie Heymans of 'Hands on Technologies' with a robot created from Lego. Enquiries: Visit www.handsontech.co.za.

Kalaivani Pillay and Naadiera Patel, Siemens.

6th SA Innovation Summit

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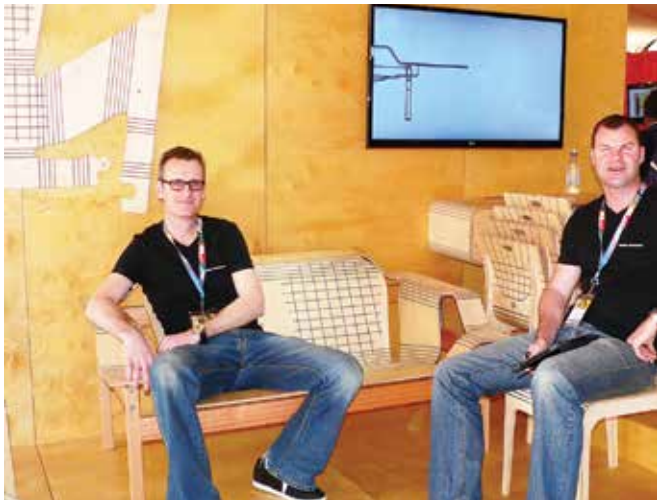

Gary Murray and David Stratford of Wintec Innovation showing furniture created using StratFlex technology. Enquiries: Email info@wintec.co.za.

The SABS Design Institute joined the IDC, Telkom, Sasol and Eskom as an official design partner in the Summit. 'Designed to fly' are Grace Ramadi, Pako Magagane, Koketso Komane and Ntwanano Mamitwa.

Sustainable education development

Wear control specialist, Filter Focus, and library resource service provider, Qualibooks, have teamed up with Love Trust charity to provide underprivileged children in Tembisa with a brighter future through education. The company decided to support Nokuphila, due to the inspiring work being undertaken at the school. Chief operating office, Craig FitzGerald said: "This is a project that is dear to the hearts of many Filter Focus employees and we see tremendous value in what it is being achieved there."

Enquiries: Email cfitz@filterfocus.co.za.

Left: Filter Focus: Craig FitzGerald and Magda Sly.

Right: Children at Nokuphila School.

APPOINTMENTS

DEHN

Kirk S Risch, sales manager
Johannes Oelofse, sales engineer
Edgar Botes, business development manager

Alexis Barwise, managing director (front)

EPLAN: BLM Software & Service

Sefie van Schalkwyk, technical support consultant

MUSTS FOR YOUR DIARY

Syntell Sustainability 2013 Forum
11 – 13 November 2013. Hyatt Rosebank Hotel, Johannesburg
The African forum for municipal financial sustainability designed for African metropolitan, district and local municipalities and traffic authorities, local and provincial government, councils and cities from across the continent. This interactive event will showcase the latest technologies and best practices for effective revenue management (including revenue collection and procurement) in order to improve service delivery.
Enquiries: Tel. 021 700 4300 or email Zayeen.daniels@hypenica.com.

8th Southern African Energy Efficiency Convention (2013SAEEC)
13 & 14 November 2013, Emperors Palace, Gauteng
This two-day convention will feature over 70 speakers, 50 exhibitors and 500 delegates and annually brings together stakeholders in the energy efficiency sector including equipment suppliers, consulting engineers, energy service companies, end-users of energy, utilities and researchers.
Topics to be covered range from mining and industrial energy optimisation, tax rebates, carbon incentives, business case studies, technical case studies, energy management in buildings, alternative energies to standards and government requirements.
Enquiries: Erika Kruger. Tel. 018 290 5130 or email convention@saee.org.za

Energy Training Foundation
** 14 - 18 October 2013, Johannesburg*
Certified Energy Manager (CEM) an AEE course - 5 CPD credits
** 16 - 18 October 2013, Johannesburg*
Certified Measurement and Verification Professional (CMVP) an AEE course - 3 CPD credits
** 16 - 17 October 2013, Johannesburg*
Energy Management System Implementation Course (EnMSI-ISO 50001) - 2 CPD credits
** 18 - 21 November 2013, Johannesburg*
Certified Renewable Energy Professional (REP) and AEE course
Enquiries: Email info@entf.co.za.

Power-Gen Africa & Distributech Africa
17 – 19 March 2014
Solutions for Africa's Energy Future
A three-day event, Power-Gen Africa serves the industry's information and networking needs with a trade show floor featuring the prime movers in the conventional power and renewable energy industries. A multi-track conference covering strategic, technical and renewable topics will feature commercial and practical solutions (including case studies) for power industry businesses.
Enquiries: Visit www.powergenafrica.com.

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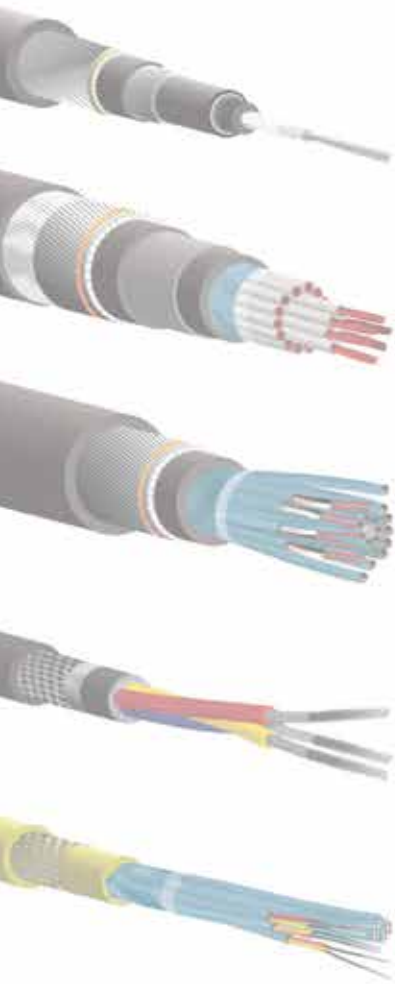

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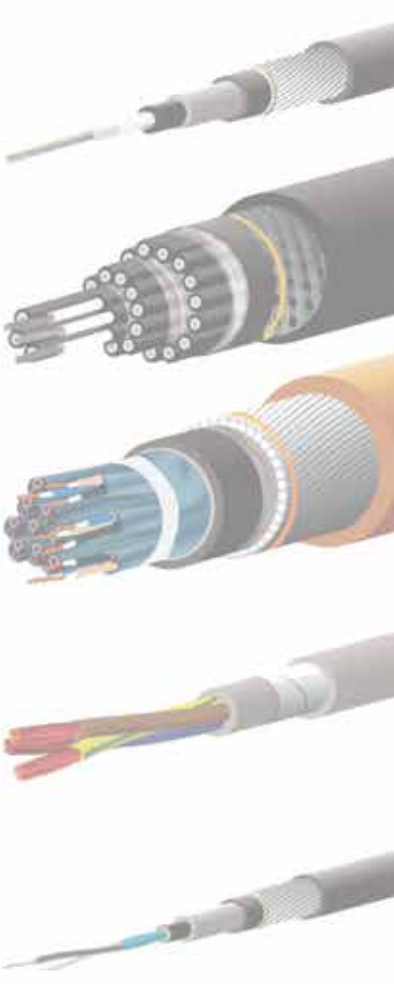
Our **LABORATORY CENTRE** executes tests during every step of the production process.

We can design and manufacture the AL/HDPE/PA technology as an alternative to the lead jacket cable.

We develop cables of high **RELIABILITY, QUALITY** and **DURABILITY.**

We are able to manufacture tailor-made cables in **SHORT LENGTHS** and in a very **SHORT TIME.**



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