07/2017
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A CONDUIT OF POWER & EDUCATION

FEATURES:

- Power solutions
- Drives, motors + switchgear
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- Valves + actuators

ELECTRICITY + CONTROL
CROWN PUBLICATIONS

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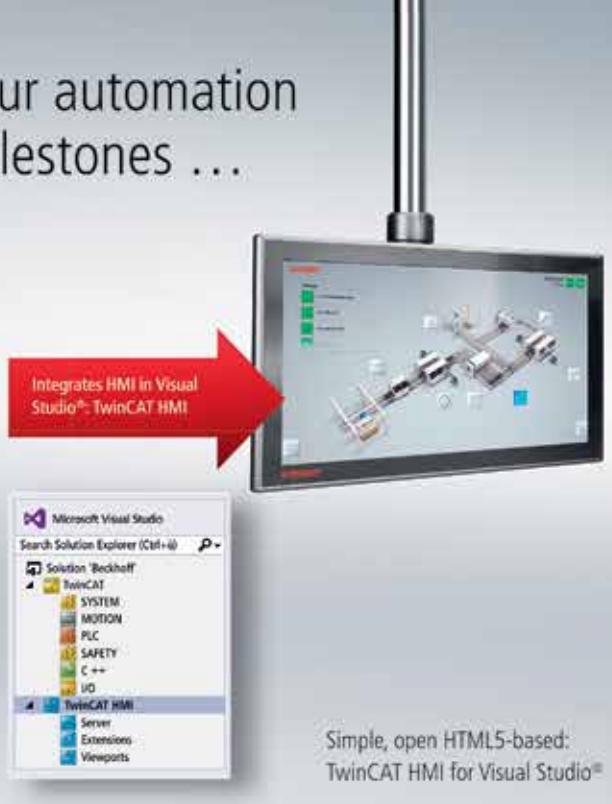

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This year, Beckhoff will exhibit numerous innovations at the KZN Industrial Technology Exhibition in all technology areas. As an expert in One Cable Automation, Beckhoff shows how users can reduce installation and material costs significantly: for example, with the new EtherCAT P technology for the field level. Another highlight: the integrated in Visual Studio®, TwinCAT HMI: in just a few steps without programming, a platform independent user interface can be created. It also adds new TwinCAT modules for Industrie 4.0- and IoT-projects.

We look forward to seeing you at the Durban Exhibition Centre, Booth A19!

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New Automation Technology **BECKHOFF**

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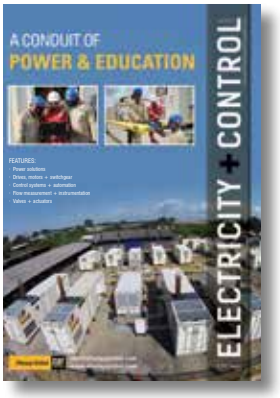

Altaaqa Global and Caterpillar promoted economic and social progress in Cameroon by bringing electricity and transferring knowledge to local technicians.
Read more on page 7.

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TECHNICAL DIRECTOR'S COMMENT

As usual, there is much to write about as we pass the middle of 2017. There have been some wonderful trade shows, some intriguing political developments, massive strides in the State Owned Enterprise space, and the launch of the Earthing and Lightning Protection Association (ELPA). And on a personal note I gave my first lecture in a cocktail club where the host sends you a glass of wine as your five-minute signal. Absolutely marvelous!

I was privileged to have been asked to say a few words at the launch of the Earthing and Lightning Protection Association (ELPA). In my speech, among other issues, I reflected on the profound South African contribution that has been made in the field of lightning and lightning protection. This contribution should never be underestimated.

ELPA is an initiative that needs to be supported. There has long been a tendency in South Africa for the critical aspect of earthing and lightning protection to be passed off to contractors and installers who may or may not be adequately versed and educated in the subtleties of proper system design.

This is not often an issue as most installations are pretty much by-the-book; but many are not. I would argue that an increasing number of installations require levels of design expertise that work beyond the simple approach and guidelines of the standards.

As lightning is a statistically defined phenomenon, all may appear well – until something goes horribly wrong. In the case of a lightning protection system failure, the consequences may be dire.

ELPA sets out to actively ensure that the installer and contractors working in the areas collaborate, support, and educate each other. This involves input from those with well-developed international links and so forth – but fundamentally speaks to the next chapter in the South African lightning protection industry.

Education is the basis of all that we aim to achieve and we can never allow that process to be anything less than world-class. Dare I suggest that, in some respects, we have lost that desire in the basic education space? Do not get me wrong, that process is served by some of the most well-informed and dedicated human beings I have ever had the privilege of working with – but I harbour a deep-seated concern that our attention, as society, has been allowed to drift off from what we are doing in this space.

Ian

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

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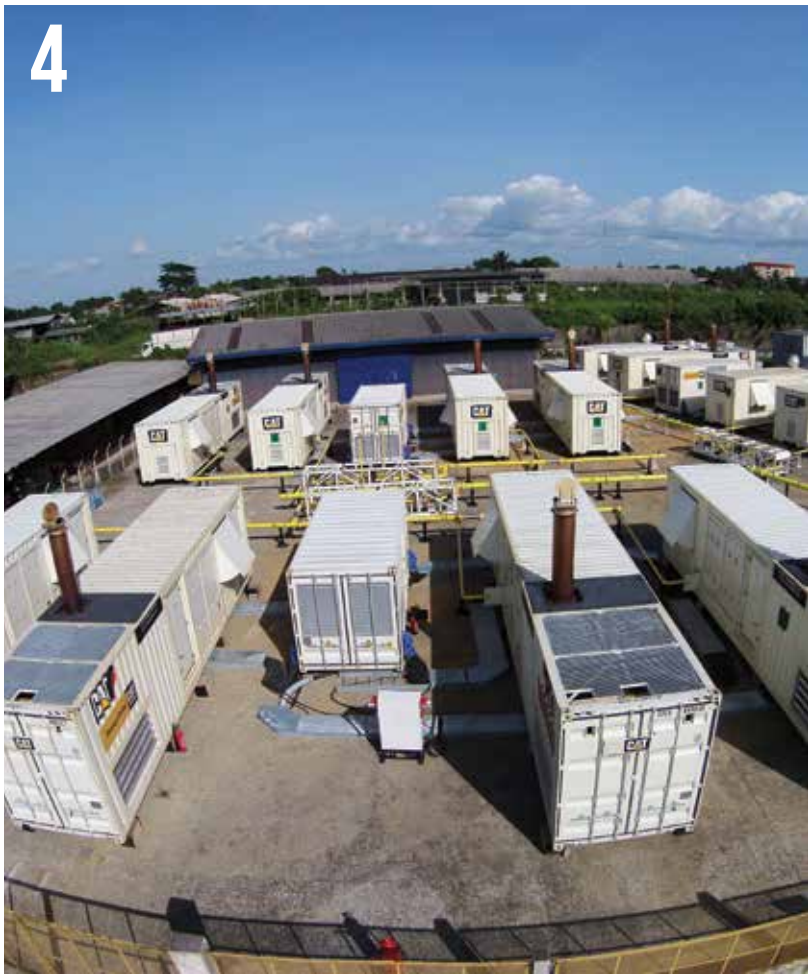

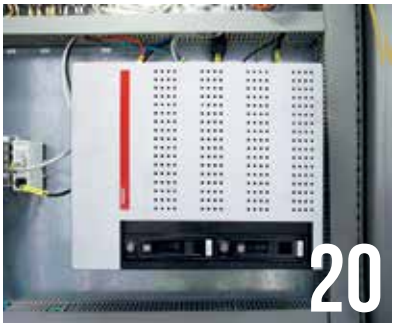

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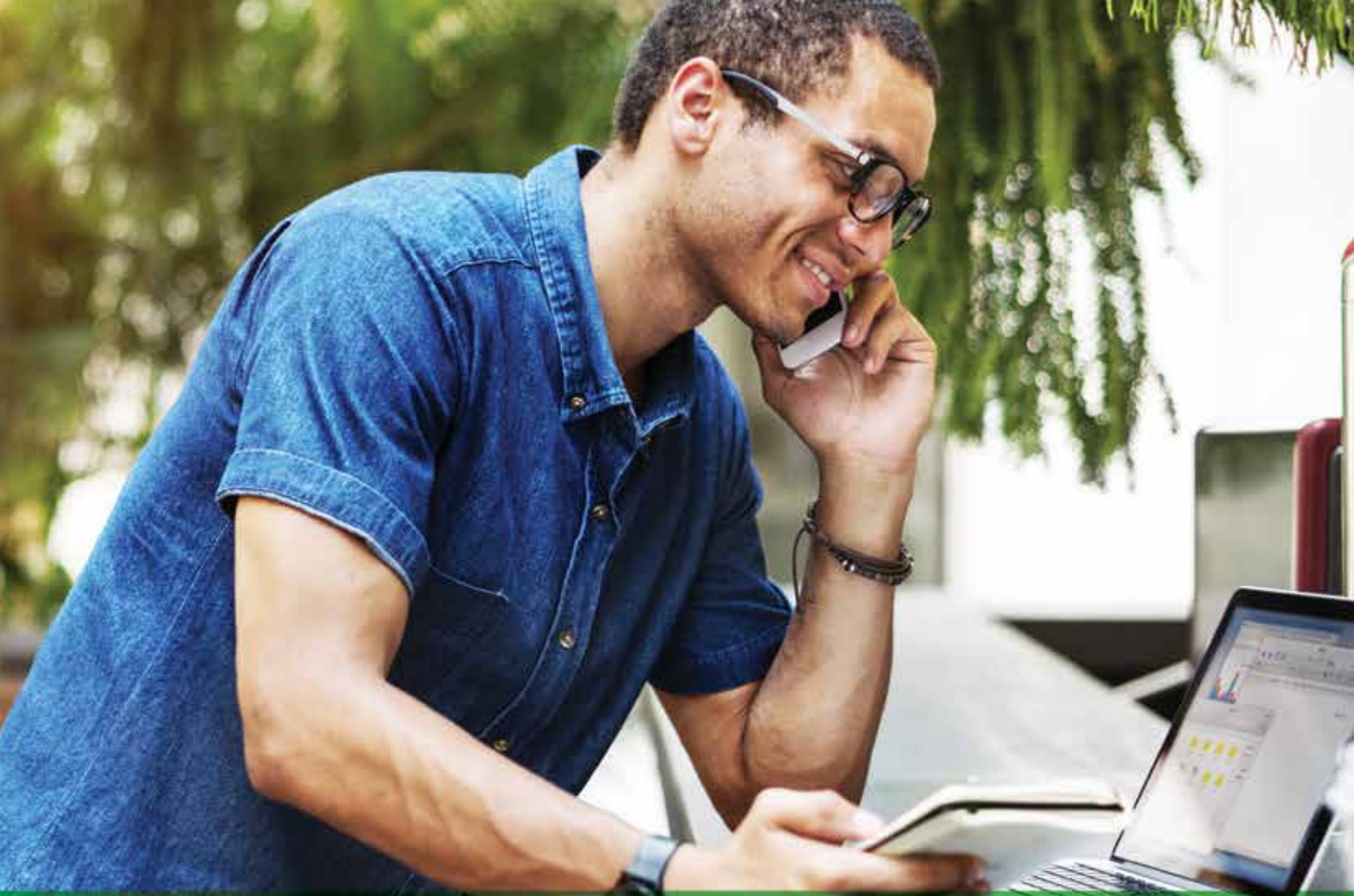

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Temporary Power as a Free Agent in **Complex Adaptive Systems**

Nalen Alwar, Altaaqa Global Caterpillar Rental Power

Temporary power – as a free agent – is assistive in terms of a fast-tracked decentralised source of power.

Altaaqa Global's ISO 50001:2011 Certification

Altaaqa Global provides rental power on an IPP basis and is a pioneer company in the temporary power industry worldwide to be ISO 50001:2011-certified that addresses requirements of effective energy management systems. In line with the system's perspective of efficiency and effectiveness, key attributes behind ISO 50001 are:

- Progress Management to ensure that the energy plans agreed to are being carried out as designed
- Change Management in terms of ensuring that the operation of the energy system has appropriate responses to internal or external threats
- Operational Problem Resolution Management in terms of treating problems as improvement opportunities
- Risk Management to ensure risk factors are evaluated to ensure continual improvement
- Contingency preparation for documented procedures and emergency plans to ensure safety is prioritised at all times
- Document management and reduced bureaucracy
- Objective and Target Achievement Evaluation Criteria for successful assessments of progress

Central utilities are driven by their indigenous resources to produce and supply power at the least cost of generation. These least cost generation curves are regionally understood as gas in West Africa, hydropower in Central Africa, and coal and hydropower in Southern Africa.

Whilst this makes sense, it could result in perceived monopolistic behaviour and restricted access to private sector participation when power supply problems occur, either through project delays or disruptions in generation and distribution systems.

This article argues the case for temporary power as a free agent that is assistive in terms of a fast-tracked decentralised source of power. Free agents can enter a system and either help it thrive through mutual adaption or fail if the adaptation is not achieved.

Several papers have been written on viewing power generation from heterogeneous fuel feedstock sources and decentralised utilities as complex adaptive systems.

It is argued that retaining this theoretical lens to view power generation as a complex adaptive system aids the design and implementation of solutions.

Specific characteristics of complex adaptive systems and the fit of free agents in the form of temporary or rental power solutions are emphasised to describe system performance potential. The system referred to shall always mean the power supply grid and its interconnected or unconnected industrial or end-user entities.

Free agents

One of the most topical subjects is the provision and cost of power supply for the sub-Sahara Africa region. Whilst new power stations are being built, there are problems of delayed project delivery. By definition, a free agent is an external entity introduced into a system, and there may be positive or negative causal effects due to its interaction with the system and other agents or entities within the system. Agents within a system adapt to their environment and it is the ability of agents, entities and the environment to mutually interact, adapt and co-evolve that brings about system performance. Free agents can enter a system and assist in improving system performance through contribution at a local or decentralised level or at a centralised level. The national grid and its decentralised parts (stepped down voltage distribution networks) create system connectivity – a typical feature of complex adaptive systems.

Complex Adaptive Systems

Complex Adaptive Systems are systems that are constantly adapting to internal interactions and their external environment based on relationships, emergence, patterns and iterations.

Studies done from a complex adaptive systems perspective are enriched due the ability to incorporate increasing realism and empirical data into modelled problems that can be understood in a practical business setting. More specifically, a complex adaptive system has the following four common properties:

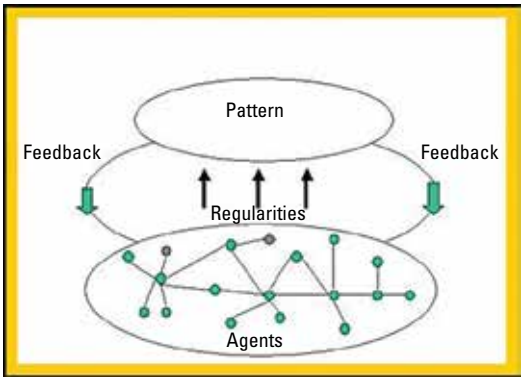

Figure 1: Complex Adaptive Systems.

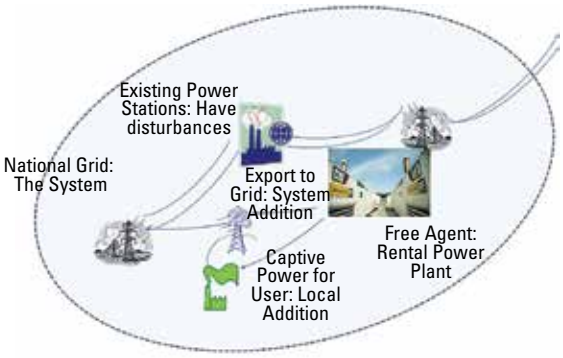

Figure 2: A Complex Adaptive System.

First, it is a network that comprises of organisational elements or entities that are interconnected and exhibit adaptivity in response to changes in the external environment or the entities themselves. An electricity supply network with nodes or agents representative of electricity production capacities easily portrays this. Where mainstream power plants are the typical agents to be found in such a supply network, a free agent can be introduced in the form of a temporary power plant or a different technology. The system then has a new interaction. The interactivity is possible because of synchronous technology of the temporary power plant that contributes a high level of operational stability. This makes sense in that sub-Saharan Africa's energy mix would comprise renewable power generation sources that pose challenges to system reliability and performance, given their inherent intermittent contribution and associated disturbances to the grid or system.

Second, Complex Adaptive Systems are self-organising and provide the best fit with the environment through feedback mechanisms. Temporary power plants have control mechanisms that provide flexibility in their supply scheme in that they can be loaded, unloaded, follow demand profiles and their maintenance scheduled in order to optimise availability and operation with transmission system operators.

Third, Complex Adaptive Systems co-evolve to the edge of chaos to take advantages where maximum creativity, diversity and variety exist. Thus when their environments change, the entities co-evolve and change the environment. This is a continuous process of co-evolution. Sub-Saharan Africa is beleaguered with power

Specific characteristics of complex adaptive systems and the fit of free agents in the form of temporary or rental power solutions are emphasised to describe system performance potential.

Majid Zahid, Group President-Energy, Zahid Group (Parent company of Altaaqa Global) accepts the ISO 50001:2011 certification from TÜV Nord.

shortages, but the availability of various fuel types offers fuel diversity and, combined with rental power technologies for operational schemes, can change the power supply landscape providing advantages to the national utility or to end-users who invest in distributed generation. The national utility can take advantage of the surplus increase and availability of outputs and end-users can benefit from load management incentives, electricity price hedging, profitable power sales, critical process protection and energy efficiency. This leads to positive outcomes for both entities in the respective industry in which they operate, as nested systems.

Fourth, Complex Adaptive Systems are nested systems and together with their environment, form a subset of another Complex Adaptive System. Similarly, the power supply network of each country is a subset of the regional power pool that further influences other environments, namely industry and economy, cross-border power trade and economic activity. The interconnectedness of nested systems results in adaptation and resilience. Local efficiency of the system is sometimes compromised at a local level as rental power solutions come with tariff premiums. However, it should be understood that Complex Adaptive Systems can sometimes reduce efficiency at a local level for greater system effectiveness as increasing electrification is fundamental to increasing a nation's gross domestic output.

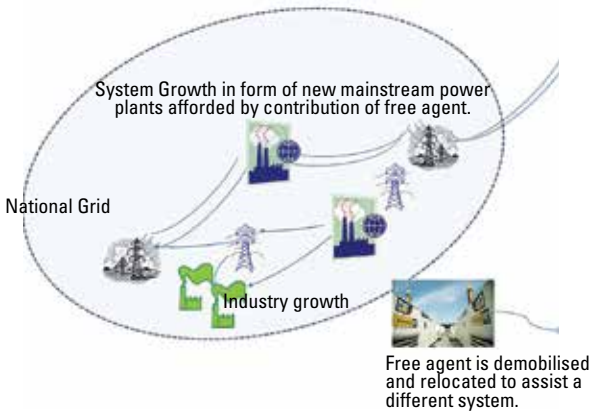

Figure 3: Free agent demobilised after system infrastructure and performance has increased.

Conclusion

Parastatals need to recognise the potential contribution of free-agents represented by fast-track technology and solutions for provision of power that would aid system performance. In regions where system disturbances are highly visible in the form of restricted power supply and investment constraints due to capital shortages, the Complex Adaptive System perspective provides good sense for allowing adaptation through rapid response in terms of delivering temporary or rental power solutions. Given the current limited level of decentralisation, it is important that overarching policy is written so that system performance is not hindered. The complex adaptive system theory could thus provide effective blueprints to develop appropriate frameworks for public sector organisations to formulate policies that encourage an increase in private sector participation with well–oriented support mechanisms for independent power producers.

TAKE NOTE!

1. A free agent is an external entity that is introduced into a system.
2. Free agents can enter a system and assist in improving system performance.
3. Complex Adaptive Systems constantly adapt to internal interactions and their external environment based on relationships, emergence, patterns and iterations.

<<AUTHOR>>

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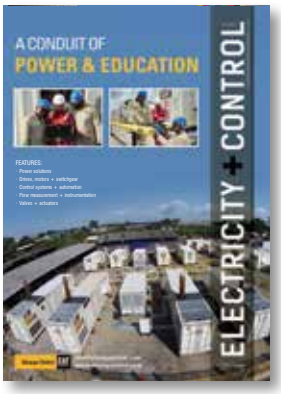

Altaaqa Global

A Conduit of Power and Education

How Altaaqa Global and Caterpillar promoted economic and social progress in Cameroon by bringing electricity and transferring knowledge to local technicians.

Douala, Cameroon's economic centre and most populous city, was facing challenges in meeting the electricity demand of its residents, businesses and industries. The city's existing power infrastructure was unable to cope with the increased demand for electricity.

As a result of this, load shedding was implemented in the city. The regular power interruption brought inconvenience and health and safety risks to residents and financial and opportunity losses to businesses and industrial operations.

In recognition of the urgency of the situation, the government of Cameroon and the country's integrated power utility provider Eneo sought for immediate solutions while long-term energy plans were being developed and carried out.

Thus, Altaaqa Global, together with natural gas supplier Gaz du Cameroun (a subsidiary of Victoria Oil & Gas), approached Eneo and presented a case for fuel-efficient and cost-effective rental power solutions. Recognising the potential of the proposal to help immediately resolve the power shortage in the city without putting additional financial burden to Douala's residents and businesses, Eneo agreed to hire the services of Altaaqa Global.

We installed two natural gas power plants with a combined capacity of 50 MW. The power plants were installed and powered on in only 21 days from the day the equipment arrived at the agreed sites. To date, the plant has continuously provided supplemental electricity to Douala, making it possible for the city to bridge the difference in power demand and supply.

We, however, did not only bring electricity to Cameroon; we also transferred technical knowledge and skills to our customer's local technicians by hiring and training them and letting them work in our sites alongside our in-house engineers. We believe that training the local technicians in operating and maintaining gas power plants will allow them to actively participate in the development of their country's power industry and, thus, perpetuate the economic and social development promoted by the country's long-term power projects and our rental power plants.

Our customer training program comprised classroom teaching conducted by our Service Managers, on-the-job mentoring with our in-house engineers and technicians, and on-line learning through Caterpillar University, Caterpillar's own online training platform.

The first batch of trainees graduated in late March 2017. They received a Level 1 Preventive Maintenance certification, and are now eligible to advance to the next level of training.

Through the training program, our customer's technicians were able to modernise their technical knowledge and skills, and are now playing vital roles in operating Eneo's own power plants, helping bring electricity to the more than 2 500 000 residents and businesses of the city.

H.E. Atangana Kouna Basile, Cameroon's Minister of Water Resources and Energy (Centre) at the inauguration of the natural gas power plants.

Recognised energy-efficiency

Our natural gas power plant in Douala was certified energy-efficient in accordance with ISO 50001:2011 standards. ISO 50001:2011 specifies requirements for establishing, implementing, maintaining and improving an energy management system to enable an organisation to follow a systematic approach in achieving continual improvement in energy performance within its operations and projects. Altaaqa Global is a pioneer rental power plant provider to have been granted this certification.

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Stable power supply
National intervention essential

Ken Robinson, Managing Director-Resources and Associate Director at Accenture and speaker at the upcoming **POWER-GEN & DistribuTECH Africa**, says South Africa's generation crisis is largely under control, but that power supply challenges loom in distribution. "The bulk of this distribution problem lies with municipalities."

Robinson believes the situation demands national intervention. "The maintenance backlog is largely due to institutional capacity and funding, so steps should be taken at a national level to address those issues." He proposes that if the biggest challenge lies in skills, a process be initiated by NERSA whereby the electricity distribution licences of the worst performing municipal distributors be cancelled, and Eskom be tasked with supplying those failing municipalities. "If the key issue proves to be capital, we need to look to private sector capital. We saw private sector successfully engaged on the renewables programme, so there is no reason private sector investment could not be secured for municipal power investments, provided there is an assurance private sector investors would be paid."

South African National Energy Division Institute (SANEDI) CEO Kevin Nassiep believes optimising utilities and the grid itself could go some way to assuring sustainable power supplies in South Africa. "We need to effectively harmonise our energy systems, achieve the right energy mix, and look to best practice in optimising the value utilities can create. South Africa's power market missed an opportunity to privatise, which would have led to greater efficiencies", he says.

Enquiries: Leigh Angelo. Email leigh@tradeprojects.co.za

POWER-GEN & DistribuTECH Africa 2017 will take place from 18 – 20 July at the Sandton Convention Centre.

Inverters to be installed in solar plants in India

GE Energy Connections is partnering with **Solairedirect**, a subsidiary of Engie, to equip its plants with 140 MW of LV5 1 MW solar inverters as well as a 25 year, Long-Term Service Agreement (LTSA). Inverters will be installed in two solar plants with 70 MW capacity each. Included in the service agreement is the provision of parts when needed and the required man-hours for repairs and maintenance for these two plants.

The right technology is key to the plants' success, but ensuring that the technology can continue to keep performing to the desired standard is arguably just as important. GE's LTSA ensures high availability and high energy output of the plant. Thanks to the service agreement, the customer can benefit from improved project bankability and reduce the total cost of ownership throughout the lifespan of the two solar plants.

"In an ever more competitive solar industry, service becomes the differentiator. Thanks to the LTSA provided by GE, lifetime support is guaranteed for our two plants. We are confident in the knowledge that we will be able to continue efficiently supplying solar-fuelled power. We look forward to continuing to work with GE," comments by Solairedirect.

Enquiries: Email wenlin.jin@ge.com

Off-grid solutions power Africa

With more than 600 million people in Africa lacking access to lean, affordable, reliable energy, new technological developments such as off-grid solutions are becoming increasingly important. **Cummins Power Generation** specialises in the design and manufacture of pre-integrated generator sets from 8 kVA to 3 300 kVA.

Off-grid solutions are based on the specific needs of the operation or application in question, classed generally as either 'standby' or 'prime'. 'Standby' provides power in the event of grid failure, which means the duty is far lower. A light application, for example, would require a generator designed for around 20 to 40 hours of operation a month.

'Prime' solutions are entirely separate from the national grid, and supply load power on a 24/7 basis. "This option requires considerably better planning and far greater investment, as the entire outcome of the operation depends on the power supply," Cummins Power Generation Director Kenny Gaynor comments.

"The genset needs to be specified precisely. This means the most important aspect to take into consideration is the Original Equipment Manufacturer (OEM) or supplier. Product quality, parts availability, aftersales service, and technical capability are paramount to success." Gaynor stresses.

Enquiries: Sal Govender.
Email sal.govender@cummins.com

Cummins Power Generation Director, Kenny Gaynor.

EPG Services to move into Africa

Vert Energy is set to further expand its Electric Power Generation (EPG) services to generator set builders and end users throughout Africa.

"Vert Energy provides a standby and power solutions service to companies and communities, even those in the most isolated regions. Through an extensive range of quality branded EPG products, supported by a skilled team of technical experts, the company plays a major role in providing dependable power in areas that are off-grid and where power supply is not constant, or reliable," says Vert Energy's managing director, Grant Robertson. "Vert Energy teamed up with the DEIF Group over three years ago as exclusive distributors in sub-Saharan Africa, of DEIF generator controls, known globally for critical power and decentralised power applications.

"This partnership has been boosted with the recent appointment of Gaëtan Floriach, a highly qualified DEIF engineer, who is based at Vert Energy in Johannesburg for a two year period, to further develop DEIF business in Africa.

"Apart from the supply and support of power generation components for diesel and gas engines, Vert Energy's service focuses on companies investing in alternative sources of electricity production, particularly solar power.

"The growing trend to utilise environmentally-friendly photovoltaic (PV) technology to convert solar energy to electricity, requires dependable power generation systems, which need to be supported by technically competent skills.

Enquiries: Ryan Robertson. Email ryan.robertson@vertgroup.co.za

Dry-type transformers now in Africa

David Claassen, managing director of Trafo Power Solutions.

According to **Trafo Power Solutions** managing director, David Claassen, dry-type transformers are safer and more efficient than their oil-filled equivalents, factors that make them a cost effective and versatile choice in a range of applications and sectors.

"The high safety rating of dry-type transformers allows them to be installed indoors, avoiding the cost and inconvenience of the special structures normally required to accommodate the safety and environmental hazards related to oil-filled units," says Claassen. "Dry-cooled transformers are categorised as F1 in terms of international fire resistance ratings, making them low-risk as they are self-extinguishing and flame-retardant by nature," he says.

The technology also serves a growing demand for more energy -efficient solutions, especially as the price of electricity has risen dramatically in South Africa and many economies on the continent.

Less maintenance is another advantage; dry-type transformers are low in maintenance and could last for 25 years without significant attention, while oil-filled transformers require regular maintenance including oil sample analysis to ensure operational consistency and safety.

Enquiries: Tel. +27 (0) 11 325 4007 or email david@trafo.co.za

Applying Speed Reducers to Mechatronic Systems

Glyn Craig, Techlyn

The term mechatronics unites various engineering disciplines such as mechanics, electrical, electronics and computer engineering.

At the forefront of successful designs lies the correct specification of the mechanical components used. This article concentrates on the key interface, the speed reducer which couples a driving motor to a driven load.

Speed reducer functions

- Match motor top speed to load
- Match motor rotor inertia to load inertia
- Isolate drive from load environment

From this, it will become apparent that reducer selection is not a trivial process.

Reducer types

- Convert motor rotary motion to linear motion. Many machines such as machine tools and gantry robots require this type of motion. The required speed conversion is always part of the process. Common methods include leadscrews, rack and pinions, belts and chains
- Drive rotary loads with suitable speed change. Applications include rotary tables, machine spindles and robot arms. Apart from gearhead boxes, motors can drive loads via belts (usually toothed) or chains

Linear drives

A small number of applications suit the use of linear motors. The moving carriage interacts with stationary guideway magnetically. At present, applications are restricted to high speed low inertia systems such as pick and place machines.

Leadscrews

These are widely used to convert rotary input to motion linear displacement.

- *Figure 1* shows a typical leadscrew arrangement. Screws are usually steel (ferrous or stainless) with nuts made from bronze or self-lubricating plastics such as Acetal. The screw thread can be rectangular, but trapezoidal types are more common. Efficiencies are in the range of 35% to 80% depending on material used and lubrication.
- *Figure 2* shows a ballscrew and nut. In this case the sliding contact between the screw and the nut is replaced by the rolling action of the recirculating balls in the nut. Efficiencies are now in the range of 85% to 95%

Figure 1: Lead screw.

Figure 2: Ball screw.

Rotary speed reducers

Gearboxes perform the same functions of speed and inertia matching. Common gearbox types, include worm and wheel, spur gears and (for robots) harmonic. Belt (tooth type) and chains have their place as well. *Figure 3* shows a spur gearbox. The gears could be straight cut or helical and typically run in an oil bath.

Figure 3: Spur gearbox.

Figure 4 shows a worm gear box. The reduction ratio is the number of worm teeth divided by the number of starts on the worm gear. The term of starts refers to the number of threads on the screw.

Figure 4: Worm gearbox.

A normal threaded bar, for instance, has one start. Thus reductions up to 100:1 in a single stage are possible.

All of the above suffer from one major disadvantage, i.e. lost motion, also known as backlash. This often results in a serious disadvantage as the output shaft position is indeterminate. There will be more on this subject. The following two gearbox types address the backlash problem very well.

Figure 5 shows a planetary gearbox. This is the generic term but this system is also known as Epicyclic Gearing. Construction consists of four parts:

- The inner or driven gear, also known as the sun gear. It is connected to the input shaft
- A fixed outer internal gear (teeth on the inside). Also known as a ring gear
- In between the ring gear and the sun gear are the three planetary gears which mesh with both ring and sun gears
- The three planetary gears are carried by the carrier or spider. The planetary gears are free to rotate and the carrier is connected to the output shaft

Figure 5: Planetary gearbox.

Multiple gearsets can be driven in tandem and ratio per stage is generally in the range of 2:1 to 5:1. Backlash is often as low as 10 arc minutes and output torque for a given volume is high due to the multiple meshed gears. The output shaft is co-axial with the input shaft i.e. in the same straight line.

TAKE NOTE!

1. Mechatronics is a mixture of different disciplines.
2. System parameters need to be defined before components can be chosen.
3. Component choice is an iterative process.

Figure 6: Harmonic gearbox.

There are three parts:

- A cup shaped flexible spline with external teeth which drives the auto output shaft
- A ring gear
- A driven wave generator

As the input shaft rotates, the wave generator eccentric action forces a portion of the spline into mesh with the ring gear. Motion is imparted because the spline typically has two less teeth than the ring gear. Each turn of the wave generator moves the spline two teeth relative to the ring gear. This process is analogous to a Vernier scale where only one mark can line up at a time.

Output torque is high due to the relatively large number of meshed teeth, and backlash is minimal.

This all comes at the expense of relativity high friction and the need for special lubricants.

Figure 7 shows a slewing ring which usually applied together with the harmonic gearbox. The slewing ring imparts high rigidity in a compact space and is seen, almost without exception, in the joints of robotic articulated arm robots.

Figure 7: Slewing ring.

Matching motors and linear drive systems

Previous articles have touched on this subject in an application specific way. A more systematic general approach follows.

Velocity, torque, power and inertia

These quantities define servo size and performance. The speed reducer provides the interface to the driven load and ensures that the correct motor size has been chosen.

Velocity

Maximum velocity of a motor is generally in the range of 2 000 – 4 000 RPM (Revolution Per Minute). In the case of *stepper motors*, maximum usable velocity is around 600 RPM. This is because delivered torque *decreases* with increased velocity.

Torque

Brushless servos have substantially constant torque throughout their velocity range. Brushed servos are not capable of simultaneous top speed and maximum torque. This constraint is due to high wear of the brush gear.

Both of the foregoing motors are capable of much greater peak torque for short periods. This can be an advantage when the load only requires high torque during acceleration or deceleration. Resultant heating sets a time limit.

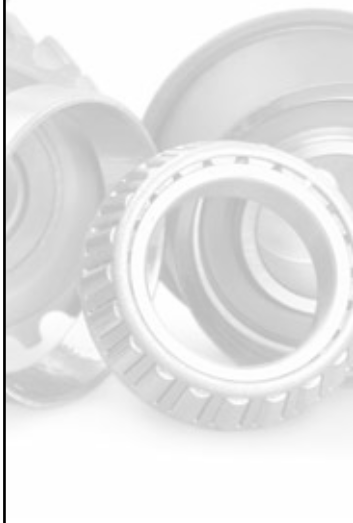
Peak torque in *stepper motors* should be restricted to 60% of available torque. This is due to the possibility of abrupt de-synchronisation of the motor and consequent loss of commanded position. This is offset by the inherent much higher torque delivery at speeds below 600 RPM, compared to a servo motor.

Power

Power is the product of *velocity* and *torque*. A gearbox cannot increase motor power delivery. In contrast to conventional wisdom, *power* is the last parameter to be considered when sizing a system.

Inertia

Inertia is defined as the resistance of a body to any change in its state of motion. The force required to accelerate a body can be calculated from the body mass and the required acceleration.



Force = mass X acceleration. Note the use of *mass* and not *weight*. Therefore, in a weightless situation the above equation will apply. The equivalent electrical analogue is impedance. Rotational systems have *rotary inertia*.

This is easily calculated if the dimensions of the object and its density are known. The SI (Systeme International) unit for inertia is metre.kilogram^2 although kg.cm^2 is commonly used as results in more easily visualised numbers.

1 kg.m^2 = 10 000 kg.cm^2
A 3,4 inch stepper motor rotor is 1,2 kg.cm^2.

The inertia of the load needs to be matched to the driving motor's rotor inertia. Conventional wisdom states that a mismatch up to 10:1 is permissible. Note, that the reflected inertia is reduced by the square of the gearbox ratio. Thus, a 3:1 gearbox will reduce the reflected load inertia by 3 squared, which is then 9:1. This is the same as a transformer which changes load impedance by the square of the turns ratio.

Worked example

We conclude with a real life example.
A laboratory carousel carries 24 test tubes and has to position them one by one beneath a dosing needle.
The following information is available
Carousel dimensions:

- 300 mm diameter
- 10 mm thickness
- Material – aluminium

Friction of carousel: 0,1 Nm
Time available for move: 1 s
Positioning accuracy: 0,1^0
Move times are moderate, therefore a stepper solution will be used.

Step 1: *Calculate the load inertia:*
We use the empirical formula for an aluminium disc

$$J = D^4L/3\,800$$
$$= 30^4 \text{ X } 1/3\,800$$
$$= 213 \text{ kg.cm}^2$$

Where:
J = inertia in kg.cm^2
D = diameter (cm)
L = thickness (cm)
This value far exceeds the inertia of moderately priced motors.

Step 2: *Choose a possible speed reducer:*

- The required positioning accuracy is 0,1^0 (i.e. 360/0,1 = 3 600 increments per revolution)
- If we base the ratio on a motor resolution of 200 steps per rev. (1,8^0), the required ratio = 3 600/200 = 18:1. This is a popular worm gearbox ratio
- The motor can then be half stepped (400 steps/rev) or quarter stepped (800 steps/rev) to give additional smoothness and correct small errors
- Assuming a maximum motor speed of 10 rev/sec (600 rpm), the table will rotate at 600/18 = 33,3 rpm which is more than fast enough

Step 3: *Select a suitable motor. The load inertia is reduced by the square of the ratio.*
Reflected inertia = 213/18^2
= 0,66 kg.cm^2
This looks like an encouraging number. Referring to a motor catalogue reveals that a single stack 34 frame motor has a rotor inertia 0f 0,6 kg.cm^2.

This is a popular, moderately priced motor. Available torque is 1,2 Nm, which is more than adequate.

The reflected inertia should not exceed the motor rotor inertia of a stepper by more than about 10:1, as this gives rise to resonance problems.

In this case, the worm gearbox will also have high internal friction, and this slightly oversize motor will ensure that there is adequate torque available.

Very often an iterative process is needed where steps 2 and 3 above are repeated until a satisfactory compromise is reached.

Conclusion

After all this we see that speed reducer selection is not a simple process.

At the forefront of successful designs lies the correct specification of the mechanical components used.

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ABBREVIATIONS

MCC – Motor Control Centre
VFD – Variable Frequency Drive

Motor Control Centres
How They Work

Johan Basson, JB Switchgear

Motor Control Centres (MCCs) have been around since the 1950s when they were first used by the car manufacturing industry, which needed many electric motors.

TAKE NOTE!

1. An MCC is a panel that works as a motor starter for several automated or semi-automated machines.
2. An MCC can include Variable Frequency Drives, programmable controllers and metering.
3. MCCs control everything through a centralised system.

Essentially, an MCC is a type of filing cabinet.

Think about what happens when you switch on your kettle in the morning. Apart from the encouraging noises it makes, indicating that coffee is not far away, all kinds of clever things are going on inside the kettle's electrical circuitry.

Every electric motor has a controller, and these controllers differ in complexity and number of features depending on the job they need to do. In the case of your kettle, the controller is the on/off switch, and you manually operate it so that your kettle can perform its very important task.

Now imagine you had to make a thousand cups of coffee, and needed to switch on 500 kettles all at the same time. Not easy. In fact, pretty impossible. This is why MCCs are such vital pieces of equipment, controlling everything through a centralised system.

In its simplest application, an MCC is a panel that works as a motor starter for several automated or semi-automated machines. Comprising one or more enclosed sections with a common power bus, an MCC can include variable frequency drives, programmable controllers and metering. Essentially, they are a type of electrical 'filing cabinet,' with 'drawers' full of lighting contactors, combination starters and other electrical control and distribution products. Each section, or motor controller, of the cabinet has a built-in safety mechanism to protect the motor. These can be solid-state overload protection relays, fuses or a circuit breaker, and there is usually a disconnecting switch as well to isolate the motor circuit.

While they were first used in car manufacturing, today MCCs are found in numerous commercial and industrial applications, specifically where there are multiple, remotely controlled loads linked to a central control point.

Conclusion

Modern MCCs offer a host of benefits, including:

- **Reduced downtime:** Standardised sections mean a simpler design, so operators require less operational training. Plug-in units can be easily swapped out for maintenance or replacement, and the inherent isolation of MCC units means they can safely be serviced individually, within legislated guidelines, without switching off adjacent units
- **Quicker, cheaper installation:** MCCs have their own factory-wired and tested units and power buses, so field wiring and testing are minimised
- **Flexibility:** MCCs can be easily expanded by adding new units and sections
- **Space saving:** Much more compact than mounting individual devices

JB Switchgear is known in the industry for designing and manufacturing high quality switchgear solutions that meet the latest national and international safety and performance standards.

The company offers a comprehensive range of fixed, de-mountable and withdrawable MCCs, so talk to us about how we can help you get the solutions you need.

<<AUTHOR>>

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Precision balancing of rotors

As the operator of the largest independent high speed dynamic balancing machine in sub-Saharan Africa, **Marthinusen & Coutts**, a division of **ACTOM**, has an in-depth understanding of the importance of precision-balancing rotating machines.

Mike Chamberlain, marketing and commercial executive, points out how critical it is to ensure the highest degree of accuracy when balancing rotating machines as this will minimise vibration levels thereby increasing reliability and reducing maintenance costs.

The 32 ton Schenck HM7 U/S balancing machine is in constant use. "Our customers, which include major local and international OEMs, benefit significantly through access to an independent balancing service offering with this level of capacity and quality."

The HM7 U/S balancing machine has a measuring range between 100 and 5 000 r.p.m. It is nine metres long, has a journal size of 400 mm and a swing of 2,4 metres. The machine is fitted with a CAB 920 H computer measuring system with advanced functionality.

"This state-of-the-art technology makes changeovers to new rotor types quick and straightforward, and the machine is capable of balancing larger high-speed rotors dynamically at full operating speed," Chamberlain says.

Enquiries: Richard Botton. Email richardb@mandc.co.za

High efficiency motors – BIG cost savers

As Africa's mines work to hold down costs and extract more value from their assets, modern high efficiency motors from **Zest WEG Group** are helping to cut energy bills and maintenance.

Almost two-thirds of the power consumed by the mining sector is associated with electric motors, so these items of equipment are important for mines to look at when demanding savings, according to Zest WEG's Group African business development executive, Edson Cristofolini.

"Where an old 55 kW motor is operating 24 hours a day and seven days a week, we estimate that a mine can save over to 20 MW a year by replacing it with a new WEG Top Premium Efficiency IE3 motor," says Cristofolini.

- Apart from reducing energy consumption, the WEG IE3 motors also contribute to mine profitability through their long life, low maintenance and reliability
- An important aspect of the design in the WEG Top Premium Efficiency IE3 range, for instance, is the Class H Insulation with Class B temperature rise
- This provides a buffer of 60°C between the motor windings average operating temperature and the actual motor insulation capability, protecting the motor where quality of power varies or where ambient temperatures are very high
- This robust design also provides a service factor of 1.15, allowing a motor to be overloaded by up to 15% continuously without compromising reliability
- Lower bearing temperature means that less grease is used, and the intervals between the re-greasing of bearings are longer
- Dust and water ingress is prevented by the unique WEG W3 Seal arrangement, which comes with an IP66 rating

Enquiries: Kirsten Larkan. Tel: +27 (0) 11 723 6000 or email marketing@zestweg.com

Edson Cristofolini, Zest WEG Group African Business Development Executive.

Three new 200 kV substations for rural Rwanda

Efacec has been chosen by the winning consortium of the international tender launched by the Republic of Rwanda for the construction of three new 200 kV substations. These infrastructures are essential to distribute power to the country's rural areas, such as Rwabusoro, Mamba e Rilima. The technical abilities and skills of Efacec's High Tension Substations area was the reason behind being chosen by the tender's winning company – STEG International Services, from Tunisia – to implement the project of engineering, supply, supervision and commissioning of the three new substations on a turn-key basis. This contract is worth approximately €10,5 M and has an 18 months' execution deadline.

This construction work will be fundamental to give flow to the 80 MW produced in Mamba's Biomass Power Station for the national electricity grid. Currently only 25% of Rwanda's households have power. This project is part of the government ambition to bring electrical energy to 70% of Rwanda's families, until 2018.

According to Ângelo Ramalho, Efacec's CEO, "Being chosen for this project attests, once again, Efacec's skills.

Enquiries: Email JoaoSeabra@LPMcom.pt

Latest French technology on show

EM, a specialised direct importer and wholesale distributor of high-end industrial electrical products, motor control switchgear and electronic automation products, is the exclusive distributor for Socomec in South Africa.

The company exhibited as part of the French Pavilion at African Utility Week 2017, Socomec Technical Sales Engineer Yoann Guinamant highlights. Socomec is of particular interest to the utility sector due to products such as the DIRIS Digiware system, described as an innovation hub to facilitate connection and configuration.

"EM takes pride in supplying only the best technology possible for the diverse industries it targets. Our DIRIS Digiware is the most effective solution for metering consumption and monitoring the quality of electrical energy," Guinamant stresses.

In terms of power management and optimisation, the system allows for optimal control of an electrical network. It manages consumption, and monitors power and electrical events, with its high level of accuracy guaranteed by its compliance with IEC 61557-2, across a wide range of sensors (Class 0.5), from 2% to 120% of rated current for the global measurement chain.

Enquiries: Tel. +27 (0) 11 249 5000 or email info@em.co.za

Miniature, integrated circuit transducers for ac and dc isolated current measurement

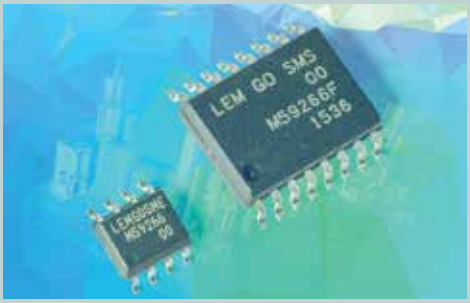
LEM has expanded its miniature, integrated circuit transducers range for ac and dc isolated current measurement up to 300 kHz with the introduction of the GO series. These new components offer full isolation, despite their small size, by integrating the primary conductor for nominal current measurements of 4 A, 6 A, 8 A, 10 A, 12 A, 16 A, 20 A or 30 A with a measurement span of 2,5 times the nominal current . Products in the GO series are able to support high overload currents up to 200 A peak for short durations (1 ms).

Available from **Denver Technical Products**, the transducers are mounted directly onto a printed circuit board as SO8 or SO16 SMD devices, reducing manufacturing costs and providing much needed space saving for space-constrained applications.

GO models are simple to use as they integrate low resistance primary conductors (minimising power losses) within a proprietary ASIC to allow direct current measurement and consistent insulation performance, while still providing high creepage and clearance distances.

Standard models provide an analogue voltage output with different sensitivity levels according to the models to achieve an output voltage of 800 MV @ IPN for 5 V versions and 500 MV @ IPN for 3,3 V versions. Ratiometric output is also an option though dedicated models.

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



Africa's largest rotor pole refurbishment

In probably the largest repair of this nature in Africa, **Marthinusen & Coutts**, a division of **ACTOM**, recently refurbished 11 of the full set of 14 rotor poles of Motor Generator Unit 3 at Eskom's Ingula Pumped Storage Scheme on South Africa's Drakensberg escarpment. The rotor poles were extensively damaged during a fault condition at the station, and the return to service of the unit was of national importance. Working closely with stakeholders, an extensive local programme of testing, dismantling, inspection and repair was conducted by Marthinusen & Coutts within extremely tight time frames to accommodate the criticality of the project.

A technical audit confirmed that facilities at both Marthinusen & Coutts' 8 000 m² main workshop at Cleveland, Johannesburg, and its 12 000 m² Benoni Power Generation division were indeed up to the daunting task. All 14 main rotor poles were then collected from Ingula Pumped Storage Scheme and dispatched to the Benoni works using Marthinusen & Coutts' in-house transport. Each pole weighed 12 tons with the coil alone weighing in at over two and a half tons.

It was vital that Marthinusen & Coutts determined not just the electrical status of the windings, but the health and physical integrity of each entire rotor pole (body and coil). They were therefore subjected to insulation resistance and inter-turn insulation tests, comprising both impulse and power frequency inter-turn insulation tests. Extensive visual inspections were also conducted. The test results were analysed, resulting in the decision to refurbish 11 of the 14 poles; two coils were accepted as healthy and the station owned a spare universal coil.

To facilitate the grinding procedure necessary to remove the support side brackets from the main rotor poles, a customised heavy duty jig was manufactured. After the severity of the damage was determined, various techniques and repair concepts were tabled and discussed in great detail. It was finally agreed that the coils be stripped of their existing inter-turn insulation layers and the coils be reinsulated, heat cured using 2 500 Amps, including pressing at up to 1 000 tons, and reassembled to the main poles. To fast track the process, Marthinusen & Coutts prepared custom parallel operations at their two facilities; separating the dirty and clean processes with full clean conditions areas for the critical pressing and heat curing processes.

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M12 connector with connection technology for all applications

The M12 connectors for assembly from **Phoenix Contact** have now been equipped with push-in connection technology. Rigid conductors and conductors with ferrules can be wired easily and without using tools by means of direct insertion. The contact point does not have to be opened first. To connect fine-stranded litz wires and release a connected conductor, the terminal point is simply opened using the colored lever. A new product range with crimp connection adds to the connector portfolio. These are compact and particularly suitable for the requirements of the rail industry. Together with Quickon, Piercecon, and screw connection, Phoenix Contact offers all common connection technologies for shielded and unshielded applications. The customer can therefore, according to the application in question, choose the right connection technology for the transmission of data, signals, and power.

Enquiries: +27 (0) 801 8200 or email info@phoenixcontact.co.za

New condition monitoring app

WearCheck Managing director, Neil Robinson, believes that the company is one of a handful of condition monitoring companies in the world, and possibly the first in Africa, to develop and launch an app of this nature. He is confident it will substantially improve customers' benefits from their condition monitoring programme by allowing them to make virtually instantaneous maintenance decisions based on reliable data which is highly accessible. WearCheck customers can now download WearCheck Mobile and, at their fingertips via their mobile device, access a host of critical information pertaining to machinery condition. This data is immediately available even while patrolling the factory floor or inspecting mining machinery on-site. WearCheck's IT manager, Eddie Perumal, outlines some of the app's features.

- It has been designed it to be intuitive and logical, allowing for ease of use by all generations
- All data is secure and the login process uses the same username/password credentials as our WearCheck Online website. Those customers registered on the website can start using the app immediately
- Once the app is downloaded, customers can access reports and view their current samples list. As an optional feature, this keeps track of unread web/app reports, and notifications about items on this list are sent out as reminders
- Sample reports can be viewed on the mobile device as either one page ('concise'), or two page ('full') pdf documents
- Sample data can be submitted, either via the equipment/component search option (recommended), or via the 'submit samples' option, where equipment/component verification is needed for currently-listed machinery. Where applicable, new equipment/components information is created in the WearCheck system. Customers can also view their five-day submission history
- One of the highlights and unique features of the app is the interactive key, where customers can ask a diagnostician about a specific sample, and receive an emailed reply on their mobile device

Perumal says: "Another useful feature is the ability to enter feedback about a sample result, component condition or maintenance event. Various search options and filters are available, including sample history and equipment or component searches." The free app is compatible with both Android and Apple (iOS) mobile devices, and is available on Google Play Store or the Apple Store. Simply type 'WearCheck Mobile' into the search bar to locate the app.

Enquiries: Tel. +27 (0) 31 700 5460 or email softwaresupport@wearcheck.co.za

WearCheck IT manager, Eddie Perumal, shows off some of the devices onto which the brand new WearCheck app has been downloaded.

Open, Highly Scalable **Control Technology** for **EnviroFicient** Retreading Plant

Stephan Ziegler, Beckhoff

This innovative plant combines bus and truck tyre retreading with a rubber recycling system.

TAKE NOTE!

1. The benefits for universal OPC UA communication are clear.
2. It will increase the flexibility and efficiency of overall production.
3. This tyre retreading plant benefitted by using the UA system with PC-based control technology.

In 2013, Continental Reifen Deutschland GmbH opened the sustainable ContiLifeCycle (CLC) plant in Hannover-Stöcken, Germany, which combines bus and truck tyre retreading with a rubber recycling system. As a result, the company was not only able to establish the innovative production process for tyre retreading, but also to enhance raw materials utilisation significantly. A major contributor to the efficiency of the new plant is its universal automation system with PC-based control technology from Beckhoff, featuring optimal scalability and standard connectivity for Industry 4.0.

The new process for buffing, rebuilding and curing tyres in a sustainable and resource-efficient manner represents a huge step forward in the retreading business for Continental and the industry as a whole. Retreading extends the useful lifecycle of the tyres, saves resources and reduces vehicle fuel consumption and CO_2 emissions by improving the rolling properties of tyres. These are significant competitive benefits, because reducing the fuel consumption of trucks and buses is just as important to our customers as the tread life of their tyres. After all, retreaded tyres account for about 40% of the market in the truck and bus segment.

Complete resource recycling

When a tyre is retreaded, the buffing process generates rubber granulate. In the past, the granulate was either disposed of or it was recycled into lower end products, such as filler material for rail ties. With a new process, 100% of the granulate is processed into high-quality raw ingredients for the new rubber mixture. This concept of reusing 100% of the granulate completes the ContiLifeCycle recycling process. The lifecycle of a tyre begins with its production, using raw materials like synthetic rubber, natural rubber or carbon black. Next, the tyre hits the road and, if desired, customers have the option of re-cutting the tread to get more miles out of their tyres. Once the tread is worn down, it comes to our CLC plant and is buffed. The granulate enters the mix production process after having passed through an innovative recycling test procedure to finally re-enter the production cycle. Then another tyre is retreaded with this mix.

The conditions were ideal for the construction of the new factory. The project was completed in only 12 months with roughly 200 Continental employees. We benefitted from the fact that R&D, quality management, mixing production, inspection, engineering and Continental Machinery – our own machine and system engineering company – were already on-site. This also generated many synergies. For example, we now fully analyse and evaluate each tyre that is sent to us for retreading. This provides the R&D department with valuable information that ultimately benefits the development of new tyres.

Universal control technology

Dr. Paul Malliband, Project Manager of Control and Drives at Continental, notes that the company was also able to apply its synergies and many years of control technology experience for ContiLifeCycle: "We employ PC-based technology from Beckhoff for all control systems in this plant. At the start of the CLC project in November 2012, we used four different controller types. However, to make the maintenance process as simple as possible and streamline the controller interfaces to the MES

ABBREVIATIONS

HMI – Human Machine Interface
IPC – Industrial Personal Computer
MES – Manufacturing Execution System
OPC UA – Open Platform Communications Unified Architecture
OPC DA - Open Platform Communications Data Access
PC – Personal Computer
PLC – Programmable Logic Controller

The C6650 control cabinet IPC provides ample performance to control even large multi-axis machines. (Image courtesy Beckhoff).

In front of the many control cabinets equipped with Beckhoff control technology, are: Dardan Zeqiri, 'Continental Tires'; Alexander Kruse, Beckhoff Hannover; Franz Stuefer, CLC; and Dr. Paul Malliband, Continental Reifen. (Image courtesy Beckhoff).

level, we decided to make PC-based control the standard system. In addition, Continental Machinery, the machine manufacturing business unit of Continental Tires, has used Beckhoff technology in production machines for many years, which provided us extensive expertise directly on-site."

Beckhoff C6925 and C6650 control cabinet Industrial PCs (IPCs) are used to control all 25 production machines. Malliband explains: "The PC-based control technology from Beckhoff is highly scalable to accommodate every individual application requirement. We use the C6925 predominantly for basic machinery like our vulcanising presses. The C6650 comes into play whenever more computing power is required. Examples include the multi-axis machines for attaching the tread strips to the tyre casing in the cold retreading process, or for layering the strips in the hot retreading process. The same applies for the HMI, where we use the proven CP7931 Control Panel with 12-inch touchscreen and an alphanumeric keyboard. This is supplemented with additional electromechanical keys where necessary, for example when a machine offers many application-specific motion control options.

MES connectivity via OPC UA

In line with Industry 4.0 concepts, the entire facility is fully networked and connected to management-level IT systems. This is where the openness of PC-based control really shines, according to Malliband: "Vertical integration, i.e. the communication with the SAP system that serves as an MES (Manufacturing Execution System), is implemented via OPC UA. Since all C6925 and C6650 Industrial PCs run an OPC UA client, they directly communicate with the SAP system. At the start of the project, Continental's standards called for OPC DA for this purpose. OPC UA had not been tested at the time, but it is currently being analysed for new production plants containing a large number of machines. We currently use several basic communication functions. The move to OPC UA positions Continental as a trailblazer in this area."

Conclusion

The benefits for universal OPC UA communication are already clear for Malliband: "It will increase the flexibility and efficiency of our production overall as envisaged in Industry 4.0 concepts. For example, we plan to scan the tyre barcode directly on the machine at the start of the retreading process and pass it on to the MES. The MES will then recognise the order for this specific tyre and return the appropriate processing recipe to the machine." Alexander Kruse, Key Account Manager at the Beckhoff Hannover office, adds: "The SAP system is closely linked with the control platform. Production data, such as the barcode data, or different production steps can be exchanged directly via OPC UA. Method requests directly from the PLC into the SAP system will also become more common in the future. This will speed up communications while freeing up processor capacity for other tasks."

A major contributor to the efficiency of the new CLC plant is its universal automation system with PC-based control technology from Beckhoff.

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10 Steps for Combatting DDoS in Real Time

David Holmes, F5 Networks,

To the uninitiated, a Distributed Denial-of-Service (DDoS) attack can be a scary, stressful ordeal. But don't panic. Follow the following steps to successfully fight an attack.

TAKE NOTE!

1. In the digital age, organisations need to prepare for cyber attacks.
2. Security must be scrutinised thoughout the company.
3. There are ten important steps to mitigate DDoS.

If you appear to be suffering a volumetric attack, it helps to have a historical sense of your own traffic patterns. Keep a baseline of normal traffic patterns to compare against. If you have determined that you are under a DDoS attack, record the estimated start time in your attack log. Monitor volumetric attacks. Remember to keep a monitoring web page open to indicate when the attack may be over (or mitigated). You will need to follow (up to) 10 steps for your DDoS mitigation:

1: Verify the attack

Not all outages are caused by a DDoS attack. DNS misconfiguration, upstream routing issues, and human error are also common causes of network outages. You must first rule out these types of non-DDoS attacks and distinguish the attack from a common outage.

- **Rule out common outages:** The faster you can verify the outage is a DDoS attack, the faster you can respond. Even if the outage was not caused by a misconfiguration or other human error, there may still be other explanations that resemble a DDoS attack
- **Check outbound connectivity:** Is there outbound connectivity? If not, then the attack is so severe that it is congesting all inbound and outbound traffic. Check with your usual diagnostic tools (such as traceroute, ping, and dig) and rule out all such possibilities
- **Rule out global issues:** Check Internet weather reports, such as Internet Health Report and the Internet Traffic Report, to determine if the attack is a global issue.
- **Check external network access:** Attempt to access your application from an external network. Services and products that can perform this kind of monitoring include: Keynote testing and monitoring, HP SiteScope agentless monitoring, SolarWinds NetFlow Traffic Analyser, and Downforeveryoneorjustme.com
- **Confirm DNS response:** Check to see if DNS is responding for your website. The following UNIX command resolves a name against the OpenDNS project server: % dig @208.67.222.222 yourdomain.com

2: Contact team leads

Once the attack is verified, contact the leads of the relevant teams. If you have not filled out any quick reference sheets or a contact list, create one now or use our templates. When an outage occurs, your organisation may hold a formal conference call including various operations and applications teams. If your company has such a process in place, use the meeting to officially confirm the DDoS attack with team leads.

- **Contact your bandwidth service provider:** One of the most important calls you can make is to the bandwidth service provider. List the number for your service provider in your contact sheet. The service provider can likely confirm your attack, provide information about other customers who might be under attack, and sometimes offer remediation
- **Contact your fraud team:** It is especially important to invoke the fraud team as soon as the attack is verified. DDoS attacks can be used as cover to hide an infiltration. Logs that would normally show a penetration may get lost during a DDoS attack. This is why high-speed, off-box logging is so important

ABBREVIATIONS

ADC – Application Delivery Controller
CAPTCHA – Completely Automated Public Turning test to tell Computers and Humans Apart
CPU – Central Processing Unit
DDoS – Distributed-Denial-of-Service
PDF – Portable Document Format
SSL VPN – Secure Sockets Layer Virtual Private Network
TCP – Transmission Control Protocol
VPN – Virtual Private Network

3: Triage applications

Once the attack is confirmed, triage your applications. When faced with an intense DDoS attack and limited resources, organisations have to make triage decisions. High-value assets typically generate high-value online revenue. These are the applications you will want to keep alive. Low-value applications, regardless of the level of legitimate traffic, should be purposefully disabled so their CPU and network resources can be put to the aid of higher-value applications. You may need the input of team leads to do this.

Ultimately, these are financial decisions. Make them appropriately. Create an application triage list; it takes only a few minutes to fill one out, and will greatly assist in making tough application decisions while combating an actual DDoS event. Decide which applications are low priority and can be disabled during the attack. This may include internal applications.

4: Protect partners and remote users

- **Whitelist partner addresses:** Very likely you have trusted partners who must have access to your applications or network. If you have not already done so, collect the IP addresses that must always be allowed access and maintain that list. You may have to populate the whitelist in several places throughout the network, including at the firewall, the Application Delivery Controller (ADC), and perhaps even with the service provider, to guarantee that traffic to and from those addresses is unhindered
- **Protect VPN users:** Modern organisations will whitelist or provide quality-of-service for remote SSL VPN users. Typically this is done at an integrated firewall/ VPN server, which can be important if you have a significant number of remote employees

5: Identify the attack

Now is the time to gather technical intelligence about the attack. The first question you need to answer is "What are the attack vectors?" There are four types of DDoS attack types, these are

- **Volumetric:** Flood-based attacks that can be at layers 3, 4, or 7
- **Asymmetric:** Designed to invoke timeouts or session-state changes
- **Computational:** Designed to consume CPU and memory
- **Vulnerability-based:** Designed to exploit software vulnerabilities

By now you should have called your bandwidth service provider with the information on your contacts list. If the attack is solely volumetric in nature, the service provider will have informed you and may have already taken steps at DDoS remediation. Even though well-equipped organisations use existing monitoring solutions for deep-packet captures, you may encounter cases where you have to use packet captures from other devices, such as the ADC, to assist in diagnosing the problem. These cases include: SSL attack vectors and FIPS-140.

Organisations that focus on a holistic security strategy are considered forward-looking and ahead of the digital economy curve.

6: Evaluate source address mitigation options

If Step 5 has identified that the campaign uses advanced attack vectors that your service provid-

er cannot mitigate (such as slow-and-low attacks, application attacks, or SSL attacks), then the next step is to consider the following question: 'How many sources are there?' If the list of attacking IP addresses is small, you can block them at your firewall. Another option would be to ask your bandwidth provider to block these addresses for you.

- **Geoblocking:** The list of attacking IP address may be too large to block at the firewall. Each address you add to the block list will slow processing and increase CPU. But you may still be able to block the attackers if they are all in the same geographic region or a few regions you can temporarily block. The decision to block entire regions via geolocation must be made as a business decision. Finally, if there are many attackers in many regions, but you don't care about any region except your own, you may also use geolocation as a defence by blocking all traffic except that originating from your region
- **Mitigating multiple attack vectors:** If there are too many attackers to make blocking by IP address or region feasible, you may have to develop a plan to unwind the attack by mitigating 'backwards'; that is, defending the site from the database tier to the application tier, and then to the web servers, load balancers, and finally the firewalls

You may be under pressure to remediate the opposite way; for example, mitigating at layer 4 to bring the firewall back up. However, be aware that as you do this, attacks will start to reach further into the data centre.

7: Mitigate specific application attacks

If you have reached this step, the DDoS attack is sufficiently sophisticated to render mitigation by the source address ineffective. Tools such as the Low Orbit Ion Cannon, the Apache Killer, or the Brobot may generate attacks that fall into this category. These attacks look like normal traffic at layer 4, but have anomalies to disrupt services in the server, application, or database tier.

To combat these attacks, you must enable or construct defences at the application delivery tier.

Once you have analysed the traffic in Step 4, if the attack appears to be an application-layer attack, the important questions are: Can you identify the malicious traffic? Does it appear to be generated by a known attack tool?

Specific application-layer attacks can be mitigated on a case-by-case basis with specific F5 counter-measures. Attackers today often use multiple types of DDoS attack vector, but most of those vectors are around layers 3 and 4, with only one or two application-layer attacks thrown in. We hope this is the case for you, which will mean you are nearly done with your DDoS attack.

8: Increase application-level security posture

If you have reached this step in a DDoS attack, you've already mitigated at layers 3 and 4 and evaluated mitigations for specific application attacks, and you are still experiencing issues. That means the attack is relatively sophisticated, and your ability to mitigate will depend in part on your specific applications.

Asymmetric application attack: Very likely you are being confronted with one of the most difficult of modern attacks: the asymmetric application attack. This kind of attack can be:

- A flood of recursive GETs of the entire application
- A repeated request of some large, public object (such as an MP4 or PDF file)
- A repeated invocation of an expensive database query

Leveraging your security perimeter: The best defence against these asymmetric attacks depends on your application. For example, financial organisations know their customers and are able to use login walls to turn away anonymous requests. Entertainment industry applications such as hotel websites, on the other hand, often do not know

the user until the user agrees to make the reservation. For them, a CAPTCHA (Completely Automated Public Turning test to tell Computers and Humans Apart) might be a better deterrent.

Choose the application-level defence that makes the most sense for your application: A login wall, human detection or real browser enforcement.

9: Constrain resources

If all the previous steps fail to stop the DDoS attack, you may be forced to simply constrain resources to survive the attack. This technique turns away both good and bad traffic. In fact, rate limiting often turns away 90 to 99% of desirable traffic while still enabling the attacker to drive up costs at your data centre. For many organisations, it is better to just disable or 'blackhole' an application rather than rate-limit it.

- **Rate shaping:** If you find that you must rate-limit, you can provide constraints at different points in a multi-tier DDoS architecture. At the network tier, where layer 3 and layer 4 security services reside, use rate shaping to prevent TCP floods from overwhelming your firewalls and other layer 4 device
- **Connection limits:** Connection limits can be an effective mitigation technique, but they do not work well with connection-multiplexing features. Application tier connection limits should provide the best protection to prevent too much throughput from overwhelming your web servers and application middleware

10: Manage public relations

Hacktivist organisations today use the media to draw attention to their causes. Many hacktivists inform the media that an attack is underway and may contact the target company during the attack. Financial organisations, in particular, may have policies related to liability that prevent them from admitting an attack is underway. This can become a sticky situation for the public relations manager. The manager may say something like: 'We are currently experiencing some technical challenges, but we are optimistic that our customers will soon have full access to our online services'.

Journalists, however, may not accept this type of hedging, especially if the site really does appear to be fully offline. In one recent case, a reporter called a bank's local branch manager and asked how the attack was proceeding. The branch manager, who had not received media coaching, responded: "It's awful, we're getting killed!" If the DDoS attack appears to be a high-profile hacktivist attack, prepare two statements:

- **For the press:** If your industry policies allow you to admit when you are being externally attacked, do so and be forthright about it. If policy dictates that you must deflect the inquiry, cite technical challenges but be sure to prepare the next statement
- **For internal staff, including anyone who might be contacted by the press:** Your internal statement should provide cues about what to say and what not to say to media, or even better, simply instruct your staff to direct all inquiries related to the event back to the PR manager and include a phone number

Conclusion

Anton Jacobsz, managing director at Networks Unlimited, notes that it is the organisations focusing on a holistic security strategy that are considered forward-looking and ahead of the digital economy curve.

"In a digital age – where sensitive or personal information is at risk of being exposed, and where geo-location and sensor-based tools track movements – organisations need to be prepared for a cyber attack. It has become essential to scrutinise security throughout the entire operation and offerings in order to build the strongest cornerstones for establishing trust between company, employees and consumers," says Jacobsz.

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David Holmes is a senior technical marketing manager: Security at F5 Networks.

Precise object detection under extreme conditions

Ultrasonic sensors transmit and receive sound waves in the ultrasonic range. The object to be detected reflects the sound waves and the distance information is determined via time of flight measurement. As opposed to photoelectric sensors, colour, transparency or the object's surface shine do not play a role. Blister packages in packaging technology or transparent plastic bowls in the food industry, for example, can be reliably detected. The **ifm** ultrasonic sensors in M18 design provide a particularly small blind zone and long sensing ranges which are usually only achieved by sensors of a considerably larger design. The sensors operate reliably with heavy soiling so that they can be used in applications in which photoelectric sensors meet their limits.

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

PROFINET added to safety controllers

Banner Engineering, locally represented by **RET Automation Controls**, has added PROFINET communication to their popular SC26-2 and XS26-2 safety controllers. The SC26-2 is a versatile, easy-to-use, and configurable safety controller used to monitor multiple safety and non-safety input devices, providing safe stop and start functions for machines with hazardous motion. The XS26-2 is a scalable version of the SC26-2 capable of supporting up to eight expansion I/O modules. The addition of the PROFINET industrial protocol to these safety controllers enables simple and robust communication channels to any connected devices that use the PROFINET standard, including devices from other manufacturers. This new functionality matches the capabilities available for EtherNet/IP, Modbus/TCP or PCCC.

"Both the SC26-2 and the XS26-2 were designed to be adaptable to diverse and changing automation requirements and to simplify the management of complex safety systems," said Tom McMonagle, Senior Director of Product Planning at Banner Engineering. "PROFINET communication builds on this versatility and ease-of-use by facilitating the integration of PROFINET-enabled peripheral devices into a safety system and by establishing a high-speed communication link between devices for real-time access to system data and diagnostics, which can reduce and even prevent unplanned downtime."

These models can be configured with up to 256 virtual status outputs which can be used to send non-safety status signals to programmable logic controllers (PLCs), indicator lights, and similar devices.

Enquiries: Brandon Topham. Tel. +27 (0) 11 453 2468 or email brandon.topham@retautomation.com

High-quality multi-touch panels

By systematically integrating advanced multi-touch technologies into its Control Panel and Panel PC portfolio, **Beckhoff** has provided machine builders, manufacturers and other industries with forward-looking operator interface concepts for years. With the company's new CPX Control Panel series, applications in hazardous areas, classified Zone 2/22, can now also benefit. The high build quality and robust aluminium enclosures ensure reliability and durability in harsh and potentially explosive environmental conditions. This delivers significant advantages in terms of operation, look and feel, and design to applications in the process industries.

Beckhoff offers a system-integrated solution for explosion protection with the addition of a new and extensive portfolio of explosion-proof components. These solutions enable barrier-free concepts through to Zone 0/20. In addition to the Control Panels and Panel PCs in the CPX series, Beckhoff has also introduced the new ELX series EtherCAT Terminals with intrinsically safe interfaces for field device connection through to Ex Zone 0/20, as well as TwinCAT control software with numerous interfaces specific to process technology. The CPX portfolio offers a wide selection of screen formats, sizes, installation options and features. The range of formats includes 15 inch (4:3), 19 inch (5:4), and 21,5 inch (16:9 widescreen) versions. This means that process industry applications can now also benefit from advanced capacitive multi-touch technology, enabling the realisation of intuitive and feature-filled operating concepts.

Enquiries: Email kennethm@beckhoff.com

Efficient solution for simple safety tasks

Easy configuration of the Leuze RSL Series safety laser scanner via Bluetooth and Ethernet TCP/IP makes this device easy to set up and use. Further, despite the large number of possible field pairs – up to 100 – it is simple to create independent configurations with its application oriented one-step configuration.

Available from leading sensing solutions specialist **Countapulse Controls**, the Leuze RSL safety laser scanner offers 16 device versions with operating ranges of up to 8,25 metres. The large scanning angle of 270 degrees is especially advantageous as this facilitates mounting on corners or edges to allow for front and side guarding. Significantly, depending on the actual application, it is possible to replace a second laser scanner with this single device. The device features two completely autonomous protective functions, and has two pairs of safety switching outputs making it ideal for safeguarding and access guarding applications with separate machine parts.

Basic functions such as automatic start/restart, start/restart interlock (RES), contactor monitoring (EDM) can be selected. Optimum handling is ensured by means of separate intelligent connection unit and a large, plain-text display with integrated electronic spirit level.

Countapulse Controls offers access to technical support and information, as well as to its comprehensive range of sensing, measurement, counting, switching, monitoring and positioning instrumentation.

Customer support is available 24/7 through its technical advisory service hotline.

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

Decentralised display pre-processing and conversion of analogue signals

The compact connector unit is simply inserted in the connection cable of analogue sensors (4...20 mA). It displays the measured values locally. The user can set a switch point or limit at which the transistor output switches. A colour change (red/green) of the display indicates this unmistakably. Critical process states or operational problems are reliably signalled.

A special feature is the signal conversion: The threshold display converts analogue signals to digital IO-Link signals. Today they are required in almost any modern industrial environment and for Industry 4.0 applications. Some applications include: Compressed air meter for recording energy consumption of suction grippers; Monitoring of the system pressure in the coke oven machine; monitoring of hydraulic power units; invoicing of industrial water and many more.

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

New coding types for M12x1 power

Please note that on page 32 of Electricity+Control (June 2017) the incorrect image was placed with this editorial. This is the correct image.

The connectivity specialist ESCHA, Supplied locally by **RET Automation Controls**, introduced 4-pole M12x1-Power products with S- and T-coding types. As of now, the company offers variants with L- and K-coding types. Due to their compact housing style, these products are especially adapted for power supply in the automation field. Fieldbus controlled I/O-boxes, power supply devices or small servo motors are among the classical applications.

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

Hybrid safety I/O module

Turck's TBIP offers another hybrid safety block I/O module that combines standard and safety outputs in a single device – in this case for Ethernet/IP and CIP Safety. The TBPN model for Profinet/ Profisafe is already available. Both IP67 hybrid modules can be adapted flexibly to the actual signal requirements in the machine and also operated as a remote safety controller. The safety functions can also be configured and tested without being connected to the subsequent safety PLC. The high IP65/IP67/IP69K degrees of protection allow use in the most demanding environments. Decentralised plants and modular machine concepts can also be implemented without the need for any additional control cabinets.

On the safety side the hybrid modules offer two safety inputs for connecting safety sensors such as light curtains or emergency-stop buttons. Two additional safety channels can be used either as inputs or outputs. The four universal inputs/outputs for connecting non-safety-related signals can switch up to 2 A. Two of the I/Os can also be connected as IO-Link masters. In combination with Turck's I/O hubs, users can connect up to 32 additional I/Os to the module in this way. Both the standard channels as well as an IO-Link channel of the TBIP can be disconnected internally for safety-related applications, thus considerably simplifying the wiring of auxiliary drives and valve blocks. Turck – represented locally by **RET Automation Controls** – has developed the robust safety modules for an extended temperature range from -40°C to +70°C.

Enquiries: Brandon Topham. Tel. +27 (0) 11 453 2468 or email brandon.topham@retautomation.com

Siemens introduces internationally certified training program

Siemens Training offers the most comprehensive range of courses on Siemens products and associated technologies available. SITRAIN delivers quality training that is effective, flexible, and value based. We offer courses on PLCs, Drives, Controls, HMI, Industrial Networks, Process Control, Instrumentation, and more. Siemens Training is thrilled to announce the launch of their new PROFIBUS Internationally CERTIFIED Training Program, designed to help networking technicians enhance their skills, gain valuable new ones, and expand their professional opportunities with these certificates.

From left to right. Walter Chapman (Trainer), Andy Verwer (PI auditor from the UK), Henry Heymans (Siemens Training Manager).

This PROFIBUS and PROFINET suite of training services is designed in conjunction with PROFIBUS International (PI), with Industrial Networking learning needs in mind.

We've partnered with PROFIBUS International (PI) and as such are accredited by PI as a PI Training Centre (PITC) to provide custom content and efficient learning options that allow technicians to explore a range of disciplines anytime, anywhere, from a wide range of courses. Through this partnership, every technician can access Internationally CERTIFIED courses covering a wide variety of technologies and disciplines, such as Application Development, Software Testing, Installation, Fault Finding and more. Our certification program offers training and testing on vendor independent hardware and software. Certification-driven courses prepare interested employees for the highly competitive automation job market, and help them build their skill sets with practical, real-world applications. Current course offering:

PROFIBUS (certified):

- Installer Course
- Installer with Trouble shooting Course
- Engineers Course
- Installer with Engineers Course
- System Design Course

PROFINET (certified):

- Installers Course
- Engineers Course

Enquiries: Visit www.sitrain-learning.siemens.com/ZA

Secure remote maintenance of machines

The TC Cloud Client remote maintenance modules from **Phoenix Contact** connect machines to the mGuard Secure Cloud securely over the Internet. The clients provide an inexpensive basis for scalable remote maintenance of machines. Customers have the choice of TC Cloud Clients, which use the operator network, and variants which use the worldwide 4G-LTE mobile network for Cloud communication. The clients are configured with the help of the Cloud and are ready immediately for use in the machine.

The mGuard Secure Cloud constitutes a high-performance, scalable VPN infrastructure which connects service personnel with machines and systems via the Internet. The professional data center ensures a high degree of reliability and availability in terms of the service for machines and systems. The integrated mGuard VPN technology uses the IPsec security protocol with strong encryption. This ensures the confidentiality, authenticity, and integrity of all information and data transmitted between the service technicians and the machines. The TC Cloud Clients have one digital input and one output. As a result, service connections to the Cloud can be made and signalled as required.

Enquiries: +27 (0) 11 801 8200 or email info@phoenixcontact.co.za

Design any label with Brady Workstation apps

Brady Corporation has created a digital platform that offers professional, intuitive apps to design quality product and cable labels and safety signs. Brady Workstation offers practical label design for a wide range of professionals. Simply select the apps you need, download the 30-day trial and purchase when satisfied. Available apps enable users to automate label creation, including data imports and complex sequences, and to design custom labels and signs for cables and products, protected label templates, text-only cable labels, CLP chemical labels, safety and facility signs, lockout procedures and pipe markers. Basic design functionalities are offered for free via www.bradyeurope.com/bradyworkstation!

Brady Workstation works seamlessly with a range of Brady desktop and portable printers. Simply connect a Brady printer to an internet connected computer to access and print your Brady Workstation label templates and functionalities. Brady's high-end label printers also offer bi-directional communication with Brady Workstation and will inform users if they have to switch label materials to print specific label designs.

Enquiries: Email emea_request@bradycorp.com

Value for Process Industries with **INDUSTRY 4.0**

Michael Ziesemer, Endress+Hauser

Michael Ziesemer, Vice President of the Endress+Hauser Supervisory Board, gave such an interesting speech at the Endess+Hauser VIP breakfast, Africa Automation Fair, held on 6 – 8 June 2017. We share it with you.

TAKE NOTE!

1. IoT describes the architecture for applications which include smart home, smart health, smart mobility and smart grid.
2. Industry 4.0 focuses on internet applications in industry.
3. IoT is much broader than Industry 4.0 while the latter is more complete for industrial purposes.

ABBREVIATIONS

DCS – Distributed Control System
DD – Data Definition
DTM – Device Type Manager
ERP – Enterprise Resource Planning
I/O – Input/Output
IoT – Internet of Things
ISA – 'Industry Standard Architecture

It is a great pleasure for me to exchange some ideas with you at this Endress+Hauser VIP Breakfast at Africa Automation Fair 2017. The headline for my speech is 'Value for Process Industries with INDUSTRY 4.0'. Instead of INDUSTRY 4.0 we can talk as well about the 'Internet of Things (IoT)' which is at the end a part of INDUSTRY 4.0. The difference is simply that the IoT is describing the architecture for very different applications including the smart home, smart health, smart mobility or smart grid while INDUSTRY 4.0 is focusing on the internet applications in industry. From that point of view 'IoT' is much broader than INDUSTRY 4.0. On the other side INDUSTRY 4.0 is more complete for industrial purposes. It is covering the integration along the value chain – we call this horizontal integration, the vertical integration from plant and factory floor to ERP and the integration along the engineering lifecycle. The 'IoT' architecture is currently not covering the engineering lifecycle. All the rest is fairly the same but integration standards differ.

So we will deal with the future of our industry. As human beings we want to prepare for the future. Mark Twain said it in a very nice way: 'Plan for the future because that`s where you are going to spend the rest of your life.'

So let us talk about the future of process automation and in particular about Industry 4.0. I would like to cover three fields in my speech:

- Technology, products and automation solutions
- Processes and business models
- A summary to prepare for discussion

1. Technology, products and automation solutions

Let me start with the trends in technology. I will concentrate on measurement and sensors since I speak as the Vice President of the Endress+Hauser Supervisory Board.

Sensors

Our customers want robust sensors. That is most important. Once integrated into the process plant they should fulfill their defined function for years or even decades. If possible they should not need maintenance at all or maintenance intervals should be as long as possible. To fulfill these requirements it needs strong mechanics and an appropriate kind of material. Therefore high alloy steel, ceramics and fluor-polymers gained high importance for wetted sensor parts. But all this is not new.

A robust sensor is further on as much as possible decoupled from the harsh conditions of the process. The contactless sensor is ideal but not always possible. The ideal is defining a trend. Microwave sensors, ultrasonic sensors or those employing optics gain importance to measure level, flow or temperature or other parameters. But even this trend is not really new. They have existed for two or three decades.

Inline' and 'online' measurement

Let me come to a third trend and that is really a new one. It means to relocate analytical tasks from the laboratory to the process. 'Inline' and 'online' measurement instead of taking samples for lab testing. Process and automation engineers have always had

that in mind but now it becomes possible due to optical technologies like Raman spectroscopy. By means of a laser beam through a window into the process it becomes suitable to detect a certain molecule, for instance the target molecule in a fermentation process. The measuring result can be used for online process control and even in closed loop applications.

Digitisation

With these findings I will leave the field of sensors and measurement and come to digitisation. But if I have a close look I am already dealing with digitisation. Raman spectroscopy is not possible without technologies out of the semiconductor industry, without signal processors and software. In particular the necessary cost level to employ these original scientific analytical systems in process control would never be reached without digitisation. Two years ago, Pepperl+Fuchs and Endress+Hauser showed, at the Hannover Fair, 2-wire-sensors with Ethernet communication:

A pair of wires intrinsically safe both for power supply and Ethernet communication.

It was amazing to see how the project loaded without any kind of human operation when the cable was plugged. Just as a note: The plug was on the side of the I/O of the control system – not at the field device. There we found robust terminals – as it should be. It was not necessary to 'click' again, no installation of DDs or DTMs or other kind of data. All data are in the field device itself. First time we really come close to 'plug and play' in our industry.

Ethernet in the field could possibly be the answer to the different digital field buses which have been on the market for 20 years and still have gained only a 20% market share against the analogue 4 to 20 mA technology with superimposed HART protocol.

Ethernet in the field: Why is this now possible and why was it not possible when PROFIBUS and FOUNDATION FIELDBUS were established in the market? Why was our industry not directly moving in this direction? I think it was simply not feasible a few years ago from a technical point of view. It was not possible because of power consumption, and space considerations. Electronics was too space consuming. Now it becomes feasible because of Moore`s law. First I should say that this law is no physical law. It is simply a statistical observation. Gordon Moore, one of the founders of INTEL, has defined it. It says that the computing power on a given spot on a silicon chip is doubling every 18 months. Moore defined this in 1965. For more than 50 years this prediction has proved to be correct with a high degree of precision. We see that Moore`s law is defining an exponential function. That gives us some problems from the mental point of view. As human beings we are used to thinking linear. But Moore`s law is telling us that within 10 years a chip will provide computing power which is 128-fold. Or a chip can provide the same computing power as 10 years ago for a price which is more than 100 times lower.

This makes applications possible which were – yesterday – not even thinkable: Like Ethernet in 2-wire- field devices.

Ethernet in the field could potentially establish a further trend. Our customers use wireless products only in exceptional cases. Wireless HART is one technology in the market, ISA 100 is a further one competing with Wireless HART. With Ethernet in the field standard WiFi potentially could be the winner even for wireless sensor integration.

Automation and IT

Here, and in other fields, we see that Automation and IT are merging. This is not a new trend. The older among us remember that Operator stations of DCS were manufactured by DCS-vendors – Hardware and Software. They easily cost USD$ 20 000 with a fraction of the functionality of a Windows

Plan for the future because that`s where you are going to spend the rest of your life.
Mark Twain

PC. This has changed fundamentally. High volume products and high volume components are used in the automation sector, while the automation sector itself becomes a part of the Internet integrating different companies, different sectors and even economies. This is the way into the 'IoT' and into INDUSTRY 4.0. There are certain technologies which will gain high importance:

- Artificial intelligence and deep learning
- Cloud technologies and analytics software
- Mobility with Smart phones and tablet computers

2. Processes and business models

Let me come to my second subject: Processes and Business models and let me start with a provoking statement.

The real impact of digitisation is the change of business models and by means of that the totally new composition of added value chains. Hardware is tending to be commoditised and services, particularly platform services, will get a big share in added value of the future. UBER is getting 25% of the price charged by their drivers even when they do not own a single car or other assets.

'What can be digitised, will be digitised'

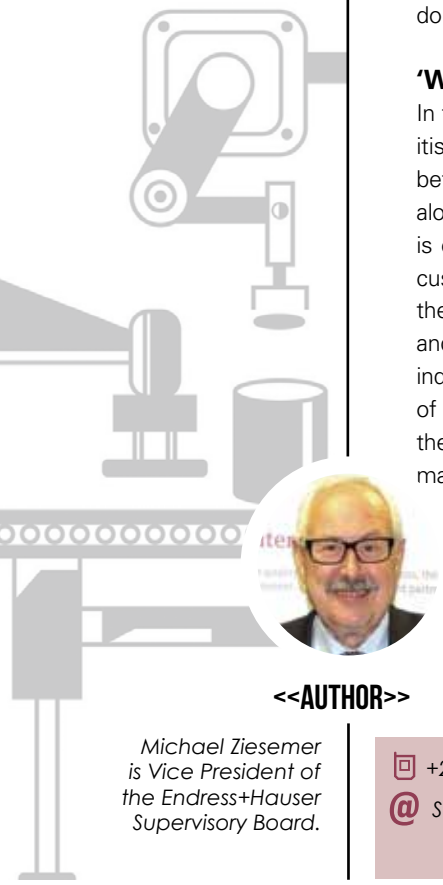
In the US I heard the statement: 'What can be digitised, will be digitised'. That is changing processes between production and office floor and processes along the engineering lifecycle. And in particular it is changing the interaction between suppliers and customers in adding value networks. Think about the press which has developed into an information and service platform industry. Think about the hotel industry where booking portals provide 'freedom of choice' and a better service to travellers. Hotels themselves are the losers in this game. They lose margins and direct customer access.

Many new business models are data centric. Some people say that data is the oil of the 21st century. Many new business models address customers with services based on the information derived from machine and sensor data.

For example: One of our customers in the machine building industry is producing decanters. Decanters separate liquids of different density – for instance water from oil or cream out of milk. Decanters rotate with high speed. Throughput should be as high as possible but remain in a safe distance from resonances. And wear in bearings should be detected well before influencing the availability of the machine. In other words: A lot of process knowledge was necessary to apply the decanter into a certain application. Today our customer integrates decanters into the internet. The data from sensors are stored in a 'Hana' Cloud from SAP and data analytics software is using the data from hundreds and thousands of decanters in order to provide information to optimise operations and maintenance. I think this is an excellent example of a 'big data' application. Even a new type of job was created: They call these people 'Vibration Analysts' and their task is to consult customers. Our customer sells modular service-level-agreements and guaranteed machine availability.

3. Summary

- In the field of sensors the existing trend towards robust sensors decoupled from the process will remain. Signal processing and software is going to improve sensors. In analytics more than that is going to happen. Applications will move from the lab to the process.
- INDUSTRY 4.0 grows process industries. Ethernet in the field, Webserver, WiFi and 2-wire-technology by APL are the trends. Smart phones and tablets are used to operate field instruments. Integration we will see between Office and factory floor, along the engineering lifecycle and in adding value networks
- The most important impact of digitisation comes in processes and data centric business models. 'As a service' will be sold to customers. They will grow productivity, reduce costs and individualise products
- We should not forget the ecosystem for digitisation. Cyber Security and clear data protection concepts are of key importance. Even more important are our people who have to learn a lot. Without training and education there can be no Industry 4.0. It is as simple as that!



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Measuring high viscous resins

Production processes in manufacturing of abrasives and superabrasives require precise dosage of even high viscous resins (e.g. 1 500 cP). Kobold Instrumentation, represented locally by **Instrotech**, was asked to look into, and supply a solution.

The application image below shows one dosing skid in such application. Each skid comprises of the following components:

- Main tank
- Secondary tank with low level alarm, always ensuring enough products and no air in the circuit
- Manual valve to close the circuit
- Peristaltic pump
- Oval Wheel Flowmeter
- Pressure Switch (safety against high pressure)
- 3-way valve (for manual or automated operation)
- Outlet pipes for manual product collection

At higher viscosities and depending on temperature fluctuations, the peristaltic pump (positive displacement pump comprising of flexible tube and of roller(s) displacing the medium from one end of the flexible tube to the other) is not able to displace the medium completely. This means that some part of the medium flows back through the flowmeter resulting in error readings. In addition, the operating pressure developed by the small sized peristaltic pump is quite low.

Oval wheel flowmeters model DON can be provided with special cut rotors reducing the pressure drop by 50%. Choosing the optional Quad Hall Sensor Dual Pulse Output provides two out of phase pulse outputs 'A' and 'B', so that net flow rate 'A-B' may be computed correctly by the PLC. Net flow rate could also be computed using ZOK-Z3 electronic with a pulse discriminator in between. With these features, Kobold was able to solve all problems associated with this application and conduct very fine dosing of resins, resulting in an improved repeatability and quality of the finished abrasives.

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

Accuracy meets dynamic range – make the best decision to fit your needs

At **Kamstrup**, dynamic range is not a main focus in our development and production of water meters. Our water meters do not necessarily have the highest dynamic range in the market, but we can ensure a very high accuracy obtained through consistent production and testing methods. To assess meter accuracy fairly, you also need to consider start flow, permissible error margin and measurement technique.

Sometimes even straightforward things can puzzle your mind, if you scratch below the surface. Meter accuracy is one of these things. But since the water meter is what enables fair billing of the utility's services and products, knowing what makes accuracy – and what does not – is key.

In water metering, meters with a high dynamic range are sometimes mistaken for being more accurate than meters with a lower dynamic range. Albeit dynamic range relates to accuracy, there is no direct link between the two terms. In fact, dynamic range does not necessarily say anything about a meter's actual measurement capability. Instead, it says a lot about the range of flow (usually ranging from a few drops to heavy usage) within which the authorities are testing a meter for type approval purposes.

Accuracy in practice

In practice, this means that a meter with a lower dynamic range can easily be more accurate than a high dynamic range one – you just do not have the authorities' word for it. So to assess accuracy fairly, look beyond the dynamic range and take into account lower start flow, accuracy within the maximum permissible error margin and measurement technique. These characteristics all affect accuracy.

At Kamstrup, dynamic range is not a main focus during the development and production of water meters. They do not necessarily have the highest dynamic range in the market, but we are able to ensure very high accuracy by means of:

- A robust construction and strict component tolerance management, which render individual calibration and fine tuning superfluous
- Databased calibration and adjustment, which ensure an error margin close to 0% in the entire dynamic range
- Continuous tests of the meter batch in three flow rates, which enables proactive fine-tuning of calibration values and test of the entire dynamic range (i.e. temperature and flow)

Understanding meter accuracy does not have to be hard. Weigh the facts and keep in mind that, if the authorities' word (the dynamic range) matters the most to you, relate the error margin to consumer profilers (how your consumers consume water) to determine the actual impact. If, on the other hand, low flow is what matters the most, consider the actual measurement technique and meter longevity. Either way, if accuracy is important to you,know the impact of the error margin.

Enquiries: Visit www.kamstrup.com

Wide process analysis portfolio for water applications

Since potable water has become a valuable resource, all stages of water treatment must be monitored effectively and reliably. Applications such as quality/limit values monitoring in waterworks, quality monitoring in distribution network, filter monitoring and disinfection control use analytical sensors and systems for an automated process control.

KROHNE is a leading supplier for process instrumentation as well as for (inline) analytical sensors and systems. The SMARTPART series is the most recent innovation for easy handling of analytical sensors: SMARTPAT pH/ORP and conductivity sensors feature an integrated transmitter for direct 4…20 mA/HART 7 connection to the process control system and allows for calibration either online (in the field) or offline (in a controlled laboratory environment).

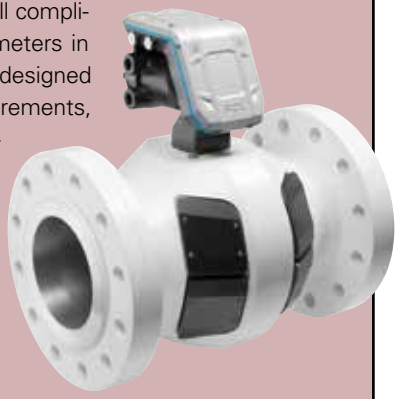
Matching accessories such as buffer solutions, junction boxes, loop-powered indicators or operating units together with mounting assemblies (static or insertion) round the portfolio for one-stop shopping of process analytical sensors. With the OPTISENS series, KROHNE offers the same sensor types for use with an external transmitter e.g. for existing installations. The product line also features measuring systems for water applications: OPTISYS CL 1100 is a potentiostatic disinfectant measuring system for free chlorine, chlorine dioxide and ozone (Cl2: 0.03...20 mg/l; ClO2: 0.05...5 mg/l; O3: 0.05...5 mg/l). It is to be used in bypass lines and comes readily mounted, pre-installed and tested with 3x4...20 mA output, chlorine sensor, valves, flow-through holders and optional pH sensor.

Enquiries: Nirisha Harinarain
Tel. +27 (0) 11 314 1391 or
email N.Harinarain@KROHNE.com

Evolution in gas measurement Ultrasonic gas flow meter

As the follow-up to the successful FLOWSIC600, the FLOWSIC600-XT ultrasonic gas flow meter is setting new standards in its market segment. With four device variants available, the FLOWSIC600-XT can take on any challenge – whether it is being used as a stand-alone device or as part of a system solution – and delivers optimum measurement performance.The FLOWSIC600 already provided absolute long-term stability in extreme ambient conditions, and now the four device variants in the FLOWSIC600-XT product family combine the features of their predecessors with unprecedented usability. Throughout their service life, they meet every requirement for safe, stable and custody transfer gas quantity measurement.

The FLOWSIC600-XT's trend-setting design houses some impressive and innovative internal features: i-diagnostics for smart application diagnostics with a built-in solution wizard and PowerIn Technology which continues to take measurements for up to three weeks in the event of a mains voltage failure. The FLOWSIC600-XT features an ideal combination of maximum measurement accuracy, long-term stability and unparalleled operational safety, yet is not at all complicated to use. The ultrasonic gas flow meters in the FLOWSIC600-XT product family are designed for custody transfer gas quantity measurements, satisfy the requirements of every current national and international standard, and are exceptionally simple to integrate into conventional system environments.



Enquiries: Doreen Cronje. Tel. +27 (0) 11 472 3733 or email Doreen. Cronje@sickautomation.co.za

High-temperature thermocouple with added protection from sapphire glass

The new TC84 high-temperature thermocouple from **WIKA** features the highest safety and a long service life. Its resilience is based on a sapphire protection tube in combination with a two-stage safety chamber. The measuring instrument is also available in an ATEX and also an IECEx certified version. Typical applications for the TC84 are gasification reactors with process temperatures up to 1 700°C and pressure loads up to 65 bar or sulphur recovery units. In the patented design of the measuring instrument, the precious-metal thermocouple is shielded from damaging process influences through two protection tubes - through an external tube from ceramic and an internal tube from monocrystalline sapphire glass, which effectively delays the poisoning of the thermocouple. In the event of any failure, the dual sealing system of the safety chamber prevents the escape of toxic media. The construction of the thermocouple also follows economical principles. A TC84, damaged following extreme loading, can be repaired through the exchange of the wetted parts; a completely new purchase is therefore not required. The sapphire protection tube also eliminates the need for expensive purging with inert gas, for example, to protect the thermocouple.

Enquiries: WIKA Instruments. Tel +27 (0) 11 621 0000 or email sales.za@wika.com

Refreshed **Soft Start Valves** and the Background Research

Brian Abbott, SMC Pneumatics

Working closely with customers ensures that cutting edge products will be developed; products that deliver outstanding performance, offer real benefits and improved life cycle.

TAKE NOTE!

1. A great deal of research has gone into developing the new AV-A series soft start valve.
2. From its size reduction to power savings, all clients will benefit.
3. The new product meets and exceeds requirements and expectations.

Priding itself on advanced technologies and with around 1 500 R&D engineers based at Technology Centres in select locations such as Europe, Japan and the USA, SMC Pneumatics develops up to 50 new or improved products each year. The company recently launched its refreshed AV soft-start valve, the AV2000-A 5000-A series. The series was developed based on international customer feedback requesting improved energy saving (lower power consumption of 0,35 Watts and no air leakage when then main valve is switched), with additional options like a bracket, built-in silencer and gauge.

Initially developed for a major machine tool manufacturer who required the AV to be installed in the main line for soft start/pressure control, the new construction shuts off the supply side when it switches off, preventing air from coming out from the supply side to the exhaust port.

Any application requiring a safe, smooth and more controlled start would benefit from using the AV series. These valves offer low-speed air supply to gradually raise the pressure in an air system and at the same time allowing for quick exhaust by cutting off air supply when it is no longer required.

When considering requests for new product development such as this start-up valve refresher, SMC's head office in Japan requires a lot of detail in the form of a NPDP (New Product Development Project) request. The R&D team then spends many months heavily invested in finding and testing a new or improved solution. This company

No leakage – energy saving

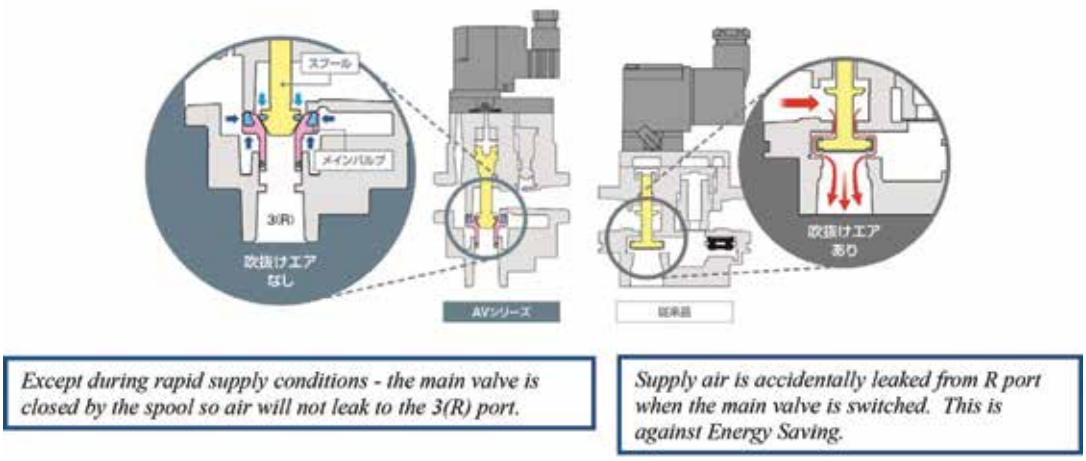


Figure 1: No air leakage to the R port when the main valve is switched.

continually encourages customers to discuss their requirements that may end up in the development of a new or improved solution through our NPDP process. Some of the features of the refreshed soft-start valve now include:

- Energy Saving: Power consumption has been reduced by up to 80%
- Prevents air leakage when the main valve is switched
- Additional options: with Bracket
  - o Built-in Silencer
  - o Gauge
- 1(P) 2(A) Improved in flow characteristics by up to 2,3 times
- IP65 Pilot Valve Enclosure (DIN terminal only)
- Improved needle adjustability during low speed air supply

Reduced power consumption

When the pilot valve was changed from the SF4 to the V115, power consumption was greatly reduced. Depending on the rated voltage, a maximum of 80% worth of power savings can be realised when using the refreshed AV series. This is an impressive saving to the customer as we often find that these valves tend to be energised for long periods of time.

Power consumption Reduced up to 80%(Dc 12/24 V)		
Rated Voltage	New	Current
Dc 12/24 V	0,35 W	1,8 W
Ac 100 V	0,78 VA	3,4 VA
Ac 110 V	0,86 VA	3,4 VA
Ac 200 V	1,15 VA	3,4 VA
Ac 220 V	1,27 VA	3,4 VA

Table 1: Pilot valve changed from the SF4 to V115.

Operating principle

Figure 2 explains... When you switch the valve (pilot valve is on), the spool is pushed down by the pilot air and comes into contact with main valve to close the flow passage to the exhaust (R) port.

At this time, the force that pushes the main valve closed is more than force the pushes down the spool, therefore the flow passage from the main valve to port 2 remains closed. "The secondary piston is now pushed down due to the pilot air and the flow passage from the needle valve to port 2 opens thereby gradually pressurising the downstream circuit. Here you can control the rate at which air flows into 2 port at this point by controlling the needle valve.

When the outlet side becomes pressurised with air supplied via the needle valve, the pressure on this side is now higher than the force that keeps the main valve closed. The main valve opens the flow passage from inlet port P to working port A to rapidly supply air.

When the AV soft start valve is to be turned off, firstly the pilot valve is turned off, the pilot air of the spool is exhausted from this valve so that the spool and main valve are pushed up via the spring force to close the flow passage. This in turn opens

Any application requiring a safe, smooth and more controlled start would benefit from using the AV series.

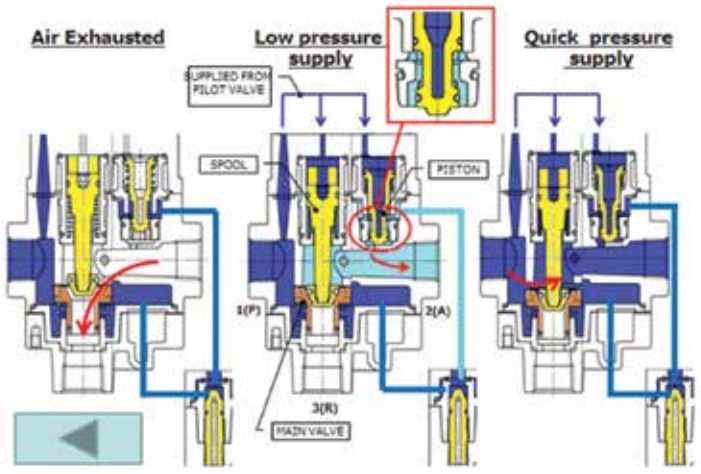


Figure 2: Refreshed AV series operating principle.

the flow passage from the outlet port A to the exhaust port R to be released but at the same time ensuring that the main valve is and remains closed preventing any loss of air.

The pilot air of the piston is also exhausted from the pilot valve and the piston is returned upwards due to a spring.

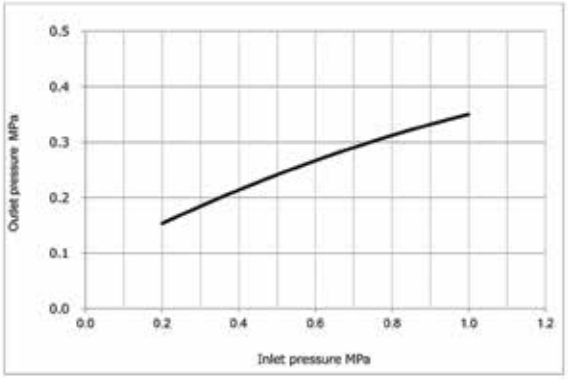


Figure 3: The switching point for the main valve to open as a function of the inlet and outlet pressure.

Space savings

Models	Compared with	Reduced size
AV2000-A	AN20-02	37 mm
AV3000-A	AN30-03	49 mm
AV4000-A	AN40-04	56 mm
AV5000-A	AN500-06	92 mm

♦ Sonic conductance C value: Up to 2.3 times the AV2000-02		
Body size	New product: C value dm^3/s bar (Effective area mm^2)	Current product:C value dm^3/s bar (Effective area mm^2)
AV2000-02	9,2(46)	4(20)
AV3000-03	13,1(65)	7,4(37)
AV4000-04	19,2(96)	12,2(61)
AV5000-06	34,8(174)	22,6(113)
AV5000-10	41,3(217)	24,4(122)

Table 2: Thanks to its built-in silencer (optional), space saving is achieved in the AV] series.

The above table demonstrates the improved flow rates. Since the flow characteristics from 1(P) to 2(A) has been improved, the rapid supply time has been reduced by almost half (compared with the old AV series).

Conclusion

The characteristics and features of the new AV-A series are indicators of just how much research has been put into this. From its size reduction to power savings, each detail has been carefully thought out to match not only the requirements of those customers who submitted NPDPs but for all customers who can now benefit.

Training has been conducted around the country and sales engineers have been receiving customer feedback in the form of surveys to ensure that the refreshed product meets and exceeds requirements and expectations.

<<AUTHOR>>

Brian Abbott is Product Manager at SMC Pneumatics.

@ *kmccarthy@smcpneumatics.co.za*

www.smcpneumatics.co.za

Brass valves are the preferred choice in residential and industrial plumbing

Valves are of great importance to plumbing installations as they control and regulate water flow and temperatures. They are designed to protect various components against damage.

Valves are required to function under considerable stress such as extreme temperatures at high pressures - This requires quality components and parts and it also needs to conform to the various standards set out by the statutory bodies such as the SABS.

Brass is made from a mixture of copper and zinc.

Here are SOME of the qualities that copper adds to this brass mixture.

- Copper has excellent corrosion resistance making it extremely durable
- Copper is virtually 100% recyclable
- Copper can handle extreme temperate without long term degeneration
- Even some of the best plastic materials looses up to 40% of its strength in under two months.
- Copper is biostatic, meaning it does not sustain bacterial growth
- Copper keeps drinking water safe and pure
- Copper is a great conductor of heat

Such qualities reduce repair and maintenance costs sufficiently making it an economic long-term investment.

APEX VALVES
SOUTH AFRICA

Apex Valves South Africa (Pty) Ltd, a member of the CDAA has become a brand name for quality valves designed for the domestic hot water systems, and is currently in the process of expanding the range into the industrial market. Apex Vales commitment to customer satisfaction, product quality, reliable services and sound values have earned them a loyal and growing client base.

012 664-0588 www.apexvalves.co.za

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End position feedback for manual valves and ball valves

With this mounting kit, you can very easily equip your manual valves with sensors and target pucks. A large number of sensors and pucks can be used on the 80 x 30 mm actuator interface to VDI /VDE 3845. The entire system can be used at ambient temperatures from -30 to +80°C. The upper part is made out of Vestamid and allows operation in hazardous areas. The lower part fits on many ISO flange valves (DIN EN ISO 5211) and is connected to the valve shaft by a shaft extension. Stainless steel components guarantee increased service life.

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

Reliable and economical automation at Hydroelectric facility

Rotork CK Range modular electric valve actuators have provided a reliable and economical automated flow control solution for a hydroelectric generating station in Mexico. The actuators have been installed at the Alameda Hidroeléctrica Planta to control the flow of water to turbines generating up to 6 MW of electricity.

The modular CK design enabled the operator to tailor the actuator specification to precisely match the requirements of the application. The selection of CK actuators complete with Centronik digital control units required only the provision of a mains electricity supply to provide automation of the previously hand operated valves. The Centronik control unit provides intelligent valve control with data logging for diagnostics and asset management. Rapid and secure commissioning and configuration is performed using selector switches on the Centronik housing or via a setting tool, following user-friendly menu driven screens displayed on the actuator indication window. In normal operation the window displays the valve position, valve status and alarms.

Standard features that are common to all CK actuators include IP68 double-sealed environmental protection, plug and socket connections for fast and efficient commissioning and maintenance, motor-independent handwheel operation, mechanical valve position indication and independent torque and position sensing for increased valve protection. Actuator gearboxes are oil lubricated for extended life and separable thrust or non-thrust bases enable actuators to be removed without disturbing the valve position.

Enquiries: Email sarah.kellett@rotork.com

New dual-mode wireless gateway

With more than 10 years of wireless infrastructure and technology development experience, **Emerson** has introduced a new dual-mode wireless gateway which supports both IEC 62951 WirelessHART and ISA100.11a industrial wireless communications standards. This latest addition expands Emerson's wireless portfolio and provides customers an easy way to take advantage of WirelessHART technologies from many suppliers.

"With our new dual-mode gateway, we're excited to give ISA100.11a users an easy path to the improved operating performance they are seeking," said Bob Karschnia, vice president and general manager, wireless, Emerson Automation Solutions. "WirelessHART has proven in 10years of successful deployments around the world to provide the highest reliability and most robust self-organising, self-healing network, for the lowest cost."

With more than 31 000 WirelessHART installations worldwide and over 9,1 billion operating hours, Emerson leads the automation industry in wireless networking. Emerson's wireless portfolio helps customers extend their automation ecosystem for improved operating reliability with sensing, monitoring and control technologies such as temperature, pressure, level, corrosion, flow, acoustic, gas and vibration, plus wireless adapters for valve positioners and digital valve controllers. Serving as the backbone of a wireless infrastructure, wireless gateways and access points increase the amount of real-time information available to automation systems, applications and analytics tools to help organisations improve responsiveness and decision making.

Enquiries: Rob Smith. Tel: +27 (0) 11 451 3700 or email Rob.Smith@emerson.com

Valves and controls acquisition

Emerson has completed the purchase of the Valves and Controls business from Pentair plc for $3,15 billion.

"This acquisition enables us to continue to grow our global footprint in automation and expand our leadership position in key served markets such as chemical, power, refining, mining and oil and gas," said Chairman and Chief Executive Officer, David N. Farr. "By adding these highly respected products and aftermarket services to our portfolio, Emerson is better positioned to serve the needs of our global customers."

Headquartered in Schaffhausen, Switzerland, the Valves and Controls business is a leading provider of valve solutions and services with nearly 7 500 employees around the world. The business will be integrated into Emerson's Automation Solutions platform.

Mike Train, Automation Solutions executive president, said, "Pentair's Valves and Controls business fits extremely well with Emerson's existing portfolio of Fisher control valves and regulators and Bettis actuators. The addition of market leading product brands such as Anderson Greenwood, Vanessa and Keystone creates the most comprehensive global valve business. Emerson's final control portfolio now includes control valves, pressure relief, butterfly, gate, globe, ball and check valves, and an extensive global network of more than 200 service centres. The combination of these two leading businesses will allow us to better support and help customers select the right product and maintain it for the life of the asset."

Enquiries: Rob Smith. Tel. +27 (0) 11 451 3700 or email Rob.Smith@emerson.com

Acting Group Chief Executive, Eskom

The **Eskom** Board has appointed Johnny Dladla as Acting Group Chief Executive with immediate effect. This follows intense consultations between the Minister and Eskom Board to arrive at a prudent choice. Both parties are of firm belief that Dladla's experience and expertise will stabilise Eskom in the short-term.

"Dladla has sufficient skills to excel in this role. He has 22 years of experience within Eskom, 17 years invested in various non-regulated businesses and five years as Chief Executive Officer for Eskom Enterprises and its subsidiaries," said Acting Board Chairman, Zethembe Khoza.

Throughout these roles, he has demonstrated sterling leadership which manifested itself in his turnaround strategies, added Khoza. Echoing Khoza's sentiments, Minister Lynne Brown said: "I welcome the appointment of Dladla as it will bring further stability to Eskom and its executive team." Dladla has plied his career amongst international brands such as BHP Billiton and South African Breweries (SAB). He has successfully executed major projects, built sustainable relationships, legacy of service delivery with major local and international private and public sector organisations. A Chartered Marketer, he has studied across a range of critical fields including finance and accounting amongst Harvard Business School, Fort Hare University, Cranfield University (UK), AAA School of Advertising and IMM. Dladla is said to be a seasoned business leader with impeccable credentials.

Enquiries: Email MediaDesk@eskom.co.za

WearCheck takes over transformer services company

WearCheck recently bought out Transformer Chemistry Services (TCS), adding an already-established transformer analysis and maintenance division to the company's condition monitoring portfolio. Coupled with WearCheck's Africa-wide network, the expertise of TCS and a general growth in the number of transformers across the continent, WearCheck is now poised to provide large-scale and widespread comprehensive transformer reliability services. The primary function of the newly-formed transformer division is the promotion of transformer health through the regular assessment of insulating fluid and diagnosis of the results.

Enquiries: Email support@wearcheck.co.za

Shaking hands on the deal – WearCheck MD Neil Robinson (right) and TCS MD Ian Gray.

Launch of Earthing and Lightning Protection Association (ELPA)

ELPA was formed to protect consumers, establish a uniform interpretation of the codes of practice, and help to regulate and advise the lightning protection industry. ELPA was established as a non-profit organisation of voluntary membership.

Chairman of ELPA, Alexis Barwise, said at the launch held at Wits University on 19 July 2017: "When we compare the annual statistics for lightning deaths in South Africa to the numbers of deaths from shark attacks, we could expect a maximum of ten or fewer recorded deaths from unprovoked shark attacks in our waters every year [1]. Shark nets in the waters off our beaches, as well as people on shore who are acting as shark spotters, are quite common around our world-famous coastline and yet statistically, far fewer people are killed by sharks annually than by lightning.

"I believe that the same vigilance, attention and resources should be applied to protecting people from lightning, and this is the primary reason for ELPA's formation. We acknowledge the need to protect life as well as property. This requires certainty, which we achieve through certification and compliance, all united under one umbrella body which brings together experts and interested parties from various areas of the lightning protection arena."

Professor Ian Jandrell, Dean of the Faculty of Engineering and the Built Environment at Wits, said in his keynote address, "The facts showcase the obvious need for an industry body such as ELPA, which needs to assist with education and awareness in general, including among consumers and the general public, and should also play a role in improving the technical competency within the industry, in particular that of installers and contractors."

Barwise explained that the formal establishment of ELPA is an important addition to the standard of safety in the South African lightning and protection industry, as the association will offer certification of qualified designers, installers and inspectors, with the support of the Department of Labour, Wits University, the Electrical Contractors Association of South Africa (ECA), the South African Institute of Electrical Engineers (SAIEE) and others. This will have positive repercussions for the building of both residential and corporate structures and there is an intention to further assist regulation and claims in the insurance industry."

Alexis Barwise (ELPA Chairman), Trevor Manas and keynote speaker, Prof Ian Jandrell (Dean of the Wits University Engineering and Built Environment faculty) at the launch of ELPA which took place at Wits University on the morning of 19 July 2017.

Reference

[1] University of Florida: For a five-year period from 2011-2015, South Africa averaged 4.8 incidents and 1.4 deaths per year with annual highs of eight attacks and three deaths in a year: https://www.floridamuseum.ufl.edu/fish/isaf/worldwide-summary/

Enquiries: Claudelle Pillay Tel. +27 (0) 11 704 1487 or email info@elpasa.org.za

NEW FACES & PLACES

BEARINGS INTERNATIONAL (BI), HUDACO GROUP

Widor Grobbelaar, Financial Director

TECTRA AUTOMATION

Grové Dicks, Sales Manager, Gauteng

Some exhibitors at the Africa Automation Fair 2017

Africa Automation Fair 2017 was everything that it promised to be – the platform where industrial automation and the digital revolution converge; and where operations technology and information technology blend. It is, indeed, the most comprehensive showcase of industrial control technologies on our side of the globe.

Siemens: *'Driving the Digital Enterprise': Godfrey Masha, Vela Khumalo, Gary Wilson, Malefu Rampai, Tyrone Naidoo, Nkosinathi Zulu, Jennifer Naidoo and Michael Thomas.*

Transducer Technology: *Gordon Smit and Mathew Battson.*

Phoenix Contact: *Tony Rayner and Samantha Hawkes.*

Comtest: *Gavin van Rooy, Fezeka Bani, Gerrit Barnard.*

Adroit: *Hidetoshi Nishiyama (Mitsubishi Electric), Hajime Sugiyama (Mitsubishi Electric), Grant Joyce (Adroit Technologies), Johan Nieuwenhuizen (Adroit Technologies), Dave Wibberley (Adroit Technologies), Frits Kok (Adroit Technologies).*

OMRON: *Josh Hodgkinson (FAE Vision System), Victor Marques (Country Manager) and Mmule Ncongwane (NGAGE).*

Endress + Hauser: *Jenish Gheewala, Michael Ziesemer and Rob MacKenzie.*

Schneider Electric: *Jacques Squire, Freddie Gonsalves, Guy Eales, Jenny van Rooyen, Ramesh Singh and Hennie Colyn.*

Beckhoff Automation: *Francois Sharp, Shaun Potter, Kenneth McPherson, Mike van der Walt (back), Dane Potter, Bradley Garside.*

WRITE @ the back

Silvana Claassen discusses reducing one's carbon footprint in security complexes.

Having been invited to 'Write at the back' of the July issue of the Electricity + Control magazine, I wish to discuss a topic that has been fascinating me for some time: how can owners of sectional title units in security complexes reduce their personal carbon footprint?

In some European countries, the energy market is privatised which means that residents can choose the company from which to purchase electricity for powering their homes. This allows for the opportunity to reduce one's carbon footprint simply by purchasing 'green' [1] electricity from companies that invest in renewable energy. In South Africa, residents cannot choose their energy supplier, hence the ability to reduce one's carbon footprint associated with energy-consumption is limited. Up until now the only alternative is to generate one's own electricity, e.g. through investing in a PV rooftop installation. Next to a personal desire to reduce one's carbon footprint, many residents wish to get 'off-the-grid' to no longer be victim to Eskom's unannounced power cuts. With an average of more than 2 500 hours of sunshine per year and average solar-radiation levels ranging between 4,5 and 6,5 kWh/m² per day [2], the installation of solar PV rooftop panels is a logical answer to a home-owner's ambition to get 'off-the-grid' and reduce one's carbon footprint.

Unless living in a freestanding home, the practicalities around such measures are not always straightforward. And living in a security complex is not uncommon in South Africa. Sectional title living imposes extra challenges to the wish to consume green energy because installing PV panels on your roof may be considered aesthetically displeasing or undesirable when viewed from the outside of your unit. Or simply because the physical features of your section are not able to facilitate a rooftop PV installation, e.g. when you own a ground floor unit.

If bodies corporate would invest in the installation of PV panels on communal buildings such as the clubhouse, swimming pool-area and/or carports, green electricity could be generated locally and occupants will have the choice to consume clean power as an alternative to the carbon-intensive electricity supplied by Eskom. Over and above the possibility to reduce one's carbon footprint, home owners could also benefit from uninterrupted (green) power supply when they use the locally generated green electricity in combination with a home battery such as the 'powerwall' that has become available on the South African market in 2016. Like this, the body corporate enables home-owners to: reduce their personal carbon footprint; ánd to get 'off-the-grid' (provided they invest in a home battery); ánd still benefit from all the other benefits that security complex living offers.

Naturally this calls for some out-of-the-box thinking regarding e.g. legal arrangements, financial and investment structures, technical constraints, etc. And to answer questions including: 'Who is the owner of the electricity generated?'; 'Does the body corporate's investment impact on the monthly levies and how will this affect home-owners which are not interested in green power?'; 'Will there be enough capacity to be able to offer green power to all the units?', etc. Body corporates can contact CES South Africa for performing a feasibility study into the suggested installation of PV panels or other measures that would enable unit-occupants to reduce their carbon footprint. After all we owe it not only to our environment but also to future generations to optimise the use of clean energy.

Silvana Claassen, CES South Africa. Tel. +27 (0) 78 097 0852 or email silvana@carbon-energy-solutions.co.za or visit www.carbon-energy-solutions.co.za

References

[1] To ensure that a percentage of the total electricity such a company sells is green, certificates are awarded for each 1 000 kWh generated from renewable energy (green) sources.

[2] Compared to e.g. Germany with around 1 500 sunshine hours per year and daily average radiation levels of 3,3 kWh/m².

NOT TO BE MISSED

POWER-GEN & DistribuTECH Africa 2017

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

Industrial and Commercial Use of Energy (ICUE) Conference

14 – 16 August 2017, Cape Town campus, Cape Peninsula University of Technology (CPUT)
Enquiries: Nadia Cassiem.
Email cassiemn@cput.ac.za

Smart Buildings & Infrastructure

15 August (Western Cape Summit, Cape Town)
Enquiries: Visit www.smart-summit.com

Waste-to-Energy Technologies Summit

23 August 2017, Emperors Palace Convention Centre, Johannesburg. The summit would focus on WASTE to Energy: the process, the treatment technologies for organic waste and its economic development.
Enquiries: Email adriaant@wrc.org.za or chris@maphosam.co.za

2017 SAEEC

14 – 15 November 2017, Emperors Palace Convention Centre, Johannesburg. The 2017SAEEC Conference features a convention agenda with seminars and an exhibition on a variety of current topics and a comprehensive overview of 'Energy Efficiency at Work'.
Enquiries: Nikki Nel.
Email support@saee.org.za

brain block...

QUESTION 1

(Courtesy: Glyn Craig, Techlyn)

In a practical examination a student is presented with an unknown voltage source and an oscilloscope. The student is asked to estimate the RMS (Root Mean Square) voltage and the frequency. A sine wave of 30 Volts peak - to peak and a period of 16,6 milliseconds is measured. What are the correct conclusions?

Check that you have answered correctly by visiting ***www.crown.co.za***

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KwaZulu-Natal industrial technology exhibition

INDUSTRIAL SHOWCASE 2017

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