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It is not possible to write this comment without reflecting on where we are as a Nation; this perhaps, because Municipal elections are upon us, and we have that hard-fought-for democratic right to put a cross on a piece of paper.

Yet the world is in crisis. To a large extent, so is our nation and others on this wonderful continent. What we need to reflect on is the age-old adage that a good crisis should never be wasted. I find that a crisis galvanises the attention; and provides an opportunity to really bring about significant change.

Not for one moment am I having political allusions. What I am thinking of, however, is the opportunity to revolutionise some of the things we do, and how we do them. To question the status quo – and to challenge our own understandings and beliefs.

Crises do not occur that often; and usually one tends to 'muddle through'. But that muddling along is the opportunity missed.

Isn't it nice to have an excuse to make radical changes? Or to listen to the younger members of the engineering team and the bright ideas that emerge when one releases them from just keeping the show on the road.

The other aspect of using a crisis speaks to one's reaction to it. I must admit to being party, of late, to many conversations (relating to industry, mining, education and the like) that make one wonder why we bother – or continue to bother.

The point is, these conversations speak to the choices that we can make; and in as much as we face problems, we can choose how best to react to them.

I cannot resist mentioning Eskom – where there has been a real improvement in plant availability and maintenance backlog. What intrigues me is trying to understand what has changed.

After all, the same people still work there; and the constraints have remained the same.

Frankly, I rather suspect that the company chose to sort itself out and possibly chose to begin to believe that it could.

Yes, we face challenges, and yes, the economy is stagnant ... which in itself is a crisis. But what better way to use it than to sort out the utility?

It is in this context that I look around at our manufacturing industry, the mining sector and most other sectors of the economy, and wonder what smart ideas could emerge if only we let them? We often drag ourselves down by being overwhelmed by what we face – but the other side of that coin is an urgency to open the door to new ideas, and consider options that, somehow, look far less scary now than they did in the (stable) past.



Ian Jandrell

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

Ian





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ACDC Dynamics is a market leader in the manufacture, import and distribution of quality products in the electrical, lighting, solar power, pumps, alarm, security and surveillance systems and tools industries. *Read more on page 21.*

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EtherCAT[®] P

Ultra-fast Communication and Power Supply in a Single Cable

Thomas Rettig, Beckhoff

Recently introduced, advanced EtherCAT P technology has been disclosed via the EtherCAT Technology Group (ETG) in the proven way. It is fully compatible with traditional EtherCAT.

With EtherCAT P, Beckhoff is expanding its EtherCAT technology which has become an established global standard. The solution combines ultra-fast EtherCAT communication with 24 V power for the system and peripherals – and optionally with additional power supply capabilities. This means that One Cable Automation (OCA) can now be implemented on the field level, enabling the plug-and-play connection of machines and other equipment ranging from 24 V sensors to 600 V drivers without the need for control cabinets.

The advanced technology combines the 24 Vdc power supply for EtherCAT P slaves and connected sensors and actuators in a single 4-wire standard Ethernet cable. US (system and sensor supply voltage) and UP (peripheral voltage for actuators) are electrically isolated from each other and can supply current of up to 3 A to the connected components.

Ideal bus for sensors, actuators, and measurement technology components

With EtherCAT P, the US and UP currents are directly fed into the wires of the 100 Mbit/s line resulting in a highly cost-effective and compact connection. This makes the recently introduced technology the ideal bus for sensors, actuators and measurement technology components with benefits for connecting small I/O stations in the terminal box

as well as distributed I/O components. For EtherCAT P a special M8 connector was developed with mechanical encoding that prevents it from being confused with connectors for standard EtherCAT slaves.

To be able to connect components with higher voltage and current needs, a complete EtherCAT P connector family has been designed that covers all applications up to drives with 400 Vac or 600 Vdc and up to 64 A ratings. Thus, the new connectors make it easy to connect all field level components. For I/O applications, the interfaces are available with IP 20 and IP 67 ratings. The system is also suitable for ac and dc motors, actuators, valve terminals and sensors such as proximity switches, light barriers, or rotary encoders. For vision applications you can connect cameras, barcode scanners and 3D scanners.

EtherCAT P simplifies system wiring

The fundamental idea of the advanced technology is to simplify the system wiring by reducing the number of connectors on automation components and devices. The one-cable solution, which is highly scalable according to individual power requirements, can be deployed on the entire field level. For 24 V applications, a standard Ethernet cable can be used. For higher voltages and currents, it is integrated into the respective power supply line. The company offers a wide range of cables and connectors for these applications.

I/O – Input/ Output
 OCA – One Cable Automation
 PoE – Power over Ethernet

Abbreviations/Acronyms

Eliminating separate power lines reduces the cost of materials and assembly as well as the risk of installation errors. It also minimises the space requirements for cable routes, in control cabinets, and in the machine itself. Other benefits include smaller and more clearly arranged cable runs as well as smaller sensors and actuators. This gives machine manufacturers more design options while minimising hardware and system costs through a convenient, tool-assisted system layout.

Flexible topology through power supply forwarding

Engineers benefit from the same flexible choice of topologies they are well familiar with from EtherCAT. Linear, star and tree structures can be freely combined to achieve the most cost-effective and efficient system layout. Unlike with classic Power over Ethernet (PoE), the new technology users can be cascaded and supplied by a single feed-in device. The cascading of associated devices is limited only by the voltage drop, but this can be remedied with additional power feed-in points.

To build custom EtherCAT P topologies, many infrastructure and I/O components with IP 20 and IP 67 ratings are already available. Since with the advanced technology distances of 50 metres, and

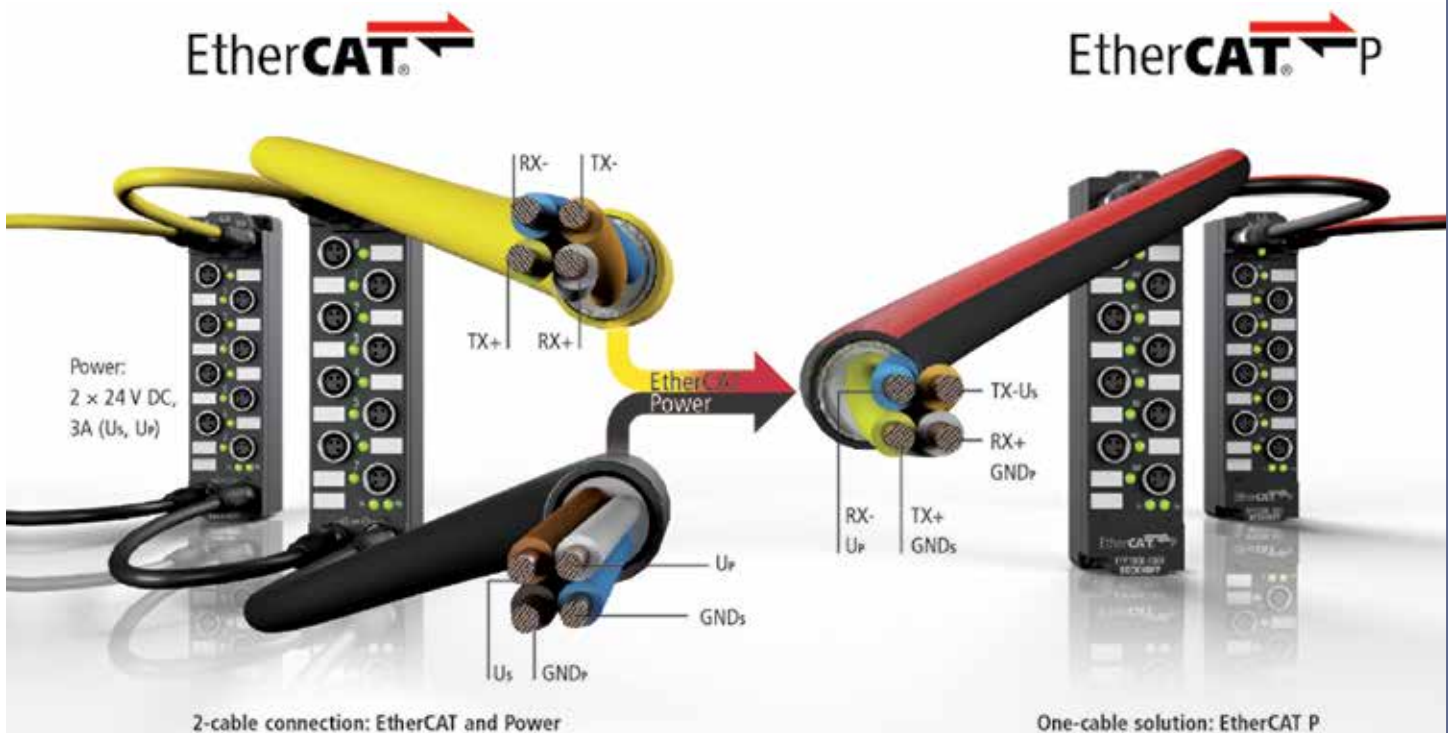
- This technology simplifies the system wiring by reducing the number of connectors on automation components and devices.
- The one-cable solution is highly scalable according to individual power requirements.
- The one-cable solution can be deployed on the entire field level.



One Cable Automation – the path to plug-and-play automation without control cabinets.

more can be bridged, even widely distributed machine modules can be easily linked. A seamless transition from an EtherCAT to an EtherCAT P network is also possible. Reversely, system and peripherals voltage on the advanced technology network can be blocked with a simple adapter to run EtherCAT devices with their own power supply.

To design or plan a machine, the individual users and cable lengths can be configured with a special TwinCAT design tool. Since the system knows the data of all users, it can also take the individual devices' power consumption over time into account. For example, if for logical reasons two actuators never switch at the same time, they never require full power at the same time. This produces additional potential savings with regard to the feed-ins and power supply units required.

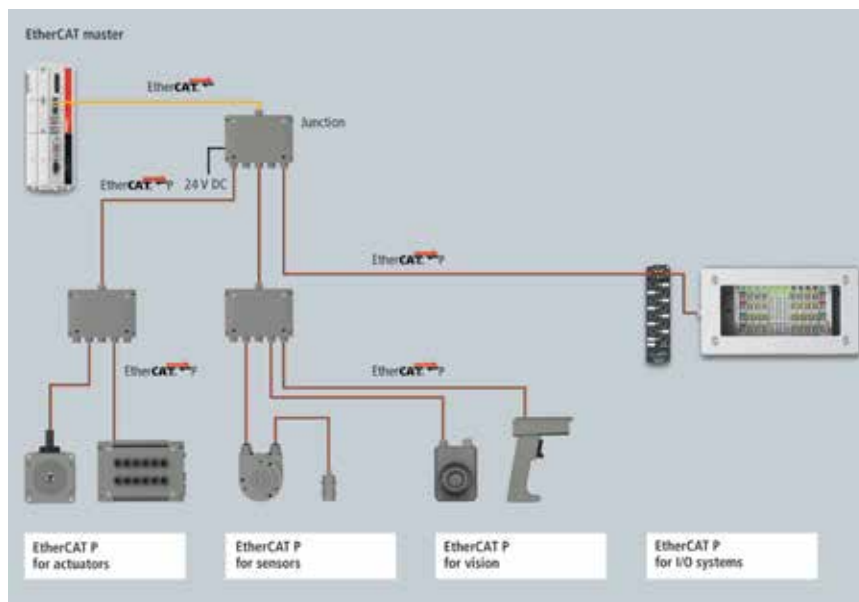


EtherCAT P (right) combines in a 4-wire standard Ethernet cable powerful EtherCAT communication with a previously separate power supply for connected users.

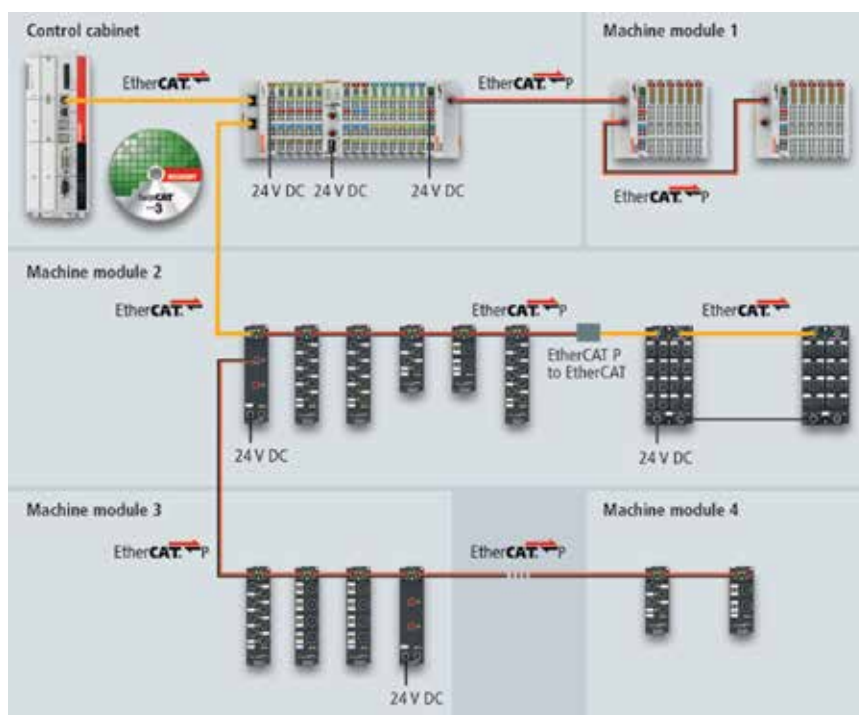
One Cable Automation for the field level

EtherCAT P was developed to enable One Cable Automation across the field level. With its simpler system cabling, it makes machine designs much less complex and reduces engineering and production costs considerably. Automation components, distributed terminal boxes and even individual machine modules and robots receive their power and their control signals over a single cable. Large control cabinets, previously unavoidable, can be reduced in size or even eliminated. As a result, modular machine and system concepts can now be implemented with lower assembly and startup costs, reduced

footprints, and maximised flexibility. Pluggable automation will deliver maximum efficiency in the future. As EtherCAT P connectors for various power requirements become established as a standard, the idea of industrial connector strips for 24 V and higher power classes is not farfetched, but a viable solution. Machine designers could distribute such strips with great flexibility and at low cost in a machine or installation according to the individual application requirements. Such a plug-and-play design which requires only the insertion of a matching EtherCAT cable would make it easy to connect all required sensors and actuators as well as distribution boxes and standalone machine modules.

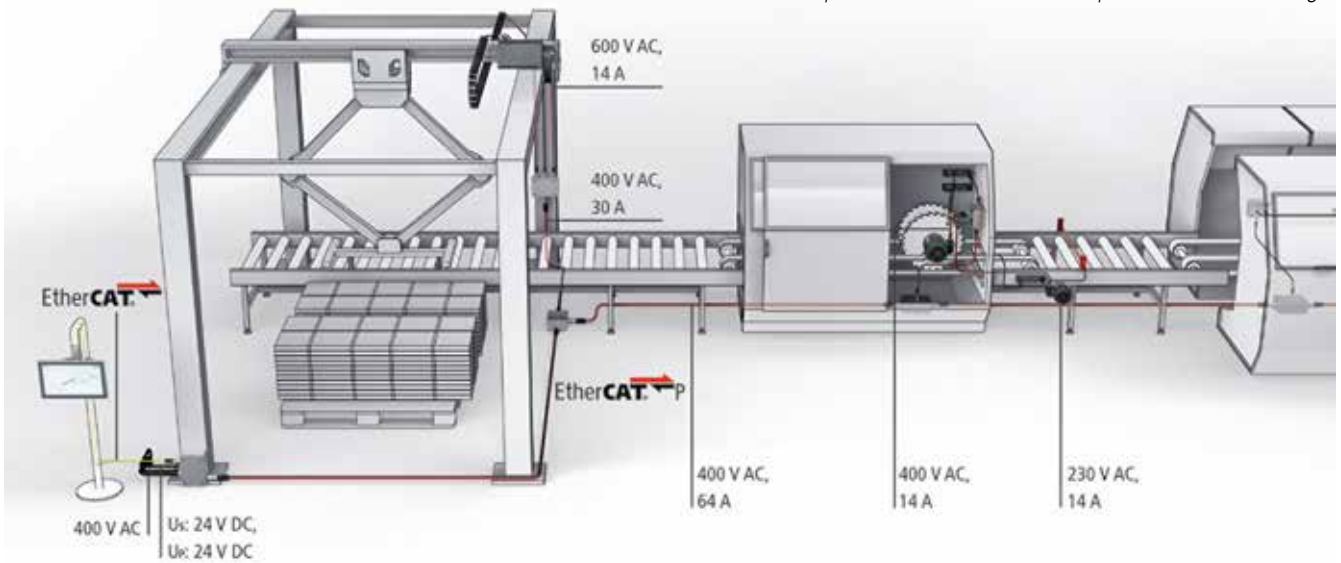


EtherCAT P provides connectivity across the entire field level with an efficient one-cable solution.



With numerous EtherCAT P components in IP 20 and IP 67 protection ratings already being available, users can implement the best-possible network topology for their application.

With its EtherCAT P cabling for various performance classes of automation components, One Cable Automation provides the optimal foundation for modular plant and machine design.



EtherCAT P: Highlights and benefits

EtherCAT is an open industrial Ethernet technology developed by Beckhoff that has been an international IEC and SEMI standard since 2007. As a result, the outstanding characteristics of EtherCAT such as 100 Mbit/s full-duplex communication down to the sensor or actuator, data processing on the fly, highly accurate synchronisation with distributed clocks, and cycle times of less than 100 ms, will continue to be available without restrictions. Additional EtherCAT P-specific benefits include:

- EtherCAT + 2 x 24 Vdc/ 3 A over only one 4-wire cable
- Power supply forwarding to connected devices
- Scalable connector family from 24 Vdc to 600 Vdc and 64 A
- Freedom and flexibility in topology selection through cascadability
- Outstanding EtherCAT performance with low connection costs
- Reduced hardware and installation costs
- Fewer sources of errors and minimised wiring cost
- Optimised space utilisation for cable tracks, control cabinets and machines
- Elimination of separate power supply lines makes smaller sensors and actuators possible



Thomas Rettig is Senior Product Manager, EtherCAT Technology, Beckhoff Automation. Enquiries: Kenneth McPherson. Email kennethm@beckhoff.com

Are you eligible to participate in Eskom’s funding programme?

Eskom has extended the current ESCo funding model

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Go to <http://eskom-bizhub.co.za/ESCo> for detailed information on application guidelines and funding criteria.



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Cloud system for Profinet simplifies distributed automation

The new Proficloud system from **Phoenix Contact** enables easy and secure communication and control of machines and systems across different locations worldwide. The unique combination of the Profinet standard and Proficloud services opens up brand new possibilities for automation.

The system consists of a coupler, the controller, the Proficloud licence, and the Proficloud services. Installation is quick and easy: users build their automation network in their usual development environment.

The Proficloud coupler is installed locally and is used to connect the local Profinet network to the Proficloud via the Internet. At distributed locations, the Proficloud-capable controllers connect to the cloud via the Internet.

The distributed devices now appear as local devices in the Profinet network, without the need for any further configuration or programming. The TLS (Transport Layer Security) encryption ensures data security.

The Proficloud provides the option of integrating applications or services developed in-house into the Profinet network via the Internet. This enables weather data to be accessed from the Internet, for example.

By entering the latitude and longitude, the system receives current or forecast weather information that is relevant to applications in many industries. Another example is the Proficloud 'Cloud Service Calc' service (for calculations).

This service outsources complex computer operations to the cloud. Programming effort is reduced considerably and some calculations that were previously too complex can now be performed.

*Enquiries: Patrick Rowland.
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email Patrickr@phoenixcontact.co.za*

Sensor provides superior durability and precision measurement

RET Automation Controls has expanded its family of L-GAGE laser sensors with the new LTF Series. Featuring time-of-flight technology, the laser measurement sensor ensures accurate distance measurements out to 12 m.

By emitting a pulsed light, the LTF measures the amount of time for the light to reflect off the object and return to the sensor to calculate the distance. This enables sensing in long-range applications, including

loop control, part presence or absence and fill level. The LTF offers the best-in-class combination of accuracy, repeatability and range. Designed with a Class 2 laser emitter with small, highly visible spot, the LTF provides easy sensor alignment and high excess gain. The same sensor that provides repeatability of less than 3 mm and accuracy of plus or minus 10 mm can also reliably detect dark targets past 7 m and white targets at 12 m. In addition to precision distance

measurement, the LTF delivers consistent detection of targets regardless of the angle, environmental conditions or ambient light conditions. The dynamically adjusted laser sensor can also sense objects with varying materials and shapes.

The laser power increases output for dark targets or objects at steep angles, while reducing power for shiny targets.

"No other sensor on the market is going to give you the same combination of range, repeatability and accuracy as the LTF," said Brad Ragozzino, Technical Marketing Engineer, Banner Engineering. "With high excess gain, high reliability and durable performance, the LTF ensures accurate sensing for challenging targets."

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Digitalisation as a key economic driver

Digitalisation is considered to be a key economic driver and one that will allow countries around the world to grow GDP, create employment and reduce spending, according to South Africa CEO for Siemens, Sabine Dall'Omo, speaking recently at the inaugural IoT Africa Summit in Sandton. Yet more can be done by both business and government across Africa to grasp opportunities and take advantage of such technologies.

"The Internet of Things is easy to identify when you think of business to consumer. We have moved from record stores to live streaming or from taxis to ride sharing. Disruption can, and does, have a positive impact on critical sectors in business markets yet more must be done to embrace this new era, this 4th Industrial Revolution," says Dall'Omo.

The business of digitalisation at Siemens will see market growth by mid-2020 of between 7 and 9%, says Dall'Omo. Businesses will use intelligence to manage physical engineering systems like turbines, trains and energy grids allowing for improved efficiency and productivity. Such efficiencies not only increase employee productivity but also generate greater customer satisfaction and loyalty as well as creating revenue streams which did not exist 15 years ago.

This growth is being driven by a number of megatrends. The growing and aging world population, global warming and weather extremities, globalisation, specifically investment abroad, and greater urbanisation. At the heart of these trends is digital transformation and the exponential growth of connected devices.

Africa will be home to a consumer population of 900 million new urban dwellers over the next 35 years, all demanding goods and services to be delivered through digital. To meet such demand, business and government have to keep up.

"We have made a number of strategic investments into South Africa digitalised economy," says Dall'Omo.

Siemens technology, through smart pre-paid metering connected to a smart digital grid, allows for optimised distribution of electricity whether it is to small power users or medium and large users such as industrial complexes and malls. It allows for the real-time monitoring and control of the electricity grid. The system can alleviate both the cost burden of copper cable theft of between R5 and R7 bn, as reported by the SA Chamber of Commerce and Industry, and the municipal debt owed to Eskom reaching into the billions.

In terms of rail, Siemens technology is being used at the Gauteng Nerve Centre. New (GNC) signaling systems on the PRASA network are being centrally controlled through a state of the art operations centre. The technology enables greater efficiencies in rail operations and train safety in Kaalfontein, Johannesburg. The system allows for more frequent service through higher line capacity and is a first of its kind on the continent.

Siemens Digital Services allows for the remote monitoring of wind turbines in Jeffrey's Bay. Remote monitoring takes place in Denmark and includes monitoring of all wind turbines throughout the year. There is real time trouble shooting and error correction to ensure maximum availability of all turbines and the technology will be applied across other wind farms in South Africa including Sere, Noupoort, Loeriesfontein and Khobab wind farms.

Other digitalisation benefits:

Infrastructure: Intelligent building technology reduces energy costs by up to 40%. Traffic management solutions allow for up to 20% fewer traffic jams, accidents and CO₂ emissions

Healthcare: Internal data management reduces laboratory test errors by 73%

Manufacturing: Totally integrated automation together with Digital Prototyping can reduce engineering costs by up to 30%. This means manufacturing companies can get products to market twice as fast without compromising on quality

Renewable energy: Through smart grid technology, renewable energy sources are integrated into energy grids and can be done at up to 40% lower costs

While South Africa may rank second in the sub-Saharan region on the Networked Readiness Index, it only comes in at 70 out of 142 globally.

"That's not to say progress has not been made but in order for South Africa to compete on the world stage, the IoT and digital transformation must be part of today's business conversation. There are also a number of downstream benefits in the digitised economy. The world is moving away from trading in goods and services and towards data trade," says Dall'Omo.

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or email keshin.govender@siemens.com

Twitter: www.twitter.com/SiemensAfrica



Stable system function for demanding tasks

Stable system function and reduced downtime are only two of the advantages that the new generation Leuze SR 46 Series photoelectric sensors and light scanners offer users.

Leveraging latest technology ensures an increased function reserve by up to 80% over the predecessor models for these photoelectric sensors and light scanners. This significantly enhances reliable performance and reduces unplanned downtime, thereby enhancing productivity.

The increase in function reserve also optimises ambient light suppression and automatic sensitivity re-adjustment in applications where soiling or reflections are prevalent.

The Leuze SR 46C Series sensor is ideal for use on special purpose manufacturing and processing machinery and on conveyor systems across a wide range of industries. Capable of reliable operation in temperature ranges from minus 40°C to plus 60°C, these sensors offer a high degree of protection to

both IP 67 and IP 69K facilitating use in harsh environmental conditions.

Other integral features include the well-proven Leuze teach button for simple and fast configuration, a potentiometer allowing a large adjustment range, a highly visible light spot, an improved status LED and an additional display behind the front screen with a Leuze L 46C throughbeam photoelectric sensor.

This series of quality sensing equipment includes the Leuze L 46C throughbeam photoelectric sensor which enables maximum functional reliability even at large operating ranges of up to 150 metres and the Leuze SLS 46C (type 2, type 4) single beam safety device which is suitable for efficient machine safeguarding. The Leuze PRK 46C photoelectric sensor is ideal for small reflectors, heavily soiled or foil-wrapped objects, while the Leuze RK 46C VarOS retro-reflective photoelectric sensor offers reliable detection thanks to the light band optics. Detection of dark and glossy objects is a simple task with the Leuze HT 46C reflection light scanner.

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



Enhancing Society Together

By working in partnership with our clients and other stakeholders, we are committed to make an impactful contribution to society through our projects. We are focused on solutions to the Global Challenges faced in respect of Urban, Water, Transport and Industry through our Business Lines of **Water; Transport & Planning; Industry & Buildings; and Maritime & Aviation**. The framework underpinning our focus on enhancing society rests on four simple questions. These are addressed in every project we undertake:

- Will our solution meet the demands of the stakeholders?
- Will it add value for society as well as clients?
- Are we providing the best solution now and in the long term?
- Can we deliver what is required with an optimal use of resources and fossil fuel energy?

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SMC Pneumatics South Africa at Electra Mining

Having officially opened its doors in South Africa earlier this year, worldwide leaders in pneumatics and industrial automation, SMC Pneumatics South Africa will be exhibiting for the first time at Electra Mining 2016.

True to its customer-centric culture and innovative nature, having been voted on Forbes Magazine's most innovative company list for three consecutive years, SMC Pneumatics promises to 'Wow' thanks to wide array of fully-functional demo units and its highly trained staff complement.

The demo units showcased at this year's Electra Mining will once again showcase the brand's broad range (of over 12 000 basic products) matched to meet infinitely diverse requirements across various industries. Offering service and training nationwide, machine builders and end-users can now benefit from increased levels of high quality technical support and the availability of customised products. Local production and assemblies of several lines at SMC's Johannesburg factory will also ensure shorter lead times.

"We are proud to be able to showcase our quality range at Electra Mining this year. What really sets us apart is our global culture of listening to, understanding and responding to customers' needs efficiently," says **SMC Pneumatics** South Africa General Manager, Adrian Buddingh. "Our team is ready, equipped, willing and able to help you find the correct solution, and with such a large footprint, there is no problem that we cannot solve."

Enquiries: Email sales@smcpneumatics.co.za



INVITATION

Priding itself on an open and engaging environment, SMC would like to invite visitors to join them at their stand throughout Electra Mining. "Whether it's simply to refuel and have a coffee at our coffee bar or to discuss the infinite possibilities when partnering with us – with our technical team and sales engineers, SMC invites you to join us on our stand," says SMC Pneumatics South Africa General Manager, Adrian Buddingh.

SMC Pneumatics' stand is situated in Hall 6 (Stand E5), Electra Mining.

Flex power supply units

RET Automation Controls stocks the complete ADEL System FLEX range of rail mount Power Supplies. FLEX power supplies are available with 1, 2 and 3-phase input, up to 600 W, and with a continuous current rating ranging up to 25 A. They easily supply power to demanding loads such as motors, solenoid valves and lamps. This is due to their 'Power Boost' feature which allows them to supply 150% of their continuous current rating for up to three minutes at 60°C. The power supplies are able to operate in ambient temperatures between -25°C and 70°C and feature three modes for output protection – Hiccup Mode, Manual Reset and Continuous Output mode. The high performance offered by the FLEX range results in a significantly reduced footprint when compared to competitors' power supplies which use conventional technology, saving you space in your control panels. All this at an extremely competitive price.

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



Reasons to use IO link

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- Easy sensor replacement with automatic parameter setting by the master
- Sensor identification included

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- Avoidance of incorrect handling during operation by deactivating the operating keys on the sensor
- Easy transmission of the measured values without conversion losses; values on the sensor display correspond to the values on the machine display
- Highly interference immune – because digital – analogue value transmission in comparison with conventional analogue technology. And this using an unscreened cable without special grounding
- Machine diagnostics up to the sensor level functions without disrupting the operation

Less wiring saves installation costs

- Several analogue signals and switch points can be transmitted using only one standard 3-wire cable. This reduces the number of terminals and makes space in the cable duct
- Sensors and actuators, analogue or binary, can be connected via IO-Link ports. This replaces different input/output modules

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- IO-Link has been internationally standardised to IEC 61131-9 and is therefore future-proof
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Visit us at Electra Mining 2016, Stand J20, Hall 6.

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Lightning and Surge Protection Systems for Free Field Solar Farms

Trevor Manas, Pontins

Research has determined that there are various factors that cause damage and downtime to PV systems.

PV systems have been installed in Europe for the past 15 years. The largest cause of damage to PV systems is without doubt, lightning and induced surges.

Damage statistics for photovoltaic systems
Causes of damage (frequency of occurrence)

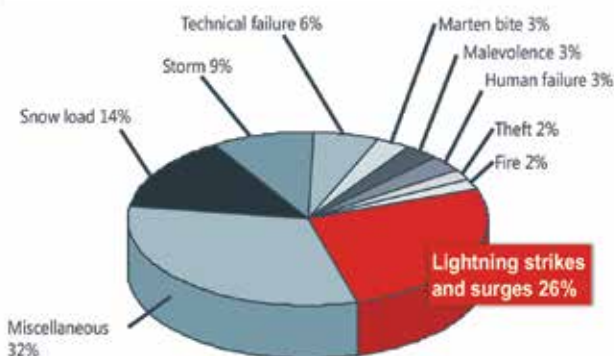


Figure 1: Damage Statistics.

There is a connection between the solar radiation, air humidity and the frequency of lightning discharges. The regional lightning flash index (strikes per km²/year) and the location and size of PV plants will determine the risk of damage and downtime to the free field PV farm. With the completion of Round 1 on the PV farm rollout in 2015, the significant amount of damage caused by lightning to various PV farms makes it clear that the proper lightning and surge protection measures are not being employed on these free field PV farms.



Figure 2: Damage.

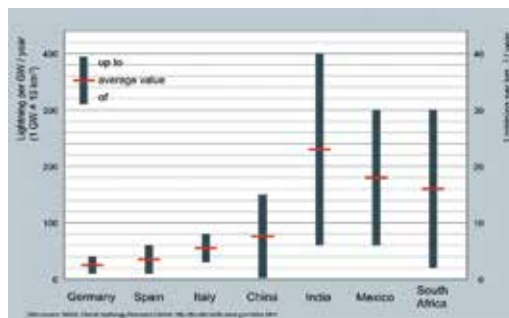


Figure 3: Lightning Flash Index.

Need for Lightning Protection

Damage to PV systems can be caused by both the destructive effects of a direct lightning strike as well as by inductive or capacitive coupling caused by the electromagnetic lightning field (in other words by nearby strikes). In addition, switching surges on the upstream ac system can cause damage to PV modules, inverters, charge controllers and their monitoring and communications systems. There are also much higher risks of fire due to the fact that a large portion of

the Free Field PV System utilises dc currents which do not disconnect under fault conditions. The cost of repair as well as the economic loss caused by downtime must be taken into account. There are also various other factors such as the premature ageing of the PV components and the risk of not meeting the PV plant's contractual requirements on the amount of power being generated.

The risk of damage caused by lightning must be determined in accordance with the SANS/ IEC 62305 part 2 [1] where the results of the risk analysis must be considered at the design stage. In addition in SANS/ IEC 62305 Part 3 [1] a minimum lightning protection level III is specified for all PV systems greater than 10 kW.

Based upon the standards it must be considered as 'Good Practice' to employ the proper earthing, lightning and surge protection systems.

The installation of non-compliant / sub-standard lightning protection systems to save on the initial PV farm build costs will result in damage and downtime of the PV system and in the medium to long term be far more costly.

Lightning protection measures

To ensure effective protection, the Lightning Protection System must have the following optimally coordinated elements:

- Air termination and down conductor system
- Earth termination system
- Lightning equipotential bonding
- Surge protection system to power supply and data systems

These elements form the complete lightning protection system, the parameters of each element are derived from the selected lightning protection level which is obtained from the lightning risk assessment process.

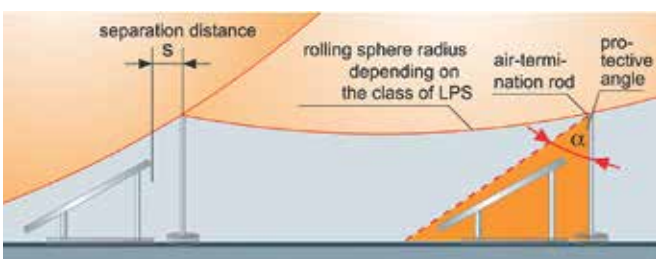


Figure 4: Rolling Sphere versus Protective Angle of air terminals.

Air Termination and Down Conductor System

A properly designed air termination system will prevent lightning striking the electrical systems of the PV plant directly. All electrical systems including the PV panels must be located within the protection zone of the air termination system. The air termination system must be designed in accordance with the parameters of SANS 62305 Part 3 [1] and as a minimum the air termination design should be based upon a lightning protection level III system.

As shown in Figure 1, generally the rolling sphere and angle of protection methods are employed for an air termination system that protects a PV array. The air termination system forms a critical part of the external lightning protection system. In the case of an uncontrolled lightning strike to the PV system, lightning currents will be induced into the electrical installation and cause severe damage to the system.

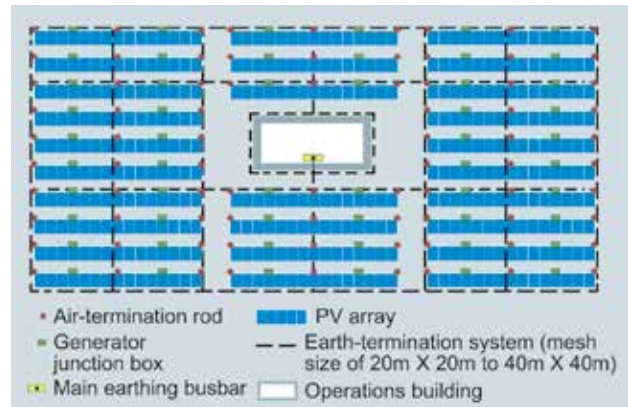


Figure 5: Earth Termination System as per IEC / SANS 62305-3.

Shadowing

When designing the air termination system, care should be taken that no solar panels are shaded by the air termination masts or rods. Diffuse shadows caused by distant masts or rods, do not negatively affect the PV system or their yield. Core shadows, however, cause stress to the PV cells and this leads to bypass diodes. The required distances from the air terminals must be calculated, for example, the calculated minimum distance from a PV module of a 10 mm diameter air terminal is 1,08 m.

Umbra Effect

The region of the PV module which is completely obscured or shaded is called the Umbra and should be prevented in all cases. The other region called the Penumbra or diffuse shadow, is partly obscured since the air terminal or conductor partly covers the sun. Depending on the dimensions of the air terminal or conductor, the minimum distance required to prevent an umbra can be calculated.

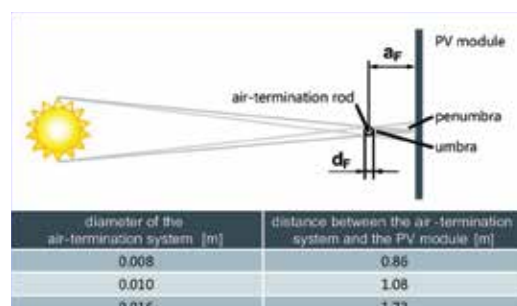


Figure 6: Umbra Effect.

Earth Termination System

The earth termination system forms the basis for the effective surge protection and lightning protection of PV Power Plants. The design and installation of a properly formatted earth termination system is therefore a critical factor in providing effective protection solutions against lightning and induced surge currents. In Annex D of Supplement 5 in IEC 62305 Part 3 [1], a meshed earth termination grid ranging from 20 m X 20 m to 40 m X 40 m in size is specified, this type of grid earthing system has proven its effectiveness in practice. Supplement 5 also specifies that all metal PV module racks must be interconnected. The installation of the grid type earth termination system allows for this required bonding. By intermeshing the earth termination systems, an equipotential surface is created across the site which considerably reduces the voltage stress on the electrical connecting lines that run throughout the PV Plant and Operations Building. Large portions of the earth termination system are frequently installed in the cable trenches; if this is done then the routes must be closed to form grids. The metal framework for the PV modules must be connected to each other and to the earth termination grid. The metallic piles can also be used as natural earth electrodes, provided that they are made of a material and wall thickness in accordance with the minimum requirements of IEC/SANS 62305-3 [1]. Each PV array must be interconnected in such a way that it can carry lightning currents.

Equipotential Bonding

Second to the installation of a grid type earth termination system, the correct equipotential bonding is of vital importance to providing effective protection to PV Plants. The installation of the proper grid type earth termination system provides the correct infrastructure for the effective equipotential bonding system. Lightning equipotential bonding means directly connecting all metal systems in such a way that they are able to carry lightning currents. This would include all cabling and electronic systems. These electronic systems are equipotentially bonded into the LPS by means of lightning current arresters or surge arresters.

Cable Routing

All cables must be routed in such a way that large conductor loops are avoided. This applies for single-pole series connections of the dc circuits (string) and for the interconnection of several strings. In addition, the data or sensor lines must not be routed across several strings to form large conductor loops with the string lines. For this reason, power (dc and ac) data and the equipotential bonding cables must be routed together as far as possible.

- PV farms require a Lightning Protection System (LPS).
- The LPS must include an appropriate earth electrode system.
- Surge Protection Devices (SPDs) must be matched to the system requirement.

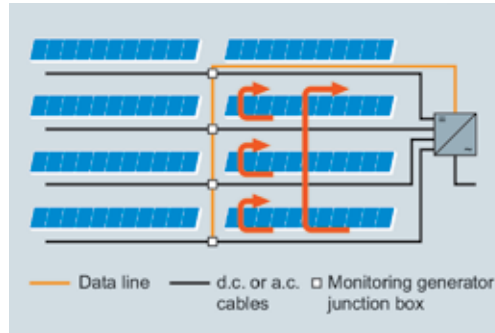


Figure 7: Basic principle of Induction Loops in PV power plants.

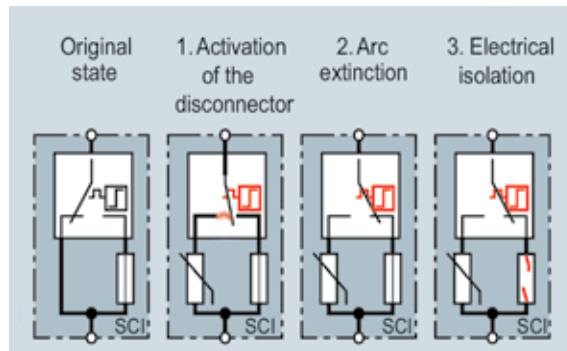


Figure 8: Switching Phases of the Three-Step dc Switching Device Integrated in the DEHNCombo YPV SCI Surge Arrester.

Surge Protection Measures

Surge Protection Devices (SPDs) must be installed to protect electronic systems in PV power plants. If lightning strikes the external LPS of a free field PV system, high voltage impulses are induced onto all electrical conductors and partial lightning currents will then flow into all copper cables (dc, ac and data cables). The magnitude of the partial lightning current depends on various factors like the type of earth termination system, the soil resistivity on the site and the type and size of the cables. Supplement 5 of IEC 62305-3 [1] requires a minimum discharge capacity of 10 kA (10/350 μ s) for voltage-limiting type 1 dc SPDs. This requirement takes into account the possible reverse currents that could occur. In PV systems with central inverters, fuses protect from reverse currents but these fuses only trip after some minutes.

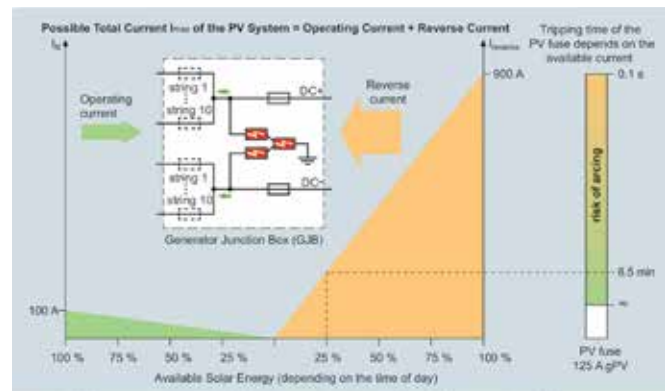


Figure 9: PV System with I_{max} of 1 000 A: Prospective short-circuit current at the PV Arrester depending on the time of day.

When dealing with dc currents in PV plants, the maximum available current depends on the actual solar radiation – therefore in order to reduce the risk of arcing, SPDs that are installed at the generator junction boxes must be able to handle the total current consisting of both the operating and reverse currents and the SPDs must ensure automatic disconnection without arcing in the case of overload.



Special Surge Protection measures for dc side

The typical curve characteristics of PV current sources differ substantially from conventional dc current sources. They have a non-linear characteristic and a different dc arc behaviour.

These differences does not only affect the size of the dc switches and fuses but it requires surge protection devices that are capable of coping with these unique dc follow currents. Supplement 5 of IEC 62305-3 [1] requires safe operation of surge protection devices on the dc side even in the case of overload.

Lightning Current Distribution and Loading of SPDs

The lightning current is mostly dissipated into the ground via a properly designed earth termination system (grid type) and only small partial lightning currents dissipate via the PV system's cables which are equipotentially bonded to the earth termination system via SPDs.

This happens for both low resistance and high resistance earth termination systems. It is therefore the shape and dimension of the earth termination that is important, not the earth termination resistance.

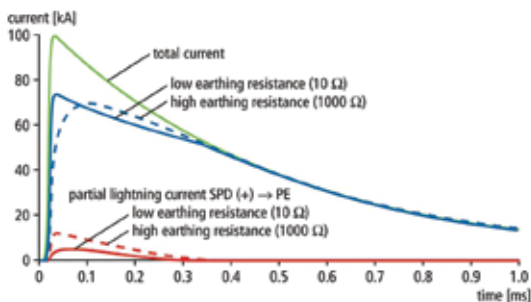


Figure 9: Lightning current distribution and loading of SPDs.

Size and Placement of SPDs

The most important factor in the selection of the type and placement of the surge protection measures, is the type of PV system.

Central Inverter

A great portion of lightning current directly enters the earthing; and partial lightning currents also seek a path to the earth via the dc cabling. The assumption that the whole surface of the PV system can be considered as 'equipotential surface' is not realisable in practice.

The energy system cables work as equipotential bonding conductors between the 'local' earth termination at the module array where the direct lightning strike occurs and the 'distant' equipotential surface of the central inverter.

Therefore, in PV ground-mounted systems with a central inverter, the partial lightning currents flow through the dc conductors between the generator junction boxes and the dc input of the central inverter. Type 1 PV-SPDs need to be installed both at the dc-sub-distribution boards and at the dc-input of the central inverter.



Through our partnership with DEHN Africa, **Pontins lightning protection systems** comply with both the design codes of practice and the component codes of practice.

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”

This research was conducted in environments that have much lower lightning flash indexes than what we have in South Africa.

String Inverter

In case of string inverters, the power supply cables act as equipotential bonding conductors between the 'local' earth termination of the PV array which was directly hit by lightning and the 'remote' equipotential surface of the infeed transformer. Partial lightning currents flow on the ac lines, therefore the installation of Type 1 SPDs on the ac side of the string inverters and on the low-voltage side of the infeed transformer is necessary. Type 2 SPDs, which mainly limit induced interference impulses, are sufficient on the dc side of the string inverters.

Conclusion

In South Africa, the high lightning flash indexes, coupled with the large size and vulnerability of Free Field PV Power Plants, makes the correct design and installation of the lightning and surge protection systems imperative. Proper lightning and surge protection for all systems gives enhanced performance of these power plants. The service and maintenance time as well as the repair and spare part costs are also reduced. The use of DEHN lightning arresters and surge arresters with their SCI (patented) disconnect technology is recommended for PV Power Plants.

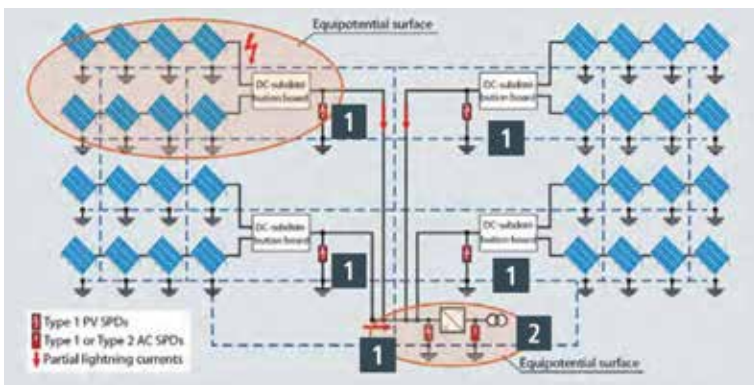


Figure 10: PV System with central inverter.

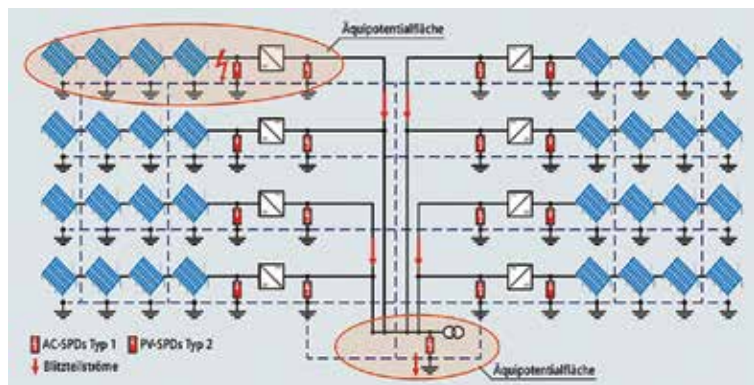


Figure 11: PV System with string inverters.

Protection of data systems

The ability to obtain reliable data from remote maintenance equipment via data cables is essential in the effective operation of the PV Plant.

It is therefore important to provide adequate surge protection to these data systems to prevent damage to the data system. The string and inverter monitoring system, weather data acquisition unit, anti-theft protection and external communication system, are based on different physical interfaces. Surge protection devices specifically suited to each type of interface must be selected.

References

- [1] SANS/IEC 62305-1, 2, 3: Lightning Protection Standard.
Part 1: General principles.
Part 2: Risk management.
Part 3: Protection of the structure.
Part 4: Electronic systems protection.
- [2] SANS 10313. 2012. Protection against lightning - Physical damage to structures and life hazard.
- [3] DEHN & Sohne - Lightning Protection Guide (3rd edition).

Note

IEC 62305 (part 3) Supplement 5. Lightning and Overvoltage Protection for Photovoltaic Power Supply Systems (this has not yet been adopted by the SABS standards committee but the writer believes that it can be considered as good practice and would recommend the use of this supplement).



Trevor Manas started his lightning protection career at Pontins in 1991 as an installation technician, learning the ropes by working on various sites and doing physical installations. Within two years, he was promoted to sales engineer, where he was involved in site assessments, soil resistivity surveys and compiling quotations. In 1996, Trevor was promoted to the position of director and was in charge of ensuring the company's compliance with the earthing and lightning protection codes of practice. In 1999, Trevor became the managing director of Pontins. In 2013, Pontins formed a partnership with DEHN Africa which gave Pontins access to world class cutting edge lightning protection technologies.
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Lightning effects and surges present a risk for the sensitive electronic circuitry of electromobility charging stations and the customer's vehicle. Failure or damage can quickly become quite expensive. Apart from the repair costs, electromobility manufacturers also run the risk of losing customers' trust. Customers may not feel safe driving electric vehicles that are not protected from possible damage. Therefore, reliability is a top priority, particularly in an emerging market.

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in multi-storey car parks, or in underground car parks. Therefore, charging stations will be installed in private, semi-public, and public areas – and consequently there is an increasing interest in comprehensive protection concepts. The vehicles are too expensive and the investments too high to run the risk of lightning and surge damage, which is why protection from thunderstorms (and the risk to the electronic circuitry), surge damage (it is highly probable that power surges will damage the vehicle during a charging process).

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Image: Source – fotolia.com

Expert solutions for lightning safety and protection challenges

As we move into or towards the lightning season in many parts of the world, lightning safety and lightning protection moves to 'front of mind'. Numerous recent events internationally, including many associated deaths and injuries, have also highlighted the safety risks associated with lightning. Many applications, such as those in mining, oil and gas (petrochemical), airports/aviation and other transportation systems (such as railways), renewable energy (such as PV and wind plants), as well as large conventional power and industrial plants and outdoor sporting and recreational facilities, all present particular lightning-related challenges as 'complex applications'.

This was noted by Ian McKechnie, Chief Executive Officer of project and engineering advisors and solutions provider **Engenamic**, who commented that: "The complexity of these applications, insofar as lightning safety and lightning protection is concerned, arises from a combination of particular factors. These include, for example, that such sites typically have relatively exposed persons, infrastructure, equipment and systems, often over an extended area. They also typically include a diverse and complex range of people, systems, technologies and interfaces in a dynamic and constantly changing environment, as

well as application and site specific factors such as possible presence of hazardous locations and particular site conditions".

He added that: "That these are some examples of factors that impact directly on the risks associated with lightning safety and lightning protection, and which require careful consideration in developing solutions". He also noted that their team members' professional expert consultation in various matters, including in investigative, forensic, remedial and mediation roles, had highlighted many shortcomings in both engineering approach and in the addressing of application specifics.

Ian Jandrell, Chief Technical Officer of Engenamic, added that a well-structured and engineered solution can nevertheless manage the lightning safety and lightning protection risks for these applications. He cautioned however that it was important that appropriate expertise and experience be applied in addressing challenges and developing solutions.

"At Engenamic, our team is led by reputable engineering professionals who are not only recognised as experts in lightning protection and lightning safety, but who also have broad-based experience in engineering management and project management, as well as in forensic and

remedial engineering. This provides them with the insights, experience and expertise to appreciate the broader implications and to address the complexities associated with both 'greenfield' and 'brownfield' applications".

McKechnie concluded that the Engenamic team members had extensive and international experience in lightning safety and lightning protection (including through sister company Innopro, now part of the Engenamic family) and that their services are offered on a world-wide basis.

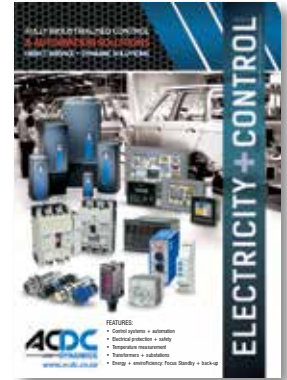
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*Ian McKechnie,
Chief Executive
Officer,
Engenamic.*

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A **ACDC Dynamics** was founded in 1984 and is a market leader in the manufacture, import and distribution of quality products in the electrical, lighting, solar power, pumps, alarm, security and surveillance systems and tools industries. Product ranges include premium international brands in low voltage switchgear, power tools, enclosures and accessories. With the head office in Edenvale and branches in Germiston, Cape Town and Durban, ACDC Dynamics is a family-owned business with Mario Maio as the founder and managing member.

ACDC Dynamics strives for service excellence and insists on employing the right people in the right places. "We don't just want to meet your expectations, we strive to exceed your expectations with every interaction." A dynamic environment exists for any employee at ACDC. ACDC employs over 600 people nationally and is represented in all CBDs in South Africa. The company comprises a team of field sales personnel, product specialists for each brand and product range, and a team of technical support staff who are always ready and able to provide any support you may require. The technical specialists as well as all support staff are among the company's biggest assets. The skilled staff are able to assist in product selection and technical specifications, solutions and more.

ACDC Dynamics offers a wide variety of products including alarms and alarm systems, hygiene, industrial and domestic automation, telemetry systems, pumps, switchgear and instrumentation, energy management and power factor correction solutions, solar and wind generators, tools, wire, adhesives and consumables, cable and wire management products, and the most comprehensive range of lighting, making use of new innovative technologies in energy saving solutions using CFL, Inductive and LED technologies.

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• Gewiss (Italy)	• Innovolt
• C&STC (India)	• Halo Lighting Solutions
• Fulleon (UK)	

ACDC Dynamics' manufacturing operations offer a wide range of solutions from the production of transformers, power supplies, electronic timers, motor starters to power factor correction systems.

Through the years the company has carefully built up strategic distribution channels to ensure that its wide range of products is available to anyone, either directly through the branches, through the many franchises, distributors or participating electrical wholesalers countrywide. This places ACDC Dynamics' products within easy reach for anyone in Sub-Saharan Africa.

Many products address the Manufacturing Industry such as industrial proximity switches, photoelectric sensors, safety light curtains, rotary encoders, module case circuit breakers, isolators, air circuit breakers, variable speed drives, soft starters, programmable logic controllers, limit switches, junction and terminal blocks, control stations, pushbuttons and pilot lights, just to mention a few. ACDC Dynamics' products are specified in projects ranging from stadiums to mines, hotels to homes, from farms to breweries and residential shelters.

One of the company's many strengths is its extensive catalogue which is widely recognised as a benchmark in the electrical industry. Truly world class, you will find all the specifications, product ranges and technical details to make the most appropriate product selections. The catalogue is produced and updated every second year to provide you with the most up to date product details.

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Making 'cents' in Pasteurisation

Benjamin Mlangeni and Natlee Chetty, Endress+Hauser

Heating processes for the preservation of beverages, pose as one of the most critical points concerning product quality and safety in any beverage production.

These processes, therefore, are always part of the HACCP (Hazard Analysis and Critical Control Points) concept of a plant and are usually under special observation in any production audit. Endress+Hauser provides expert solutions guaranteeing consistent production quality, safety and compliance, increased productivity, conservation of resources and lower production costs.

Flash pasteurisation (**HTST** – **H**igh **T**emperature **S**hort **T**ime) and **UHT** treatment – **U**ltra **H**igh **T**emperature) is the most common heating processes for preservation of beverages. The basic mechanism of all processes is to kill spoilage micro-organisms by exposing the product to a certain temperature for a specific amount of time. The higher the temperature, the shorter the necessary exposure time – this is the main difference between the different procedures. As temperature is the critical value, it must be controlled and monitored very accurately to guarantee product safety and quality.

Flash pasteurisation or HTST is used for careful preservation of perishable beverages like beer and juices. The name goes back to the French chemist and microbiologist Louis Pasteur, who invented the heat treatment of beverages in 1862. Spoilage microorganisms are inactivated, to increase product safety and to extend shelf life of

the beverage. The product is heated and exposed to temperatures between 68...75°C for a certain time (30...60 seconds). Successful inactivation of micro-organisms is mainly dependent on two factors: Temperature and the time of the heat treatment. This correlation is expressed in Pasteur-Units (PUs) and determines the microbiological effect of the heat treatment (the higher the figure, the higher the effect). Heat treatment time is determined by flow velocity and pipe length.

Flash pasteurisation of milk

Accurate temperature control is a precondition for product safety and quality as well as for process efficiency. Even an increase of only 0,5°C leads to PU increase of 18%. Typical value for milk (according to standard US protocol from 1993) is 71,7°C and 15 seconds treatment time

- 99,999% reduction of harmful bacteria
- $PU = 0,25 \text{ min} \times 1,393^{(71,7^\circ\text{C}-60^\circ\text{C})} = 12,08 \text{ PU}$

Example: Pasteurising time = 15 seconds constant (determined by required flow rate and pipe length)

- Required temperature $\geq 71,7^\circ\text{C}$
- $0,25 \text{ min} * 1,393^{(72,2^\circ\text{C}-60^\circ\text{C})} = 14,26 \text{ PU}$

- HACCP – Hazard Analysis and Critical Control Points
- HTST – High Temperature Short Time
- PU – Pasteur-Units
- UHT – Ultra High Temperature

Abbreviations/Acronyms



Pasteurisation is named after the French chemist and microbiologist, Louis Pasteur, who invented the heat treatment of beverages in 1862.

- **Increase** of the PU value by 18 %

If the temperature is too high there is:

- ♦ An impact on product quality and taste
- ♦ A waste of energy

If the temperature is too low there is:

- ♦ A risk of microbiological contamination
- ♦ Risk for consumers' health

If the temperature is too high there is:

- Loss of product quality and taste
- Waste of energy

If temperature is too low there is:

- Insufficient conservation
- Limited storage life in terms of quality and taste

Conclusion

So what is the Perfect Solution for Flash pasteurisation? Making use of the fastest sensor in the world – iTHERM.

Flash pasteurisation of bottled beer

Accurate and fast temperature control is a precondition for the best quality and taste. Slight temperature increase of 0,5°C leads to an increase of the PU value by 18%.

Typical PU values for flash pasteurisation of bottled beer is 20...30 PU with 68...75°C for 30...60 seconds treatment time.

Example: Required control range: 26 PU < real PU value < 30 PU

- Pasteurising time = 30 seconds constant (determined by the required flow rate and the pipe length)
- Required minimum temperature $\geq 72^\circ\text{C}$ $0,5 \text{ min} * 1,393^{(72^\circ\text{C}-60^\circ\text{C})} = 26,7 \text{ PU}$

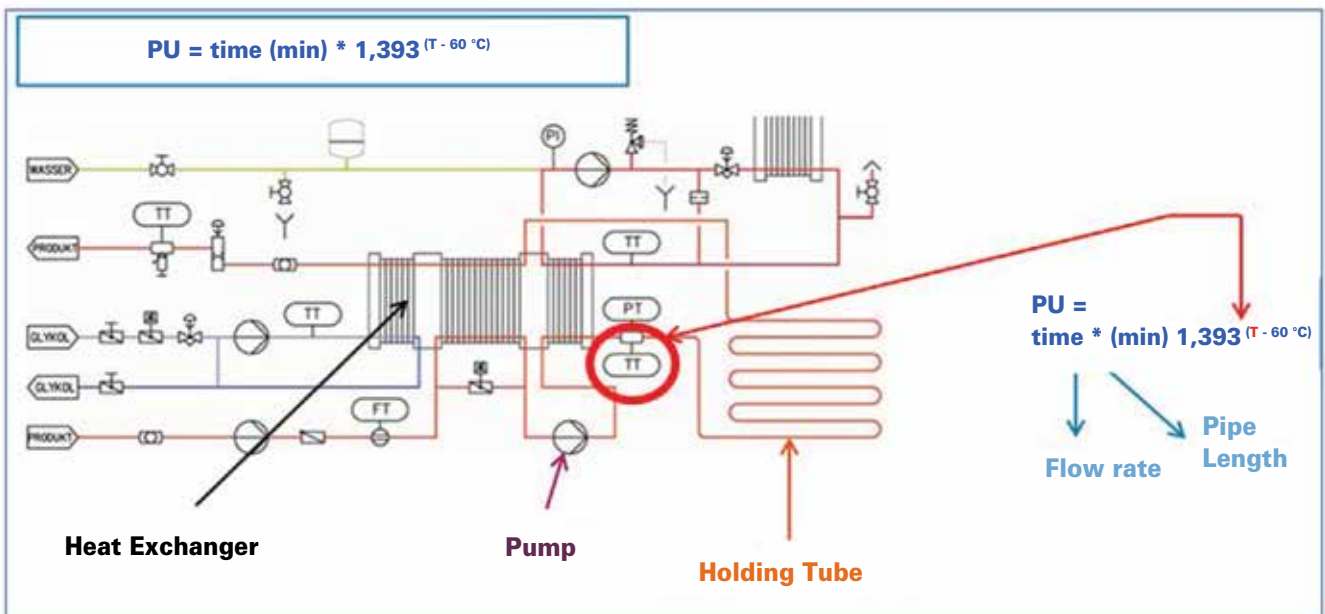
What happens, if the temperature increases by only 0,5°C?

- $0,5 \text{ min} * 1,393^{(72,5^\circ\text{C}-60^\circ\text{C})} = 31,5 \text{ PU} > 30 \text{ PU}$
- Increase of the PU value by 18%

- Flash Pasteurisation is used for careful preservation of perishable beverages.
- Accurate temperature control is a precondition for product safety, quality and process efficiency.
- The name, Pasteurisation, derives from the French Chemist, Louis Pasteur, who invented the heat treatment of beverages.



Benjamin Mlangeni is Product Manager of Temperature System Components and Registration at Endress+Hauser. Natlee Chetty is Industry Manager for the Food & Beverage Industry at Endress+Hauser South Africa. Enquiries: Tel: +27 (0) 11 262 8000 or email Benjamin.Mlangeni@za.endress.com



Troyeville Hotel's heat pump pays for itself in just over two months

Information provided by Eskom

Located in the Johannesburg inner-city suburb of Troyeville, and just up the hill from the Emirates Airline Park (previously Ellis Park) stadium, the Troyeville Hotel remains something of a legend with a loyal following across Johannesburg.

Opened in 1939 as a male boarding house, the two-storey Troyeville Hotel (generally just called 'The Troyeville') has eight rooms (which are occupied by long-term guests) plus three recently renovated upmarket rooms, including a suite. The hotel also has a small fully-equipped conference room and a bar – a very popular hangout in Johannesburg. The restaurant, and specifically its Portuguese food, is a firm favourite with Johannesburgers.

Co-owner (and well-known restaurateur) Laurence Jones recalls that he convinced a group of friends to buy the hotel with him 11 years ago because – when he heard it was on the market – he was particularly concerned about missing out on his favourite Portuguese lunch. More than a decade later most of the kitchen staff are still at the Troyeville but nowadays they are working harder than ever – preparing up to 150 meals a day.

Trimming the water heating bill

As is the case in any hard-working kitchen, hot water is essential to the Troyeville's everyday operations. It's used for the accommodation and for washing plates and equipment and preparing food. But, of course, hot water costs money which, with energy prices rising all the time, is only becoming more expensive. And so, a year ago, Jones decided to investigate alternative energy sources to supply the kitchen with hot water.

Boiler... supplied by piped natural gas

"Up to a year ago we had a gas boiler which was supplied by piped natural gas," says Jones. "It was pretty old and kept breaking down. Plus I wanted to know if we could save money using alternative technology. I decided to make some enquiries and the upshot was that we installed a heat pump which has been working fantastically ever since."

According to Jones the hotel's gas bill used to average R26 000 a month, which was spent on the boiler, gas cookers and on heaters located throughout the hotel. (Had the boiler been heated using electricity its monthly cost would probably have been similar to that

of natural gas although that cost would almost certainly have climbed faster than the gas price.)

"We spent R12 000 on a 7 kW heat pump and installation cost us another R2 000," explains Jones.

"We simply used the existing 2 000 litre water tank and the switchover was so quick and easy that we didn't have to warn anyone – guests or even staff – to expect any disruptions because there weren't any."

Compact heat pump

The Troyeville's compact heat pump is located on the roof of the hotel next to the old boiler and hot water is piped directly downstairs to the main kitchen. According to Jones his in-house handyman is responsible for maintenance – little more than rinsing a single filter every two months or so and giving the unit the occasional bit of cleaning.

The heat pump heats water to 50°C – quite sufficient for the kitchen's needs. Jones is well aware that a big reason why hotels turn to heat pumps is the added benefit that they produce cool air. "If we were a bigger establishment with, say 50 rooms or more, we probably would have installed a bigger unit which would have given us much more cold air, which we might have pumped for cooling, but the 7kW unit we have is perfect for our needs."

How much have they saved?

So how much money has the Troyeville saved from installing its first heat pump and what has been the payback period? "Our gas bill used to be R26 000 a month and, as soon as we installed the heat pump, it came down by R6 000 a month. So, yes, it's been a brilliant investment."

So what exactly is a heat pump?

In the broadest terms, a heat pump is similar to an air conditioner or refrigerator except that, instead of pumping heat out of a fridge or

”

A heat pump can be up to three times more efficient than a traditional electric element geyser.

air conditioner into the surrounding air, it pumps the heat from the outside air into the water to be heated.

A heat pump can be up to three times more efficient than a traditional electric element geyser because it uses one unit of electricity and two units of low-temperature air to produce three units of hot water whereas a traditional geyser uses three units of electricity or gas.

Eskom's national Advisory Service

Eskom's national Advisory Service can help you to locate heat pump suppliers. The team can also advise hotels on:

- Reducing energy usage
Doing walk-through energy assessments to identify energy usage patterns, energy needs, areas of energy wastage and energy saving opportunities
- Improving the energy efficiency of operations and electrical systems and processes

- A heat pump pumps heat from the outside air into the water to be heated.
- A heat pump uses one unit of electricity and two units of low temperature air to produce three units of hot water.
- Installing a heat pump has saved this hotel's management R6 000 per month.



- Prioritising maintenance as an important contributor to reducing energy usage
- Finding SANAS approved energy savings Measurement & Verification Authorities

Advisors help identify funding opportunities for energy efficiency projects. Enquiries: Call 08600 37566 – leave your name and number and an Eskom Energy Advisor will contact you. Alternatively, ask for a specific advisor to contact you or email an enquiry to AdvisoryService@eskom.co.za Visit www.eskom.co.za/idm



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- Double-conversion technology provides 24/7 full-time protection.
- Automatic input frequency detection
- AC-start and battery-start capabilities
- Remote management over network via software



	R-1K	R-2K	R-3K
Voltage	220/230/240 Vac (single phase)		
Input Voltage Range	80 ~ 280 Vac *		
Wave Form	Pure sine wave		
Switching time	1,5-6ms typical (9ms max)		
Interface	RS232 x 1, SNMP slot x 1		

RT Series 1-3kVA

- Standard 19 inches rack / tower configuration(2U).
- Power Factor 0,9
- Efficiency up to 93%
- Battery independent Startup without battery



	1 kVA / 0.9kW	2 kVA / 1.8 kW	3 kVA / 2.7kW
Voltage	220, 230, 240 Vac		
Input Voltage Range	220/230/240 Vac: 175 ~ 280 Vac (100% load); 120 ~ 175 Vac (70% ~ 100% load) 200/208 Vac: 160 ~280 Vac (100% load); 120 ~ 160 Vac (70% ~ 100% load)		
Battery Source Rating	24Vdc	48Vdc	72Vdc
Battery Charging	1,5A	2A	2A

RT Series 5-10kVA

- Output power factor 0.9
- Parallel redundancy or expansion
- Rack/tower configuration
- Multi-language (8) LCD and LED display



	5 kVA / 4.5kW	6 kVA / 5.4 kW	10 kVA / 9kW
Voltage	220, 230, 240 Vac		
Input Voltage Range	100~300Vac. Lower range 100~180Vac is acceptable under 50~100% loading condition.		
EBC* Rating	12V/5.5Ah x 16		12V/9Ah x 20
Battery Charging	Max. 4A, optional 2nd charger, totally 8A		

Maintenance Bypass Box for 5-11kVA

MBB-S - Maintenance bypass when single UPS is installed.
Manual bypass box if one unit is connected, capacity up to 11kVA.

MBB-P - Maintenance bypass when two UPS are connected in parallel.



Manual bypass box if Two units are connected in Parallel-redundant mode, up to 11kVA. Total power is 11kVA due to manual bypass breaker value 63A.



EH series 10 - 20kVA

- Power 10, 15, 20 KVA
- Phase configuration 3Phase IN / 1Phase OUT
- Paralleling up to 4 units
- RS232, Smart and Mini slot for remote management, contacts

Ultron Three phase UPS



	10 kVA / 8kW	15 kVA / 12 kW	20 kVA / 16 kW
Voltage	220/380 , 230/400 , 240/415 (3phase, 4-wire plus ground)		
Input Voltage Range	208~477VAC full load, 208~304VAC 50% -100% load de-rating		
Input/Output Connection	Hard wire (Terminal block)		
Output Voltage	3/1 model : 220/230/240 (single phase)		
Battery Source Rating	240Vdc		

Communication for UPS Range

SNMP Card Legacy
- IPv6



ModBus Card



Relay I/O Card



SNMP + Switching
Hub



Enviro Probe



Mini SNMP Card



USB Card



Mini Relay I/O Card



TVSS Card



Mini ModBus Card



HPH series 20 - 120kVA

- IGBT technology
- Power 20,30,40,60,80,100,120 KVA
- Paralleling up to 4 units
- RS232, SNMP slot, Relay contacts

	60/80 kVA/kW	100/120 kVA/kW
Voltage	220/380 , 230/400 , 240/415 (3phase, 4-wire plus ground)	
Input Voltage Range	PF1 = 400/230 -16% = > >192/334Vac PF 0,9 = 173~276 / 300~477VAC full load; 132~173 / 228~300VAC 70% derating	
Input/Output Connection	Hard wire (Terminal block)	
Output Voltage	3/3 model : 220/380 , 230/400 , 240/415 (3phase)	
Battery Source Rating	480Vdc = 40 batt. basic configuration; range from 38 up to 46 batt. FW 32-36 batt. with its derating	
Battery Charging	10/15A	20A



DPS Series, Three Phase 60 to 120kVA

- IGBT-based, efficiency up to 96% to meet green data center criteria
- 0.9 output power factor
- Transformer-less architecture and less footprint, compact design
- Double Conversion UPS

	DPS-60K	DPS-80K	DPS-100K	DPS-120K
Voltage	380/220V, 400/230V (3 phase, 4-wire +G)			
Input Voltage Range	-45% ~ 20% (208 ~ 477Vac)			
Output Voltage	380/220V, 400/230V (3 phase, 4-wire +G)			
Output Power Factor	0.9			
Efficiency	Up to 94%			



	DPS-160K	DPS-200K	DPS-300K	DPS-400K
Voltage	380/220, 400/230, 415/240 Vac (3 phase, 4-wire + G)			
Input Voltage Range	-40% ~ 20% (242 ~ 477/140 ~ 276 Vac)			
Output Voltage	380/220, 400/230, 415/240 Vac (3 phase, 4-wire + G)			
Output Power Factor	0.9			
Efficiency	Up to 96%			

NT Series 20-500kVA

- Transformer based Full bridge UPS
- 6 pulse/12 Pulse rectifier
- Economic mode for energy and operation cost savings
- Built-in manual bypass switch for maintenance

	NT-20K	30K	40K	50K	60K	80K	100K	120K	160K	200K	260K	320K	400K	500K
Power Rating - kVA	20	30	40	50	60	80	100	120	160	200	260	320	400	500
Voltage	208/120, 380/220, 400/230, 415/240, 480/277 Vac (3 phase, 4-wire + G)													
Input Voltage Range	± 20%													
Output Voltage	208/120, 380/220, 400/230, 415/240, 480/277 Vac (3 phase, 4-wire + G)													
Interface	RS232 x 1, RS485 x 2, SNMP slot x 1, Status dry contact output x 6													



Modulon Three phase UPS

NH Plus Series 20-120kVA

- Frames 80kVA, 120kVA
- Hot-swappable power modules
- Over 94 % efficiency
- Built-in manual and static bypass switch for maintenance



	NHP-20K	NHP-40K	NHP-60K	NHP-80K	NHP-100K	NHP-120K
Power Rating - kVA	20	40	60	80	100	120
Voltage	380/220, 400/230, 415/240 Vac (3 phase, 4-wire + G)					
Input Voltage Range	208 ~ 477 Vac (line-line)/120 ~ 276 Vac (line-neutral)					
Output Voltage	380/220, 400/230, 415/240 Vac (3 phase, 4-wire + G)					
Interface	RS232 x 1, SNMP slot x 2, Dry contact output x 6, Dry contact input x 2, Battery cabinet temperature x 4, Battery cabinet status detection x 1, Parallel port x 1, REPO x 1					

DPH Series 25 - 200kW

- Hot-swappable function for all major functional blocks
- N+X parallel redundancy (up to 4 cabinets)
- Output Power Factor 1,0
- Up to 96 % efficiency



	DPH 75kW System	DPH 150kW System	DPH 200kW System
Power Rating (kVA)	25, 50, 75	25, 50, 75, 100, 125, 150	25, 50, 75, 100, 125, 150, 175, 200
Input Voltage Range	380/220V, 400/230V, 415/240V (3 phase, 4-wire +G)		
Output Voltage	176~276 / 305~477 Vac		
Interface	System communication port x 1, LCM port x 1		

Telecom Power Solutions

Telecom power systems secure telecommunication equipment in case of grid power interruptions and fluctuations. Delta's power systems are designed for wireless broadband access and fixed-line applications, as well as for Internet backbone and data centres. We provide a broad range of power systems and global services to telecom operators, network manufacturers and integrators.

CabD 4000-48/6/12/24

CabD is an energy efficient, high power density system that is ideal for space critical applications. An integrated modular system allows flexible and adaptable installations. The system includes up to six rectifiers, AC and DC connections, battery connection and the Delta PSC 3 or Orion controller. In addition, easy installation and expand-ability add to the success of the system.

	CabD 4000/6	CabD 4000/12	CabD 4000/24
Dimension (WxHxL)	1800, 2000, 2200mm(H) x 600mm(W) x 600mm(D)	1800, 2000, 2200mm(H) x 600mm(W) x 600mm(D)	1800, 2000, 2200mm(H) x 600mm(W) x 600mm(D)
Max. system power	24kW	48kW	96kW
Voltage range	42 - 58 V _{DC} ; 53.5 V _{VDC nom}		
Controller	PSC 3 / Orion		

CellID – high power for space-critical applications

CellID systems are 19" Rack mount shelves (DPS) with multiple optional slots for power modules (DPR). They can be embedded in the telecom infrastructure and can be used in outdoor and indoor solutions. The products in this series are light and designed especially for installations with limited space.



	CellID 40	CellID 100	CellID 300	CellID 600
AC input connection	L + N + PE	6 x L + N + PE or optional 3L + N + PE	3 x (L + N + PE) or 3L + N + PE	2 x (3L + N + PE) or 3L + N + PE
AC input voltage	208 / 220 / 230 / 240 VRMS	208 / 220 / 230 / 240 VRMS	2 x 230 VRMS (L - N)	2 x 230 VRMS (L - N) or 3 x 230 VRMS (L - N)
DC voltage range	42 - 58 VDC, 53.5 DC NOM	42 - 58 VDC, 53.5 VDC NOM	42 - 58 VDC, 54 VDC NOM	42 - 58 VDC, 54 VDC NOM
Power, nominal	2.55 kW	5.1 kW	17.4 kW	34.8 kW or 20 kW
Efficiency rectifier	95.2%	95.2%	96.2%	95 %
Controller	PSC 3 or CSU 50	PSC 3 or CSU 502	PSC 3	PSC 3
Rectifier	DPR 850B-48	Max 6 x DPR 850B-48	Max 6 DPR 2900B-48	Max 9 or 12 x DPR 2900B-48 or max 5 x DPR 4000B-48

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 For more visit: www.deltapowersolutions.co.za /
www.solar-solutions.co.za

Humidity probe for tough processes

Michell Instruments, represented in South Africa by **Instrotech** – a Comtest Group company – has on offer their new HygroSmart HS3 probe, designed to withstand the kind of harsh and demanding conditions found in industrial processes. Unlike many 'disposable' probes that have a short life within harsh conditions before needing to be replaced, the HygroSmart HS3 sensor has a polymer tile to give long-term reliable measurements. In addition, it also has an accuracy of 0,8% RH, making it among the most accurate and reliable RH probes on the market, as well as allowing for longer recalibration periods.

This not only gives peace of mind to process operators, but also provides a low life-time cost of ownership when compared to the disposable probes. The HygroSmart HS3 consists of a solid, corrosion-resistant probe body with an interchangeable sensor. When recalibration is due, the old HygroSmart HS3 sensor is simply exchanged for a new, freshly calibrated one. This simple procedure takes only a few seconds to carry out with the probe itself remaining installed. Replacing just the sensor, rather than the whole probe, is not only quick and simple, it also saves users money over the lifetime of the probe.

In most industrial applications, RH probes have to withstand vibration, exposure to water, occasional heavy

shocks and high levels of electrical interference. The HygroSmart HS3 body is designed to cope with all these environmental factors. As well as the solid body, the probe also has a 10 bar pressure rating, rfi/emc electrical noise approvals and IP67 ingress protection rating.

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



Reduce risk of electrical injury



Delta T Alert is a wireless, self-contained temperature-monitoring sensor that attaches to an electrical enclosure cover. The patented, Delta T Alert unit is simple to install and comprises two temperature sensors one to monitor the electrical enclosure's interior temperatures and the second to monitor the room's ambient temperature where the enclosure is located.

Delta T Alert sensors are then configured to collect data on continuous basis, at preset time intervals. The data is wirelessly transmitted for analysis and trending and warns the operator of temperature rises within their electrical enclosures, well before

more serious problems arise and provides an easier, more effective way to prevent costly electrical damage and system downtime.

Delta T Alert bridges the gap between your infrared scans by monitoring and reporting critical temperatures within your electrical enclosures on a timed basis and effectively tracks your electrical system enclosure temperatures and sends data for analysis and trending. If a critical issue arises, immediate notification allows for an appropriate corrective action, before costly damage occurs.

Enquiries: Tel. +27 (0) 11 608 1551 or email sales@randci.co.za

Radical aerial thermography

Optris, specialists in non-contact temperature measurement, has on offer to the market, the newly developed Optris PI LightWeight – a market innovation that allows for radiometric recordings of video imagery from the air. The combination of a miniature lightweight PC and a light version of the Optris PI thermal imager weighs only 380 g. The PI LightWeight is therefore ideally suited for maintenance work and quality inspections of solar and wind power systems and also for thermographic surveys of buildings.

Mounted on a UAV, the Optris PI LightWeight allows recording of radiometric IR images and videos. The flight thermography system is therefore eminently suitable for error detection and quality inspections of solar farms and wind power systems. The innovative combination of a lightweight mini PC and a thermal imaging camera is also ideally suited for thermographic analyses of hard-to-reach places like roofs of buildings (building thermography) and it is al-

ready in use in agriculture where fields are being inspected before being mowed (presence detection).

Optris is a German manufacturer of non-contact temperature measurement equipment. Their product range consists of portable and stationary infrared thermometers and online infrared cameras for thermographic real time analyses.

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Best-in-class precision temperature scanner

Comtest, Fluke's local representative, has introduced the 1586A Super-DAQ Precision Temperature Scanner. With up to 40 analogue input channels and scan rates as fast as 10 channels per second, the Super-DAQ is ideal for applications such as thermal mapping, process sensor calibration, quality control testing, lifecycle testing, process monitoring and environmental testing that are common in various industries including pharmaceutical, biotechnology, food processing, aerospace, and automotive.

With the flexibility of both internal and external input modules, the 1586A is designed for use both on the factory floor where channel count as scan speeds are important, and in the calibration laboratory where accuracy and quick input connections are required.

The 1586A can measure thermocouples, Platinum Resistance Thermometers

(PRTs), thermistors, dc current, dc voltage, and resistance. It offers best-in-class temperature measurement accuracy of plus-or-minus 0,005 °C for PRTs, 0,5 °C for thermocouples, and 0,002 °C for thermistors.

The Super-DAQ has a colour display with channels that can chart up to four channels simultaneously. It features four modes of operation (scan, monitor, measure and digital multimeter) and alarms that indicate when a channel measurement exceeds an assigned high or low limit. It has 20 MB of on-board memory for storing data and configuring files, a USB port to collect and store files to a USB drive and a LAN interface for easy connection to PCs and networks. It also includes a dedicated RS-232 interface to control Fluke Calibration Drywells or temperature baths for automated tests.



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



Electromagnetic flow meters

- High accuracy of measurement in wide range of measured values
- High reliability, minimum requirements on maintenance
- Low hydraulic losses are unaffected
- Possibility of using in water, energy, food or chemical industry
- Optional long-distance transfer of measured data to control system
- Dimensions DN 32 to DN 1200

Ultrasonic flow meters

- High measurement accuracy
- Long-term measurement stability over a wide range of measured values
- High operational reliability and practically no maintenance requirements
- Extra-low hydraulic losses
- Optional long-distance transfer of measured data
- Dimensions DN 32 to DN 300



induction flow meters



ultra sonic water meters



ultra sonic flow meter



clamp on flow meter



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IS Infrared thermometers

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

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

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



needed to assess the temperature and plan the most effective solution.

Enquiries: Email info@randci.co.za or visit www.randci.co.za

Customised calibration container for Africa's DRC

Endress+Hauser South Africa has designed and built a portable calibration hub, the first of its kind, bringing its world-class process calibration technology to Mutanda Mine SARL (Mumi mine), an open-pit copper mine located within a remote area of the Democratic Republic of Congo (DRC).

Ghislain Mbayo, process control superintendent at Mumi, says that the project began when the mine urgently required a state-of-the-art calibration and maintenance facility to ensure quality and production uptime and reduce unplanned shutdowns and cost. However, it did not want to build a facility due to the time it took to obtain building rights.

"Because we are situated so remotely, there had been no daily assistance with proper calibration at our process plant, something that we knew posed a great threat to our production target," adds Mbayo.

The mine commissioned the Endress+Hauser South African office to design, build and supply its calibration and maintenance needs in one 3 m x 6 m container.

The completed container had to fulfil the mine's objectives to obtain accurate measurements via advanced calibration and verification technology, conduct training on specific instruments and calibration methods, and enable both testing and fault finding.

"The best process plants must be able to identify their own performance strengths and weaknesses, then take that information and learn from those mistakes," explains Mbayo. "We decided that if we wanted to learn from a workstation, the best solution was a container workstation."

Wouter Carstens, head of the service department at Endress+Hauser South Africa led the project. He points out that the entire solution was customised to fit the purpose, as set out by the customer. The internal and external layout of the container was key to fulfilling all requirements. "This means that everything – from the grids to the desks, pluggpoints, windows and door was fitted," highlights Carstens. "The container we chose is also resistant to corrosion. This, together with its low maintenance and high quality, makes it an ideal product in the often harsh African territory and climate."

Enquiries: Wouter Carstens. Tel. +27 (0) 11 262 8000 or email outer.carstens@za.endress.com or visit <http://bit.ly/1TbZvzY>



Wouter Carstens (Head of Department – Service at Endress+Hauser) and Ghislain Mbayo (Process Control Superintendent at Mumi).

New controller range

Instrotech – local designer and manufacturer of high quality process control instrumentation and industrial electronics – has four new controllers on offer to the market, under the Calog brand. All feature an intuitive interface, with scrolling text prompts and up to four setpoints.

The Calog Quad Process Controller –

an advanced quad channel process controller with a virtually endless range of possible applications.

The Calog Quad RTD Controller – an advanced quad channel RTD controller, ideal for numerous industrial temperature applications.

The Calog Quad Thermocouple Controller – an advanced quad channel thermocouple controller, ideal for numerous industrial temperature applications.

The Calog Counter/Rate Batching Controller – an advanced controller with three independent counters, ideal for rate monitoring and batching applications.

Optional features on all of the models are the 4-20 mA or 0-10 V analog output, the RS232/RS485 serial port and data logging function.

In operation since 1981, Instrotech manufactures and distributes process control instrumentation and specialised systems under the Calog brand to a worldwide market. CALOG and Instrotech are COMTEST Group companies

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



Smart Transformer Condition Monitoring with Smart Meter and Rogowski Coils

Patrick Schuler, LEM

An innovative, more economical way to manage the distribution grid without having additional sensors on the MV side.

A leading metering provider has introduced the use of flexible LEM Rogowski coil sensors (ART) with a smart meter connected to the low-voltage (LV) side of a distribution transformer in an MV/LV substation. The software in the smart meter calculates the thermal and electrical models of the transformer based on the LV measurements' information, providing its oil temperature and ageing rate as well as MV current values and energy flows. The smart meter's overall accuracy with the LEM ART is better than 1%, superior to conventional Class 0,5 meters associated with Class 0,5 Current Transformers (CTs).

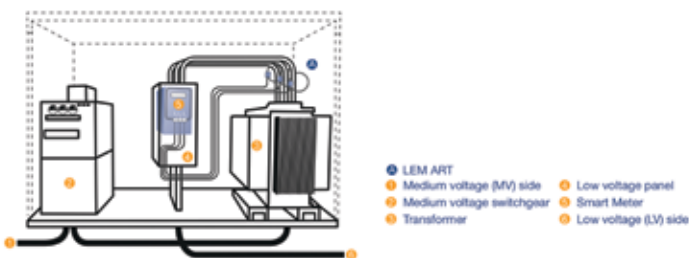


Figure 1: MV/LV Substation.

Within the MV/LV substation, the incoming power flow from the MV side (1) is managed by the MV switchgear (2) before being converted by the transformer (3) into LV (6). The smart meter (5) installed in the LV panel (4) measures the transformer's (3) health with three independent current sensors – LEM ART (A). The ART allows safe commissioning of the smart meter on an existing live transformer. Benefits for distribution system operators include:

- Real-time thermal behaviour, ageing rate, active and reactive losses of each distribution transformer
- LV load curves of consumers, producers and transformers allowing detection of non-technical losses
- Aggregation of active energy distributed by each MV-LV transformer allowing detection of non-technical issues on the MV side of the grid

The ART current Rogowski sensor has been developed with the capability to measure up to 10 000 A and beyond. The ART is a raw coil achieving IEC 61869 [1] Class 1 accuracy without the need for additional components such as resistors or potentiometers, which have a risk of drift over time. In addition, the ART labelled 'Perfect Loop' has a unique patented coil clasp curing the inaccuracy caused by the sensitivity to the position of the conductor inside the loop. Finally, the ART provides the same ease of installation as split-core current transformers and the same Class 1 accuracy. The ART also has the best performance among other Rogowski coil players.

Features	LEM ART	Other Rogowski Coil
Precision Class Positioning error T° Coefficient Mutual Orthogonality Error Operation temperature	Class 1 without calibration Below 0,65% 30 PPM/K° Low -40 - +80 , IP67	Class 1 with calibration Below 1% 50 PPMK° High (above 1%) -30 to +80
Coil Coil claps position error Coil diameter Electrostatic shield	None (LEM Patent) 6,1 mm thin and Flexible Yes (Standard)	Yes (1 – 2% Error) 12 mm thick and less flexible Yes (optional)
Case Security seal lock Closing connection Output cable length	Yes (2 mm hole) Twist and Click Customised 1,5 m, 3 m, 4,5 m	No Screw or Click 3 m

Figure 2: LEM ART features and performances versus competition.

What is a Rogowski coil?

A Rogowski Coil is used to make an open-ended and flexible sensor that easily wraps around the conductor to be measured. It consists of a helical coil of wire with the lead from one end returning through the center of the coil to the other end, so that both terminals are at the same end of the coil. The coil length is selected according to the relevant primary cable diameter to provide optimal transfer characteristics. This technology provides a very precise detection of the rate of change (derivative) of the primary current that induces a proportionate voltage at the terminals of the coil. This is then a current measuring technology only for ac currents. An electronic integrator



circuit is usually added to convert that voltage signal into an output signal that is proportional to the primary current. In other words, the Rogowski Coil enables the manufacturing of very accurate and linear current sensors, at the price of additional electronics and calibration.

A Rogowski coil has a lower inductance than current transformers, and consequently a better frequency response because it uses a non-magnetic core material. It is also highly linear, even with high primary currents, because it has no iron core that may saturate. This kind of sensor is thus particularly well adapted to power measurement systems that can be subjected to high or fast-changing currents. For measuring high currents, it has the additional advantages of small size and easy installation, while traditional current transformers are big and heavy.

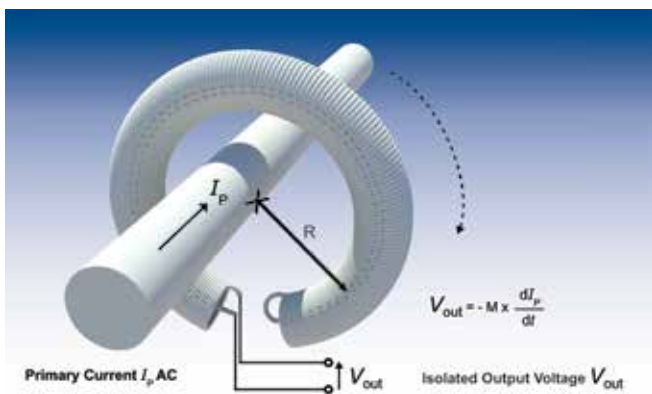


Figure 3: Rogowski Coil principle.

$$V_{OUT} = - M \times \frac{dI_p}{dt}$$

M is the mutual inductance between the primary conductor and the coil, which to some extent represents the coupling between the primary and secondary circuits.

The performance of such current sensors highly depends on the manufacturing quality of the Rogowski Coil, since equally spaced windings are required to provide high immunity to electromagnetic interference; the density of the turns must be uniform otherwise the coefficient M could change versus the position of the primary into the aperture. Another critical characteristic is the closing point that induces a discontinuity in the coil, creating some sensitivity to exter-

nal conductors as well as to the position of the measured conductor within the loop. The locking or clamping system should ensure a very precise and reproducible position of the coil extremities, as well as a high symmetry while having one of the extremities connected to the output cable. Some new technologies have recently appeared in this area, with special mechanical and electrical characteristics that allows much better accuracy and immunity to the primary cable positioning. While the error due to primary cable position was typically not better than +/-3% in the 50/60 Hz frequency domain, it has been reduced to less than +/- 1% on some of the latest Rogowski Coil sensors.

How LEM managed the challenge

Two main technics are on the market to make Rogowski coils accurate:

- The first is to buy standard wound wire on the market and to make the loop connected to a resistor, which will be used for the accuracy calibration
- The second is a so-called 'pure Rogowski coil' consisting in winding very accurately a regular copper wire all along its length to ensure the final accuracy of the sensor

While the first is really easy to produce at a low cost, this is nevertheless highly sensitive to external environments, less accurate, and less reliable as it brings in more components. At the opposite end, the Pure Rogowski coil requires much more investments and knowledge on manufacturing process.

The really thin LEM ART Rogowski coil is part of this second method and has a gain of 22,5 mV/kA; it includes an electrostatic shield to protect against external fields, optimising performance for small current measurements.



Figure 4: ART Rogowski Coil current sensor from LEM.

The locking system has also been a key point in achieving the class 1 accuracy. And here again LEM had to find an efficient design to make the closure the most efficient possible. To mask the imperfections on the closing mechanism as well as the connections of the sensor's secondary wires, LEM engineers created a sleeve acting as a magnetic short-circuit (or more precisely a reluctance short-circuit), virtually bringing together the two sections of the coil located on each side.

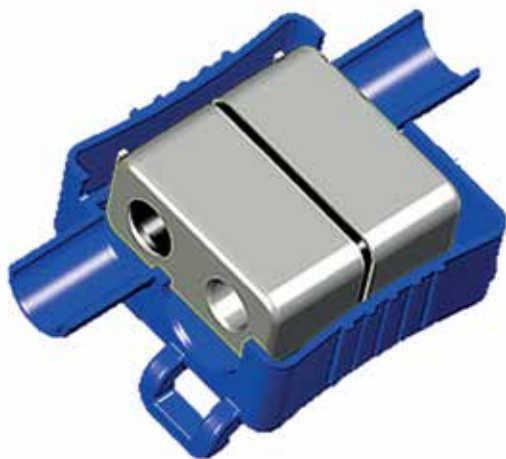


Figure 5: LEM patented Rogowski coil clasp.

The sleeve is formed of a piece of ferrite as represented in Figure 5. This approach was a complete success (LEM patent) – the error associated with the coil clasp has become almost negligible (Figure 6).

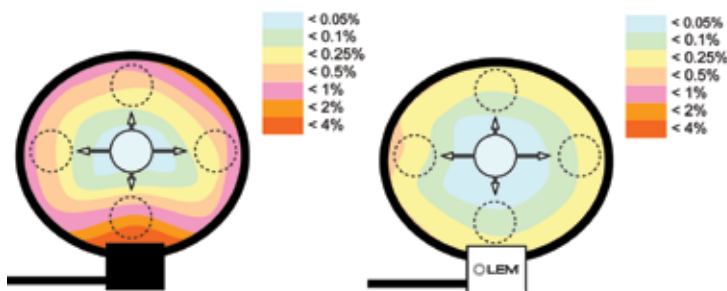


Figure 6: Rogowski coil accuracy comparison between a regular Rogowski coil and one using the LEM patented Rogowski coil clasp with primary conductor located at various positions inside the loop.

The accuracy is not only a question of position of the primary conductor in the loop but also of orthogonality, how the primary conductor is crossing the loop, how is it located versus the Rogowski loop axis at 90°, or 45° or 0° or 180° (see I). Here again, the ART loop is insensitive to this phenomenon and this has no impact on its accuracy.



Figure 7: Orthogonality effect. Primary conductor position versus the axis of the Rogowski loop.

Conclusion

Finally, in addition to these high performances, the product had to be easy to use, to install and adapted to any conditions of use. The ART series provides the same ease of installation as existing split-core transformers, but with the benefits of being thinner (6,1 mm diameter) and more flexible. Whatever the chosen dimension – 35 to 300 mm diameter for the coil aperture – the ART can be mounted very quickly by simply clipping it on to the cable to be measured thanks to an innovative, robust and fast twist-and-click closure method. Contact with the cable is not necessary, and the ART ensures a high level of safety as well as providing a high rated insulation voltage (1 000V Cat III PD2 - reinforced) and can be used in applications requiring a protection degree up to IP67. Its fixing on the primary cable can be ensured using a cable tie through its expected slot. The ART also allows disconnection of the coil to be detected through the use of a security seal passed through a specially designed slot, making it really useful when used with a meter (see Figure 8).



Figure 8: ART mechanical features: Twist-and-click closure, security seal, and slot to attach the loop to the primary cable.

Intelligent electricity network (smart grid) applications such as power generators, home energy management (HEM), battery monitoring systems (BMS), medium voltage/low voltage substations, sub-metering, electrical vehicle stations, and solar power plants integrate more and more current sensors to ensure reliable integration of distributed renewable energy, energy storage, production and consumption. This

leads to the implementation of more current sensors to allow control rooms to automate, monitor remotely and share real-time data of equipment. With the aim to bring more harmonisation in the smart grid landscape, the International Electrotechnical Commission (IEC) builds foundations in every field to provide a strong, resistant and secured electrical grid. Robust and accurate sensors in this network are major challenges to respond to this demanding environment. IEC 61869 [1] is the new performance standard for sensors, replacing the old IEC 60044 [2] standard for current transformers. ART Rogowski coils sensors are designed and tested against a strict characterisation test plan established by LEM experts to comply with and contribute to this evolution. Due to its strong knowledge in accurate measurement, LEM guarantees the measurement repeatability of all of its transducers and accuracy of Class 1.0 according to IEC 61869-2 [1] for ART models for use in future smart cities and their applications.

Reference

- [1] IEC 61869. Standard for Instrument Transformers.
Part 1: General requirements.
Part 2: Additional requirements for Current Transformers.

”
A Rogowski Coil is used to make an open-ended and flexible sensor that easily wraps around the conductor to be measured.

- A Rogowski coil has a lower inductance than current transformers.
- It has a better frequency response because it uses a non-magnetic core material.
- It is highly linear, even with high primary currents, because it has no iron core that may saturate.



take note



Patrick Schuler has been working in the internet, telecommunications, smart grid, power electronics and power utility sector for more than 15 years. Since joining LEM in September 2014, Patrick has been responsible for defining the global smart grid offering and managing smart grid business development. As a smart grid expert, Patrick is a member of the IEC’s world smart city community in Geneva and was the former smart grid chairman at the China European Chamber of Commerce in Beijing. Enquiries: Mervyn Stocks. Denver Technical Products. Tel. +27 (0) 11 626 2023 or email denverttech@pixie.co.za

ROUND UP

TRANSFORMERS + SUBSTATIONS

New 300 kHz to 200 MHz antenna and cable analyser

Bird Technologies, a provider of RF components, subsystems, test equipment, and



services – represented locally by **COMTEST Solutions** – has introduced their SiteHawk SK-200-TC, a handheld antenna and cable analyser that operates between 300 kHz and 200 MHz. The instrument simplifies detection of problems in coaxial transmission lines and antenna systems, and pinpoints their source using distance-to-fault measurements.

The SiteHawk SK-200-TC provides all of the measurement capabilities required to evaluate the performance of a communication system’s transmission path, and has the same features as its higher-frequency counterpart, Bird’s SiteHawk SK-4000-TC, which operates over a frequency range of 85 MHz to 4 000 MHz. The SiteHawk SK-200-TC is a rugged, compact instrument, measuring

only 18,2 x 9,6 x 4,8 cm and weighing 900 g, that is easy to use by novices and veterans alike. It has an intuitive user interface displayed on its high-resolution TFT LCD color display that is readable in bright sunlight, and has 16 Gbytes of internal flash memory for storing thousands of traces and measurement setups.

The distance-to-fault measurement indicates VSWR or return loss at various points from the beginning of the transmission line all the way to the antenna and identifies the location of a problem with high resolution. The cable loss function measures insertion loss of the transmission line over a given frequency range.

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

Converter transformers for solar power solutions

South Africa is fast becoming one of the key producers of renewable energy. This was recently realised with the introduction of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) by the South African government. The first three rounds of bidding amounts to 3 916 MW of renewable energy that will feed into the national grid.

Facing ever-increasing worldwide energy demand, the reliable and environmentally friendly use of natural energy sources is one of the biggest challenges of our time. Alongside wind and water, the sun – clean, CO₂-neutral and limitless – is our most valuable resource to generate renewable energy in South Africa.

Transformers are critical components in solar energy production and distribution. Solar-power systems have special design issues. The key to solar transformers is to understand and cater for all the variables in every system.



Reliable Transformers recently participated in the construction of an 86 MW Solar plant in Prieska in the Northern Cape. The scope was to supply all the converter step-up transformers (42 units) in the plant. The Solar plant connects to the Eskom grid, supplying enough power for 20 000 homes. More than 270 000 individual solar panels, spanning an area larger than 200 sports fields make this installation one of the largest in Africa. Reliable Transformers' custom design successfully passed lightning impulse and temperature rise type tests.

The actual manufacturing process took less than four months and the goods were delivered on-time and within budget. Due to the fact that most transformer parts are produced in-house at the factory in Benoni, the company was able to achieve local content quotient of more than 85%.

"Thanks to our sophisticated and advanced production planning and management software we were able to give our client regular project progress and human resource utilisation updates throughout the duration of the project," said Chief Executive Officer Andre van Zyl.

He added, "As a result of this project, Reliable Transformers has gained extensive experience in the design and manufacture of solar PV transformer technology and we are now able to offer far more efficient and economical solutions than ever before. Reliable Transformers is fast becoming a key innovator and supplier in this expanding market and is proud to offer transformers that are specifically designed for Solar Photovoltaic medium-voltage applications. We are working to evolve the industry and change the way we distribute power"

Enquiries: Andre van Zyl, CEO.
Tel. +27 (0) 11 421 2333 or email andre@reltrans.co.za

Belt rip and tear detection for conveyors

Conveyor belts are used where materials need to be transported from A to B, e.g. in mining, cement, sand and gravel industries. A conveyor belt may get damaged by sharp-edged stones/ materials or become worn out during operation. Such damage must be detected and the conveyor belt deactivated. The new belt rip and tear detection system from **ifm electronic** is used to reliably detect belt damage.

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



Switchgear for fly ash plant

JB Switchgear was recently awarded a contract by Rula Bulk for the design, manufacture and supply of a new containerised switchgear substation to replace the old motor control centre at the Fly Ash processing plant at Matla, near Kriel in Mpumalanga. With four state-of-the-art classifiers, Matla has an annual capacity in excess of 800 000 tons of DuraPozz Pro. JB Switchgear supplied their well-known Eagle series motor control centre and PLC panel, fitted into a specially modified marine container.

Enquiries: Johan Basson. Tel. +27 (0) 11 027 5804 or email info@jbswitchgear.co.za or visit www.jbswitchgear.co.za



Offering complete confidence, certainty and comfort

It is never just about supplying products or technical support to the market. It is also about implementing best practice across all companies and in particular manufacturing operations.

Louis Meiring, chief executive officer of the Zest WEG Group, says that it is this operating philosophy that has seen the Group's holding company, WEG Brazil, continue to invest in the local operation's manufacturing facilities. Significantly, Zest WEG Group will be exhibiting its locally manufactured custom equipment at Electra Mining Africa 2016.

Meiring says that the most recent investment has been in best practice production control programmes that will allow the ZestWEG Group manufacturing operations to improve processes thereby accelerating production and meeting the shortened lead times which have become the norm in the market.

He explains that the decision to introduce WEG's manufacturing planning and execution system into the South African operations forms part of the global sustainability strategy. "It was always the intention to implement best practices at these facilities with the long term objective of enabling these manufacturing plants to produce product for the international market," he says. Eventually, WEG will be able to manufacture at any of its centres worldwide.

"Zest WEG Group as an organisation is very excited about this step and particularly the very clear benefits that our customers will see," Meiring says. "It will make a massive contribution to the success of our local manufacturing facilities and put us into the international space."

Juliano Vargas, Zest WEG Group logistics and operations director, explains that the manufacturing planning and execution system being used is well proven at other WEG manufacturing facilities.

"The system facilitates full control of all our manufacturing operations, and importantly provides accurate cost and time control. Access to this level of information allows a high degree of certainty and creates an environment where customers can have complete confidence and comfort," Vargas says.

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



Visit the Zest WEG Group stand at Electra Mining Africa 2016 to view the company's locally manufactured custom equipment.

Motor Control Centres being manufactured at Shaw Controls.

Pressure transmitter with mbar ranges



The A-10 pressure transmitter from WIKA is now also available with the smallest of pressure ranges from 0 ... 50 mbar to 0 ... 600 mbar. The wetted parts in this variant are all welded and from stainless steel. The new mbar pressure ranges are particularly suitable for level measurements on small tanks in stationary and mobile applications. A further field of application is all types of gas measurement. Among WIKA's measuring instruments for general industrial applications, the A-10 is a best-seller with an excellent price/performance ratio. It offers more than two million variants. Customers can choose from a wide selection of pressure ranges, process connections and output signals. A free test report provides information on the measuring points recorded during manufacture.

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



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Comprehensive dc range improves performance

With the introduction of renewable energy into the main stream market and the drive for higher data performance of systems, companies are looking to push the boundaries of how dc can be applied. With all of the advances in dc usage, dedicated dc protection equipment is essential to ensure the safety of systems, equipment and people.

CBI-electric has a comprehensive range of dc Miniature Circuit Breakers (MCBs), dc Moulded Case Circuit Breakers (MCCBs) as well as a range of Accessories suitable for providing protection for any dc system. Data centres have traditionally been operated at Low Voltage dc.

However, with the increased data traffic around the world, the advantages of using higher dc voltages is being realised. It can reduce the hardware in the system, but at the same time increase the energy throughput, thus aiding in the volume of data that can be transferred between locations.

With this dc portfolio of products CBI holds a strong position internationally as an equipment protection supplier to the Telecommunications, Rail and Solar industries.

CBI-electric offers solutions-driven customer support, both locally and internationally, providing peace of mind through exceptional service and support through an extensive network of branches and authenticated wholesalers and dealerships. 24/7/365 support is provided via their customer hotline.

Enquiries: Aletta Olivier.
Email aletta.olivier@cbi-electric.com
or visit www.cbi-lowvoltage.co.za



Largest plug and socket manufacturer under one roof

Component, equipment and system engineering specialist, Powermite's range of electrical products manufactured locally by Ampco and Proof Engineering, is now under one roof in a new state-of-the-art manufacturing facility, enhancing products and service delivery.

Ampco relocated to the manufacturing facility which is located on Johannesburg's Westrand, in December 2013, and was joined in the November of 2015 by Proof Engineering and Azolite. "Pooling the talents and resources across both businesses has created the largest plug and socket manufacturer under one roof in Africa," states Powermite Marketing Director, Donovan Marks. "The combined strengths and synergies of the two companies have lowered our cost base and improved efficiencies across the board."

The range of electrical products, hazardous lighting products and components from Proof Engineering and Ampco, part of **Powermite**, a Hudaco Group company, are used on mobile generators, pumps and welding machines marine, industrial and general engineering applications as well as on mining machinery operating in underground and opencast mining such as continuous miners, shuttle cars, pumps, tunnel borers, transformers, etc. The ISO9001:2008 compliant products respectively carry SABS approval to IEC60079 Parts 1 and 2 and SANS 1489 – 2005, and to 60309 Parts 1 and 2.

As a leading industrial plugs and sockets manufacturer for over 30 years, Ampco produces products renowned for their quality, reliability and safety. Proof Engineering is a flame- and explosion-

proof product specialist with over 45 years' experience in the manufacture of world class components, equipment and systems. Proof Engineering through Azolite, recently introduced a range of energy saving LED lighting solutions for hazardous tunneling and underground mining applications.

Enquiries: Donovan Marks.
Powermite. Tel. +27 (0) 11 271 0000 or email donovan@powermite.co.za

Proof and Ampco family in front of the Roodepoort facility – the team that makes it happen.



Rapid turnaround on mill motor repair

Marthinusen & Coutts, a division of Actom, recently repaired two large mill motors for leading uranium producer, Rössing Uranium in Namibia; a company celebrating 40 years of production this year.

Marthinusen & Coutts' field service team was requested by Rossing to inspect two brush mill motors on site. The team found that the starting cage winding on one of the motors had moved and rubbed against the stator winding, while an insulation test conducted on the second motor indicated that the stator winding was down to earth. This necessitated having both motors repaired at Marthinusen & Coutts' facility in Cleveland. In view of the fact that no spare motor would be available to the mine in the event of a further breakdown while the two spare motors were being attended to by Marthinusen & Coutts in Johannesburg, the first of the two 1 586 kW 3 300 V, 187,5 rpm, brush motors to be repaired was treated with the greatest urgency to ensure that it was returned to the mine as quickly as possible.

"We therefore designated it as being 'a breakdown' and the repairs on it were carried out as soon as it was received at our plant in October last year. The repairs were completed within three months and the motor was returned to the mine early in January this year," Craig Megannon, Marthinusen & Coutts' general manager, says.

The repairs carried out on the two motors consisted of rewinding the stators incorporating use of a resin-rich winding system, overhaul of the rotors and complete replacement of the rotors' electronic diode and synchronising hub.

"Application of the resin-rich winding system for the stator rewinds necessitated having to manufacture special customised press boxes for curing the cells. A critical part of this was ensuring that the dimensions of the cells were 100% correct so that they fit into the core slots exactly. A coil reset jig also had to be made to enable us to manufacture the coils to the correct shapes," Megannon commented.

Repair of the second motor was completed at the end of March. In addition to the stator rewind with resin-rich windings, the rotor was overhauled and the quadrants on a damaged damper winding of the rotor were replaced.

Enquiries: Richard Botton. Tel. +27 (0) 11 607 1700 or email richardb@mandc.co.za



Alpheus Mtshali, from Marthinusen & Coutts, with the 1 586 kW 187,5 rpm, 3 300 V, 278 A stator.

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'The Future Starts Now'

Celebrating its 85th anniversary this year, Germany-based SEW-EURODRIVE will unveil a range of new products at Electra Mining Africa 2016 from 12 – 16 September at Expo Centre Nasrec in Johannesburg.

SEW-EURODRIVE MD Raymond Obermeyer highlights that the Original Equipment Manufacturer (OEM) has had a presence at this flagship exhibition since the 1980s. "Electra Mining is the largest exhibition of its kind in Africa. Therefore as a market leader, it is important for us to be there."

New products to be unveiled include the new DRN series of asynchronous motors, which complies with all of the requirements for European energy-efficiency class IE3. The new motor range is fully downward-compatible with all of SEW-EURODRIVE's existing products.

Another new product is the X-Series agitator, based on a modular concept that incorporates many parts from the standard product platform. Features include an integrated extended bearing distance (moderate or heavy-duty), integrated drywell sealing and pressure lubrication and a thermally-optimised housing.

SEW-EURODRIVE will also launch its Movitrac LTP-B Eco HVAC unit for mining, industrial and commercial applications. This comprises a total HVAC solution from fans to pumps and motors.

Citing Electra Mining Africa 2016 as a valuable platform to showcase SEW-EURODRIVE's ongoing innovation and technological development, Obermeyer comments: "We see this as an opportunity to welcome existing and potential new customers to our product range and our brand."

Commenting on the 'The Future Starts Now' campaign that will underpin its presence at Electra Mining Africa 2016, Obermeyer stresses that innovation, tradition and customer focus are the cornerstones of SEW-EURODRIVE.

Enquiries: Nomvelo Buthelezi. Tel. +27 (0) 11 867-7763 or email nomvelo@ngage.co.za



SEW-EURODRIVE
Managing Director,
Raymond Obermeyer.

*You are invited to visit the SEW-EURODRIVE stand
in Hall 6 J20 at Electra Mining Africa 2016.*

State-of-the-Art local production facilities

Rooted in the 'SMC way' for 28 years, Pete Austin truly embodies the corporation's culture, philosophies and values.

Pete Austin, as the head of production for **SMC Pneumatics UK**, has been tasked with the setting up of South Africa's production facility. Austin has been involved since the conception of SMC Pneumatics South Africa and looks to steer this state-of-the-art production facility to ensure global standardisation and that SMC's local production capabilities meet the stringent international standards of SMC's head office in Japan.

"It's an honour to form part of the local team and to play a key role in taking the organisation's production processes from start-up to success," Austin explains. "Creating a competitive advantage through efficiencies, superior quality, the right people and ultimately customer satisfaction is what we strive for"

Thanks to its significant investment into South Africa (exceeding R150 M), SMC aims to enrich the local economy through job creation, skills transfer and resources during trying economic times. "We are starting off with a production team of four to five people and over time these numbers should increase depending on demand," Austin says.

SMC's local production facilities are situated at its head office in Midrand, Johannesburg and will be fully operational once all the machinery has been commissioned and samples have been signed off by SMC Japan.

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



Pete Austin
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In Conversation With

Peter Middleton talks to ABB's Tony Duarte



Peter Middleton



Tony Duarte

ABB's Longmeadow facility in Johannesburg now has a 750 kWp, monocrystalline rooftop PV system connected to a microgrid.

On June 8, 2016, ABB inaugurated an integrated solar-diesel microgrid installation at its Longmeadow facility in Johannesburg, which comprises a grid-connected system with full on- and off-grid functionality that maximises the use of renewable energy and ensures uninterrupted electricity supply. A Crown Publications editor, Peter Middleton, talks to ABB South Africa's sales manager for microgrids and grid automation, Tony Duarte.

Microgrids, a resilient, cost-effective and greener power solution

"Traditionally, utilities depend on a concentrated region of generation. In South Africa, for example, the largest percentage of our power comes from the coal-fired power stations in Mpumalanga and Limpopo, where the coal mines are," begins Duarte.

"But with many power stations interconnected, critical points of failure emerge which can have serious effects on the whole system," he says. "Microgrids are networks of smaller independent but interconnected generation 'islands' designed to service local power needs. A fault in one part of the network does not affect the others and, with a degree of redundancy in every microgrid and/or between interconnected microgrids, outages can be avoided with other sources continuing to supply power," he explains.

"Microgrids are generation agnostic," he continues. "They are not fussy about how the power is generated or where it comes from. Essentially, their core purpose is to manage and combine the available power to best meet demand.

"Gas, hydro, diesel, HFO, solar, wind or geothermal sources can be incorporated into a microgrid solution. But each technology responds differently and their response curves don't necessarily overlap, which can make the delivery of seamless power difficult. Hydro and diesel, for example, can complement each other, but if there is

a sudden upset, their response times don't overlap enough to avoid a disturbance on the grid. On a mill trip on a grid-isolated mine, the response times of a base-load hydro plant might be a few seconds. The diesels will try to compensate, but these are too slow in starting additional units. This can cause the circuit protection to lift, so the whole mine can go into a blackout state," he relates.

Exemplifying the critical role of microgrids is the Longmeadow demonstration plant, which combines the grid-based supply from Johannesburg's City Power; the facility's existing diesel backup generators; a newly installed solar PV plant; and a compact and versatile PowerStore™ battery-based grid stabilising system to address frequency and voltage fluctuations. "If City Power cuts out now, the PowerStore needs to respond quickly enough so that no one sees a dip in power.

"This is fundamental to microgrids. They need to incorporate fast acting mechanisms or generation sources to fill in the gaps while the preferred alternative source ramps up. Effectively, the PowerStore compensates for a lack of overlap and ensures system stability, regardless of fast fluctuating conditions on the grid, step changes in the load; or variations associated with renewable energy sources," Duarte explains.

"Batteries and flywheels are ideal for meeting this need, because the connected inverters switch at electronic speed, so they react within a few milliseconds, which is well within a single cycle of a 50 Hz ac supply," he explains, adding that a fly wheel or battery storage system can react in milliseconds.

Describing the problem with traditional grid-connected PV power plants, he says that PV solar generally needs a frequency and voltage reference signal from a live grid before it can be synchronised. "Systems such as those adopted for the REIPPPP are grid following. If the grid trips, then the PV plant also trips. This negates the usefulness of grid-connected PV as a backup power solution," he says.



The dc power generated from the panels is passed through a single PVS 800 630 kW ABB inverter to generate the ac supply.

- Microgrids are networks of smaller independent but inter-connected generation 'islands'.
- Gas, hydro, diesel HFO, solar, wind or geothermal sources can be incorporated into the microgrid solution.
- The core purpose of microgrids is to manage and combine the available power to best meet demand.



Key features of microgrids

The core purpose of ABB's microgrid solutions is power security and grid resilience. Since no single generation option is able to offer this all of the time, it makes sense to combine power generation sources to make sure power is always available. "While seamless power changeover is not always necessary, it is now a primary part of our offering and is often essential," Duarte suggests.

"Probably the largest microgrid market is in the USA, where you would think they have no need of it. Why? Because of the increasing occurrence of natural disasters, which tend to take out the grid and cripple the affected community. To minimise the impact of such events, the power needs to be restored immediately and microgrids are being installed on a redundancy basis to back up the grid in high-risk areas. Typically these are large systems of between 10 to 100 MW, but there is no capacity limit since the technology involves the management and coordination of generation, not the generation itself," he informs MechTech.

A second objective is to achieve the lowest possible levelised cost of energy (LCOE) from a combination of generation sources. "Levelised cost of energy is a stream of equal payments, normalised over expected energy production, that would allow a project owner to recover all costs – including financing and an assumed return on investment over a predetermined financial life – and expressing this total as a tariff per kWh of generation," he explains, adding, "this is generally calculated for a 20-year life."

With this information, ABB's Microgrid Plus DCS is able to optimally combine available generation sources to meet prevailing load demand at the lowest possible cost.

"If the grid goes into a blackout state, the PV system cannot help. So if used in this way, PV solar and wind generation can never be a substitute for base-load generation because they cannot replace the loss of grid power," he explains.

ABB's microgrids, however, are grid forming. "While they will synchronise to a grid if it is available, they can also provide the references for renewable and fossil energy generation to follow. PowerStore sits between the grid and all the other generation sources, so PV, diesel and wind generation will all look to the PowerStore reference in order to synchronise.

"So while microgrids can be grid connected, as we see at our demonstration plant here in Longmeadow, they are also 100% 'islandable'. Here, we have grid-connected power, PV solar generation, the battery and diesel generation all interconnected via a common ring and automatically managed by the Microgrid Plus Distributed Control System (DCS). The unique feature of ABB's microgrid control system is that it has a distributed network of controllers allowing for redundancy, expandability and maintenance to take place without interrupting generation of power.

"As soon as an outage is detected, the PowerStore provides the reference for the off-grid generation. Then, when as the grid comes back on line, the PowerStore resynchronises, which will cause the off-grid generation sources to follow. The grid can then be safely brought back into the supply mix," he adds.

An infographic outlining the key features of ABB's microgrid installation at Longmeadow.

ABB microgrid solution - Johannesburg, South Africa
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The third important imperative driving the implementation of microgrids, according to Duarte, "is to reduce the carbon footprint of electricity generation as a whole". "The management software allows us to make decisions on a millisecond basis as to how to generate the electricity needed in the cleanest way possible," he says.

Talking about advancing renewable penetration, he says that in spite of the rise in installed renewable capacity in South Africa as a result of the REIPPPP, the penetration of renewables in terms of supporting load demand remains low. "Current generation capacity is at around 43 GW and we now have some 3 000 MW of installed renewables. This translates to an installed penetration of around 6.0%," he says, comparing this to Germany, where up to 78% of daily electricity demand could come from renewables.

"But high renewable penetration introduces power supply volatility, which creates difficulties for system operators, who need to balance the grid via deflections and stabilisation strategies.

"While all renewables are associated with volatility, the battery

”
 ABB's microgrid solutions
 provide power security and
 grid resilience.

Components of ABB's Longmeadow microgrid system

Four diesel generators of 700 kVA each allow for a maximum generation from fossil fuel of 2,8 MW. Each of these has its own controller allowing them to be brought online individually. "We only ever use two because demand at our Longmeadow facility seldom exceeds 1,0 MW," says Duarte.

"On the PV side, we have a 750 kWp system based on mono-crystalline panels. We use a 630 kW transformation centre to convert the PV power, which matches the maximum capacity we can get out of the cells at any time, due to differently inclined morning/afternoon panels, etc." The dc power generated from the panels is passed through a single PVS 800 630 kW ABB inverter to generate the ac supply.

The battery bank and PowerStore controller is a 1,0 MW system with 380 kWh of energy storage. It uses Samsung Li-ion batteries, which can be discharged down to 20%. "When we model the microgrid, we look at the loading and the biggest impact at any one time and we base the storage needs on minimising this impact. For financial reasons, it is impractical to simply size the storage system to deliver, say, 1,0 MW of power for four hours to cover load shedding. Instead, we use the batteries to give us enough time to allow the diesels to come in and take over generation, approximately 15 to 20 minutes on full load. Ideally, we prefer the batteries to be cycled between 40% and 88% of capacity and we only use excess PV to recharge them," Duarte reveals.

storage and flywheels embedded in microgrids are an ideal way of managing this. Distributed microgrids, at suburb level for example, can significantly increase overall renewable penetration, while making the whole system more stable and reliable. Even if hundreds of microgrids are interconnected, each one balances itself, so the grid itself is not destabilised in any way by the variations in renewable energy generation," he assures.

Modelling local load profiles

Another distinguishing feature of the microgrid is that emphasis is placed on modelling the generation needs based on the load profile of the facility or area to be supplied. "There is a concerted and upfront effort to balance the generation/supply equation. It is not just a matter of putting up a PV system, connecting it to the distribution boards and hoping it will generate as much power as possible," Duarte argues.

ABB also offers power consulting, which results in upfront investment cost savings by ensuring a reliable consumer-oriented system and power quality. Operational cost savings are also achieved: by optimising network configurations and the intelligent use of modern automation equipment; and maintenance cost reductions through the implementation of reliability centred maintenance.

At the starting point of this offering is a grid study to determine the prevailing load and connecting standards. "If the load turns out to be lower than the generation capacity of the chosen solution, then the initial CAPEX investment will never be used to its potential. Conversely, if the renewable component of a chosen system is too small, then the likely return on investment will also be low, as will the emission reductions.

"As part of our grid study, we also determine how to comply with local regulations. Whether in rural Africa or here in Longmeadow, systems must all comply with power quality requirements and safety regulations," he adds.

Adding to this offering is the a steady state analysis – how much power is needed under normal operating condition, which governs the overall capacity (kVA) of the microgrid – and a dynamic analysis model is also needed: "The effect of step loads being introduced, the need for critical loads to retain their supply and the impact of partial supply outages all need to be taken into account," Duarte explains. "This helps to size the battery store or flywheel capacities, for example. It also helps to identify ways of expanding the system, when the need arises."

Depending on the size of the system and the variety and number of generation sources, the complexity of microgrid increases. To cater for this, visualisation and automatic control functionality has to be introduced – "and this is where ABB really excels," believes Duarte.

From the analyses performed during the consulting phase of a project, ABB is able to make specific recommendations about the



generation components required, the load curves and the response envelopes. The microgrid analysis report includes a business case, which makes for a bankable solution that can be taken directly to a funder. "We strive to find the sweet spot with respect to capex and opex, which, ideally, combines generation options for lowest LCOE, highest reliability and resilience and least possible environmental impact," he adds.

From a reliability perspective: "ABB has over 25 years of experience in this field and its R&D department is turning 100 this year. We have a service and remote monitoring capability that enables web-based monitoring to be implemented on any plant anywhere in the world," he says pointing towards the prevailing generation and load profile of the Longmeadow demonstration plant."

The online monitoring system shows PV generation at 364 kVA, with the grid draw being reduced to 650 kVA on a 1,14 MW load. "In the event of a grid outage, it will first bring in the PowerStore from

batteries, and if the outage lasts longer than the 15 or 20 minutes, the diesel generators will automatically kick in to meet demand load," he explains.

In the municipal context, there numerous ways that Microgrids can play a major part, not only in the southern African region, but especially in South Africa.

Across Africa, he sees the modular and containerised microgrid solutions as ideal for augmenting weak grids. "Some mining clients are interested, but food and beverage processing plants in more remote Africa are most promising. Applications such as grain milling and ingredient heating/drying need large power supplies and local grids are often weak.

"For new factories being mooted in places with power limitations, and municipalities striving to supply the stable power needed for the emerging economies to thrive, microgrids are an increasingly viable option," Duarte concludes.

Use a circuit breaker in the management of a microgrid?

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Thorium – a **Safe** Nuclear Fuel

Trevor Blench, Steenkampskraal

There is growing awareness that thorium is a safe alternative to uranium as a nuclear fuel and that its use will limit nuclear proliferation.

To meet this demand, the Steenkampskraal thorium mine in the Western Cape will begin production in about 24 months. The company will mine, process and refine thorium for nuclear fuel applications. The mine has the world's highest-grade rare earth and thorium deposits, with an average rare earths grade of 14,4% and thorium of 2,14%.

HTMR100

Steenkampskraal is also designing a small, low-cost, helium-cooled thorium pebble-bed reactor known as the HTMR100. This will use thorium, mined at Steenkampskraal, as well as Steenkampskraal's locally designed thorium/uranium pebble fuel.

Steenkampskraal is designing the factory to produce the pebble fuel for the HTMR100. The fuel presents no risk of meltdown in the HTMR100 reactor compared to that experienced at Fukushima. Steenkampskraal's strategy covers four key areas: mining thorium and rare earths at Steenkampskraal, designing a safe thorium-based HTMR100 nuclear reactor; designing the thorium/uranium pebble fuel for this new reactor; and testing a safe thorium/uranium and thorium/plutonium pellet fuel for existing reactors.

The TRISO coated-particle pebble fuel for the HTMR100 reactor has been licenced, manufactured and tried and tested over many decades and is proven to be the safest nuclear fuel ever made.

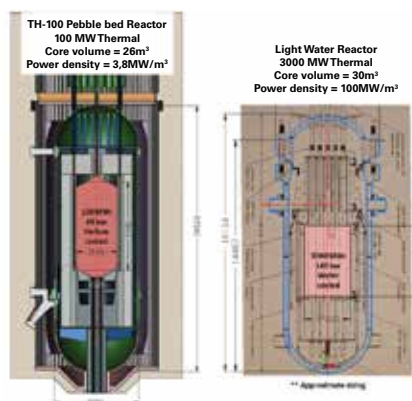


Figure 1: Triso coated-particle pebble fuel.

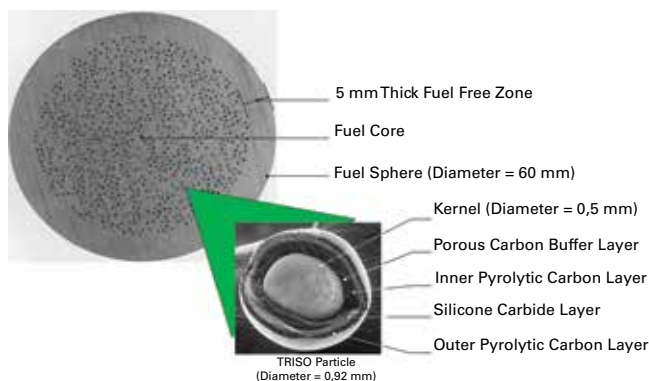


Figure 2: 60 mm Diameter graphite fuel sphere.

Large water reactors are expensive to build and require high-cost distribution networks to deliver the electricity to where it is needed.

A small modular reactor will obviate the need to build expensive distribution networks. In addition, the HTMR100 reactor could meet other energy requirements such as desalination.

Present-day nuclear reactors are not suitable for African conditions. They can take years to build and are too large to connect to small and poorly-developed electricity grids.

Benefits

The HTMR100 reactor displays a number of benefits. Firstly, it is small. With a power output of 100 MWth, or about 35 MWe, the HTMR100 could be deployed in countries with a total installed capacity of less than 10 000 MW. It is also suitable for distributed generation. The small reactors could be built at the point where energy is needed, near towns, cities, smelters, factories or mines in remote areas.

Secondly, small HTMR100 modular reactors could be built relatively quickly. Large reactors take up to ten years to build. Small modular reactors, when the supply chain has been established, could be built in two or three years.

Thirdly, large reactors are very expensive and are beyond the financial reach of most African countries. Small modular reactors could be built, like aircrafts, in factories with efficient production capabilities and good quality control, and easily transported to the site. The production of large numbers of small modular reactors could substantially reduce their cost of production.

Tried and tested

The HTMR100 reactor technology has been tried and tested over many years and has proven its safety on many occasions. Because the HTMR100 is a helium-based, gas-cooled reactor, it does not need any water for cooling and could therefore be built away from the sea.

The HTMR100 is also versatile and capable of co-generation of several useful products. It is a high-temperature reactor with outlet temperatures of up to 750 °C. This means that it could supply high-temperature steam for industrial applications, desalinate sea water or purify contaminated water such as acidic mine water. It could also produce clean, safe and reliable base-load electricity. The HTMR100 reactor would have practically no emissions of carbon dioxide or other greenhouse gases. The combination of these factors make the design of the pebble-fuel nuclear reactor a world first. No other nuclear reactor offers a combination of these features contributing to safety, efficiency, environmentally friendly, reduced cost and the elimination of the risk of nuclear proliferation.

In addition to the pebble fuel for the HTMR100 reactor, Steenkampskraal is testing thorium/uranium pellet fuel in co-operation with its associate company in Norway, Thor Energy. This pellet fuel will be used as a supplement for uranium in existing Light Water Reactors (LWRs). Tests are being conducted at the Norwegian government-owned Halden reactor.

There is potential to use this thorium pellet fuel to supplement uranium fuel in approximately 350 existing LWRs around the world with no modifications needed to the uranium reactor. Thor Energy is now in its fourth year of a five-year test qualification period to produce this world-first commercial thorium/uranium and thorium/plutonium pellet fuel, which will revolutionise the nuclear industry by improving safety and efficiency.

The US, France, Japan, China and South Korea have the most uranium-based nuclear reactors. These are all potential clients for the thorium/uranium pellet fuel. The Korea Atomic Research Institute (KAERI) is one of the organisations working closely with Thor Energy as part of the pellet fuel programme. South Korea has 24 uranium-based nuclear reactors, each the size of Koeberg, representing enormous potential for our pellet fuel.

Thorium fuel can use either uranium or plutonium as the fissile driver material. The by-products produced by thorium are safer than uranium-based fuel that is used in existing nuclear reactors, making thorium environmentally safer and extremely difficult to create a nuclear weapon. Plutonium is now being tested by Thor Energy as an alternative to uranium for producing thorium fuel. This on a large scale would reduce the huge plutonium stockpiles held by some of the world's largest countries.

The thorium fuel cycle is also cleaner than the uranium fuel cycle. Uranium produces plutonium and minor actinides in its waste, and plutonium can be used to manufacture nuclear weapons. The minor actinides produced in existing nuclear reactors remain radioactive for thousands of years. The thorium fuel cycle produces no plutonium and hardly any minor actinides.

The waste from the thorium fuel cycle contains mainly fission products that lose most of their radioactivity in a shorter time period. As a result, the thorium fuel cycle would substantially reduce the problems associated with the management and storage of nuclear waste.

Reactor

STL's HTMR100 (High Temperature Modular Reactor) reactor uses a once-through fuel-cycle process, meaning that the fuel passes through the reactor slower than a traditional high-temperature pebble-bed reactor.

Why is the pebble bed reactor meltdown proof? A pebble bed reactor's core power density is approximately 30 times lower than most water-cooled reactors. Power density is the amount of heat from nuclear fission typically generated in one cubic meter in the reactor core.

Figure 1 illustrates the size and core volume of a pebble bed reactor producing 1 00 MWt compared to a typical water-cooled reactor which produces 3 000 MWt. The reactor pressure vessels are of similar size (height and diameter) and the cores (i.e. the volume where the nuclear fuel is placed to produce heat from nuclear fission) are of similar physical size.

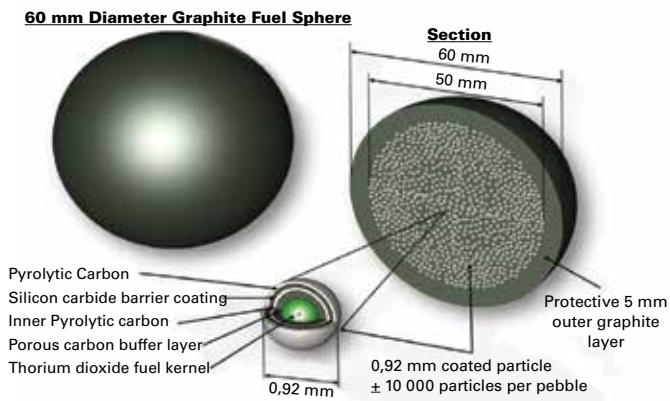


Figure 3: Comparison between Pebble and LWR reactors.

In both cases, a coolant reduces the temperature of the core during normal operation. However, the pebble bed reactor has a number of inherent safety features that ensure that the core cannot melt down when the coolant flow stops, in the case of an accident or some unforeseen event.

The strong negative temperature coefficient, together with the low power density of a pebble bed reactor, means that if the active coolant flow ceases, the reactor will automatically become sub-critical (i.e. shut itself down). On the other hand, LWRs also have a negative temperature coefficient, but have a high power density and require active cooling to keep the core cooled, hence the high risk of a meltdown.

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Present-day nuclear reactors
are not suitable for African
conditions.”

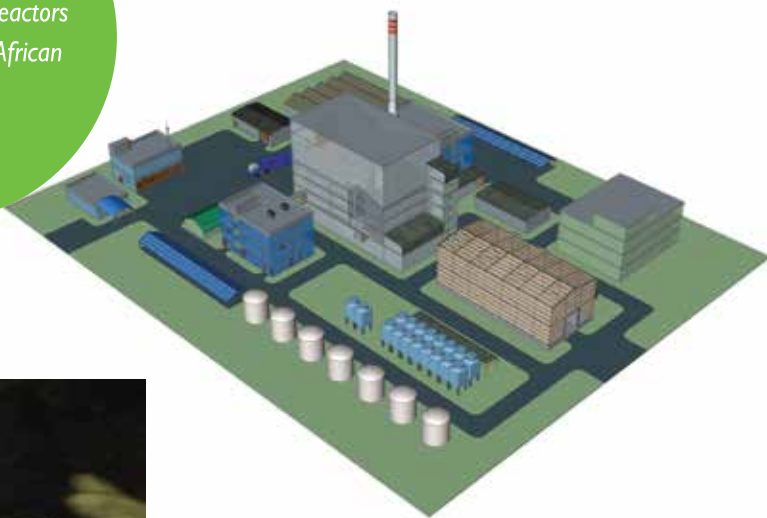
- The HTMR100 reactor technology has been tried and tested over many years.
- Because it is a helium-based, gas-cooled reactor, it does not need water for cooling and could be built away from the sea.
- The HTMR100 would have practically no emissions of carbon dioxide or other greenhouse gases.



Conclusion

The British Government published a report in 2014 entitled ‘Future Electricity Series Part 3 – Power from Nuclear’ which emphasised the importance of small modular reactors and thorium as a nuclear fuel for Britain’s future energy supplies.

In addition, the American Nuclear Regulatory Commission published a report in 2014 entitled ‘Safety and Regulatory Issues of the Thorium Fuel Cycle’ describing the qualification procedures that need to be done in order to introduce the thorium fuel cycle.



Trevor Blench has worked in financial services for most of his career as a commodity trader, stockbroker, bond trader, foreign exchange trader, financial analyst and portfolio manager. He was a member of the Johannesburg Stock Exchange for many years. He is also a director of Thor Energy AS in Norway. This company commenced a project to develop thorium as a nuclear fuel for Light Water Reactors in 2006. He has a B.A. Economics, M.A. in International Relations and an MBA. Enquiries: David Boyes. Tel. +27 (0) 12 667 2141 david.boyes@thorium100.com

Stationary Battery Basics: jars and straps

There is so much terminology related to stationary batteries and it is hard to know what everything means. So, what's the difference is between jars and straps?

What is a jar?

A stationary battery jar is the container that holds the cell or group of cells and electrolyte. It is also commonly referred to as a battery case or cell case. Jars are typically made out of some kind of thermoplastic substance. However, hard rubber is sometimes used as well. If the battery contains nickel-cadmium cells, the jar may even be made out of steel. Vented lead-acid batteries normally have transparent jars to allow for plate and sediment inspection.

What is a strap?

A stationary battery strap is the component in a cell that joins plates of like polarity in parallel. It is an electrical conductor that is made of copper. It typically has a lead or tin plating for lead-acid cells. Nickel-cadmium cells require a different connector. They are typically made with nickel-, cadmium-, or tin-plated copper, or even steel bar. Occasionally, the strap may be insulated copper wire or lead (with or without a copper insert) for lead-acid batteries, depending on the manufacturer's specifications.

Stationary batteries

Transportation batteries function as start/stop batteries. The primary discharge occurs when the vehicle is started. After that, it spends the rest of the drive time recharging. Motive power batteries do not operate this way. Instead of only being used to start the machinery, there is a continual discharge. Stationary batteries are used constantly while in operation and used until depleted, or until the job is done, and then recharged after use. Midtronics electrical system testing technology is used by six major automotive manufacturing

facilities in South Africa in on-vehicle equipment, recording events that may lead to battery or electrical system failure. In addition to this, two leading South African battery manufacturers and distributors have committed to using the Midtronics technology in their facilities and distribution outlets.

Comtest is Midtronics' accredited partner in southern Africa.

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



Klipheuwel research facility for wind energy technology decommissioned

For the past 13 years Eskom's Klipheuwel Wind Farm, situated on the West Coast near Cape Town, has served as a valuable research facility for wind energy technology and has contributed 3 MW to the Eskom plant mix.

With these objectives achieved and the new 100 MW Sere Wind Farm delivering excellent results, the time has come to decommission the three wind turbines at Klipheuwel. The decommissioning of the first turbine took place on 18 July 2016.

Where it started

In 2002, Eskom's Resources and Strategy Division erected three wind turbines as a demonstration wind farm facility at Klipheuwel. The intent of the wind farm was to conduct research on the potential of wind energy as an electricity generating option as well as to evaluate the different wind-based technologies and their economic viability.

In 2006, once the research was completed, the ownership of Klipheuwel wind

farm was transferred to Peaking (Generation Division) to operate and maintain. The Klipheuwel Wind Farm provided an excellent platform for learning in this type of renewable technology. This learning has helped inform the business in its decision-making for other larger projects such as the Sere Wind Farm. Valuable operational and maintenance experience has been gained through this facility. Since the commercial operation of the facility, the plant has reached the end of its useful life and Eskom is in the process of decommissioning this demonstration facility.

How it will end

One of the turbines will be used for practical training at the South African Renewable Technology Centre (SARETEC), the only renewables training facility in South Africa and is situated in Bellville, Cape Town. There will be an opportunity for learning to continue and to broaden the skills base in South Africa and help enable development

in the industry. The remainder of the wind farm (land and two Vestas wind turbines) will be disposed of following Eskom's commercial processes.

**Enquiries: Eskom Media Desk.
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Farmers reap rewards from energy investments

Information from Eskom

Before any farmer spends money on improving operations there's one crucial question they want to ask: *what will the payback period be?* Recently Jacobsdal crop farmer, Steven Squires, undertook a wide-ranging assessment of where he could make his business more efficient and where it could save money. An economist, Squires understood the importance of any investment to pay for itself – and that the bottom line of his business, AIS Farming, should reap the benefits as soon as possible.

AIS Farming irrigates maize, wheat and ground nuts on 500 hectares near the Riet River in the western Free State. Production is in the order of 13,5 tons per hectare of maize, seven tons per hectare of wheat and 3,5 tons for groundnuts. Irrigation is fully mechanised with nuts being dried using axial fans, which use coal as the energy source.

In 2013, acutely aware that energy was a key (and growing) cost to his business, Squires initiated a R1,5 M energy efficiency upgrade. Before deciding what to invest in, he obviously needed to know where AIS Farming was spending money and how much. Assisting him to determine his energy-cost baseline was an Eskom Energy Advisor who not only visited Jacobsdal to help Squires with the number crunching but gave him detailed, practical advice on what the numbers meant.

Working with the advisor, Squires decided on a number of interventions that would help AIS to cut its energy bills. Pumps and motors were replaced with newer and more efficient models. Pumps' suction pipes were enlarged to lower water speeds, effectively eliminating cavitation (which impacts performance and reduces equipment life expectancy while adding to maintenance costs). Moreover, Variable speed drives (VSDs)

were installed to ensure that the motors were running at their optimal speeds and not wasting electricity.

A small amount was invested in soil moisture probes, which would have the benefit of not only making sure that crops were getting the right amount of water but also testing the wisdom of Squires' decision to implement no-till operations - no-till operations has had the effect of improving water absorption while reducing the need for irrigation.

(The Eskom Energy Advisor was extremely helpful in making Squires aware of what equipment was available from whom at what cost and what likely energy savings could be achieved.)

Payback on the investment

Two years since making the energy-efficiency switch, AIS Farming is as automated as it is ever likely to be. Thanks to the VSDs the business can afford to automatically start and stop its pumps using timer switches to irrigate outside of Eskom's peak periods. "During the week irrigation is done at night when evaporation and wind speeds are lower while additional irrigation is done over weekends when electricity costs are lower," says Squires, adding: "One of the benefits of the new set-up is that our eight employees are more productive; instead of being involved in the detail of irrigation, they can be used for other tasks on the farm."

But back to that all-important payback question. How much did AIS invest and

what has been Squires' experience? "In total, we spent R1,5 M on the upgrade," he explains. "That includes upgrading the pump station structures and equipment and replacing our main pipeline. On some centre pivots the payback has been less than one year, in line with what we were expecting and even better than what we were promised.

"We took detailed readings of electricity consumption per pivot. While there were some variances between the planting seasons we compared, the results were remarkable – as much as four times what we were expecting. In one case, for instance, energy consumption went down from 162 835 kWh to 89 311 kWh – we saved 45%. On the pivot where the pipe was replaced, the payback will be less than five years. Overall, yes, a great investment and very acceptable payback periods."

Conclusion

So would he recommend that other crop farmers take a leaf out of AIS Farming's book? "Definitely," says Squires. "The whole process of deciding what to do, what changes to make and what investments to make was challenging but definitely not difficult. I would certainly advise every crop farmer using irrigation not to hesitate; investigate the possibilities, the potential up and down sides. You've got nothing to lose. And you get great advice and help from Eskom's Energy Advisors".

Enquiries: Tel. 08600 37566 or email advisoryservice@eskom.co.za



Better use of natural resources for African power shortfall

During the opening session of the fourth annual **POWER-GEN & DistribuTECH Africa**, held in July, keynote speakers noted that Africa had the greatest concentration of households without electricity in the world; with 10 African countries having over 75% of their populations unconnected to power.

Lynne Brown, South African Minister of Public Enterprises, said: "The current electricity deficit in Africa is quite alarming. This lack of electricity access remains one of the biggest barriers to development and prosperity and continues to trap millions of people in poverty."

In her opening address, the Minister noted that the use of renewable energy sources was increasing, but said that the early stages of South Africa's Independent Power Producer programme had highlighted constraints in alignment of the national grid to new renewable energy sources. Major investment would be required in the transmission grids to ensure renewables delivered on their potential, she said.

Brown noted that while South Africa's power supply and demand side management had remained stable over most of the past year, surging demand and ageing infrastructure meant there was pressure on the government to consider power generation technologies that could meet future demand affordably and with a low carbon footprint. The government was looking to a mix of coal-fired, nuclear, natural gas and hydro power, supplemented by renewables such as wind and solar.

"However, for baseload generation, there are still only two real options – coal and nuclear. Future development requires assessments of COP 21 guidelines and overall lifecycle costs. There is growing consensus that future cost comparisons will favour nuclear over fossil. However, more research is required," she said.

In line with this, the minister announced that as part of the second phase of the Eskom Power Plant Engineering Institute (EPPEI) programme, Eskom would establish a specialisation centre focusing on nuclear technology. Eskom signed its second five-year, R170 M EPPEI funding agreement with South African universities during the conference proceedings this morning. The EPPEI programme funds eight Eskom specialisation centres at six universities.

Enquiries: Visit <http://www.dpe.gov.za/>



Group Chief Executive, Eskom, Brian Molefe and William Price, Country Manager at Enel Green Power South Africa, look on as Lynne Brown, South African Minister of Public Enterprises, cuts the ribbon... opening the POWER-GEN & DistribuTECH Africa Exhibition in Sandton on 19 July 2016.

Bizz Buzz

Flying solar

Around the world... and a journey that began on 9 March 2015, ended successfully as Swiss-engineered Solar Impulse 2 landed in Abu Dhabi on Tuesday, 26 July 2016. This is the first solar-powered aircraft to achieve this remarkable feat... a 42 000-kilometre journey across four continents, two oceans and three seas. "The future is clean, the future is you, the future is now, let's take it further," said Swiss explorer and project director Bertrand Piccard as he disembarked from the cockpit. Often referred to as the 'paper plane', Solar Impulse 2 has been circumnavigating the globe in stages, with 58-year-old Piccard and his compatriot, Andre Borschberg, taking turns at the controls of the single-seater. While the pilots do not expect commercial solar-powered planes any time soon, they hope the project will help spur wider progress in clean energy.

Immense potential to use solar power for rural India

As part of its commitment to bringing electricity to the entire country by 2022, India is undergoing a number of radical power sector reforms. PV mini grids present a powerful method of quickly bringing energy generation to rural areas. However, there is a need to develop international supply chains, national policy and financial structures to make renewable technology practical and financially viable. Research undertaken by **Ricardo Energy & Environment** – recommends immediate actions to scale up the Indian PV mini grid market. The close involvement of international supply chains for the development and manufacture of PV components is also highlighted as a critical component for success. *Enquiries: <http://ee.ricardo.com/cms/ppa-energy-project-examples/>*

Palladium... in the Cloud

Palladium Business Solutions has signed an Enterprise agreement with Microsoft to host client's data in the cloud. This means that clients are no longer required to purchase costly hardware in the form of servers or have upfront fees to purchase the MS SQL server database. This option gives clients the ability to choose the deployment option that fits their specific needs, whether it is in the safety of their own file server, data centre or in the cloud. This is a flexible and cost-effective option for medium-sized businesses and offers extensive benefits for growth and expansion.

Enquiries: Tel. +27 (0) 11 568-2900

Africa rising needs good private investors and public opinion

The African Renaissance will remain a pipedream unless African countries are prepared and willing to trade with one another and to rely on one another's companies and resources for infrastructure development, said the Minister of Home Affairs, Mr Malusi Gigaba, in his opening address at a conference hosted by the University of Johannesburg (UJ) on Monday 11 July 2016.

The Minister was speaking at the 5th International Conference on Infrastructure Development in Africa, hosted by UJ in collaboration with the Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana; and Bells University of Technology, Ogun, Nigeria. The conference explored sustainable practices in development and procurement for large infrastructure projects.



"Four critical issues need to be looked at to unlock infrastructure development in Africa," said Minister Gigaba.

"Firstly, countries need long-term vision and planning to provide investors with project pipelines so that they can plan their investments. Secondly, coordination both within and between countries is needed to maximise impact and resolve red tape and other impediments. In addition, institutional infrastructure needs to be set up to drive such development programmes and ensure coordination and alignment. Finally, funding is needed to explore various financing models, including pension funds and public-public partnerships, to unlock the balance sheets of investors and get infrastructure projects off the ground in Africa."

Echoing the Minister's sentiments, Prof Didibhuku Thwala said Africa's impressive economic performance over the past decade has rekindled hopes for the continent's future as an important player in the global economic landscape.

Enquiries: Email theresevw@uj.ac.za

From Left to Right: Prof Saurabh Sinha, Executive Dean of the Faculty of Engineering and the Built Environment, UJ, Prof Tshilidzi Marwala (UJ Deputy Vice-Chancellor: Research, Postgraduate Studies and the Library); Mr Malusi Gigaba (Minister of Home Affairs), Prof Didi (Wellington) Thwala (UJ Professor of Construction Project Management; Chairperson of the Johannesburg Development Agency; and member of the Gautrain Board.)

Answers to SA's COP21 challenges

Andreas Pistauer, Siemens

As a signatory to the Paris Agreement drawn up at COP21, South Africa requires a diligent transition of energy systems. There is not just one solution for achieving a sustainable, economical and reliable energy system. The respective political and economic conditions in each specific region need to be analysed in order to find the most suitable answer.

South Africa, the dominant player in African coal, is seeking to diversify its power mix. Renewables, hydropower, gas and nuclear operators are all seeking to play a role in bringing the share of coal in power output down from over 90% today to less than 33% by 2040.

The Independent Power Producer Programme (IPP) has proven to be highly successful in South Africa, and has attracted considerable foreign investment. This places the country in a privileged situation from which to choose from a multitude of energy mixes.

As a result, there is an increase in the number of photovoltaic (PV) and concentrated solar power (CSP) solar projects, as

well as wind farms. Another technology with considerable potential for low emissions while efficiently meeting demand outputs is gas-to-power.

Mozambique is thought to have one of the largest reserves of natural gas, and South Africa is well set to take advantage of utilising this as part of the Department of Energy's 3 125 MW gas-to-power programme, plus a 600 MW additional gas determination.

When compared to a coal-fired Steam Power Plant (SPP), a gas-fired Combined Cycle Power Plant (CCPP) offers far greater environmental and investment advantages. Using a 600 MW plant as an example, CCPP runs at >60% efficiency, while a new SSP runs at around 43% efficiency.

The CCPP also ensures a 58% reduction in CO₂ emissions. This equates to the annual elimination of approximately 15,5-million tonnes of CO₂ for South Africa, when taking into account a combination of the 3 125 MW and 600 MW programmes.

A 600 MW CCPP can produce its first power within 20 months and is fully com-

pleted after 32 months, as opposed to 6 months for the SSP. Finally, a CCPP consumes almost 50% less land (111 000 m² versus 220 000 m²), thereby ensuring that it effectively produces the same power using half the space.

Gas-to-power is certainly a cost and energy-efficient solution to South Africa's long-term sustainability targets that align with COP21 objectives. It is, however, not the only solution, and should form part of an integral energy mix.

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



Andreas Pistauer, Siemens



VEGAPULS 64 Radar Sensor launch at Montecasino

On 15 July 2016 the VEGAPULS 64 80 GHz radar sensor was introduced at a gala dinner at the Montecasino Ballroom in Fourways, Johannesburg. The VEGAPULS 64 is a contactless level radar sensor ideal for the Food and Beverage sectors. VEGA's Frikkie Streicher and John Groom demonstrated how this latest development in radar level measurement works with agitation, foaming surfaces and heavy build-up. Frikkie Streicher showed how the VEGAPULS 64 could even continue to measure level through a cake covered with cream.

Enquiries: Email Chantal.groom@vega.com



John Groom (African Region Group Director for VEGA Instruments and VEGA Controls SA) Frikkie Streicher (Business Development Manager at VEGA).



Frikkie Streicher demonstrating the level radar sensor.

Bringing Energy Solutions to the Nation

Cummins Inc. embarked on a national City to City Tour of South Africa in a highly visible red Cummins Power Truck. The company took to the road to demonstrate innovative products and the efficacy of Cummins-powered vehicles... starting in Johannesburg and finishing in Cape Town. The launch took place on 30 June 2016 at Cummins in Buccleugh.

Enquiries: Email sal.govender@cummins.com



Nic Roditis (Cummins) and Piet Boshoff (High Tech Processing).



Top – all from Cummins: Steven Pereira, Celeste Cadilhe, Deren Moodley, Michael Van Der Merwe, Tshifhiwa Nekhavhambe. **Bottom** – all from Cummins: Warrick Gibbens, Umesh Kalyani, Kenneth Gaynor, Alok Joshi, Nalen Alwar, Faith Mbabazi, Devika Datadin and Eric Flechet.

WearCheck



*David Schumacher
Diagnostician,
Durban laboratory*



*Steven Lara-Lee Lumley
Technical manager,
Durban*



*Thomas Madlala
Business development and technical support,
Steelpoort*



*Josephine Rakolota
Sales and customer support,
Steelpoort*



*Sharon Pieterse
Business development and technical sales*

GE Energy Connections' Power Conversion



*Azeez Mohammed
President and CEO*

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Enquiries:
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