

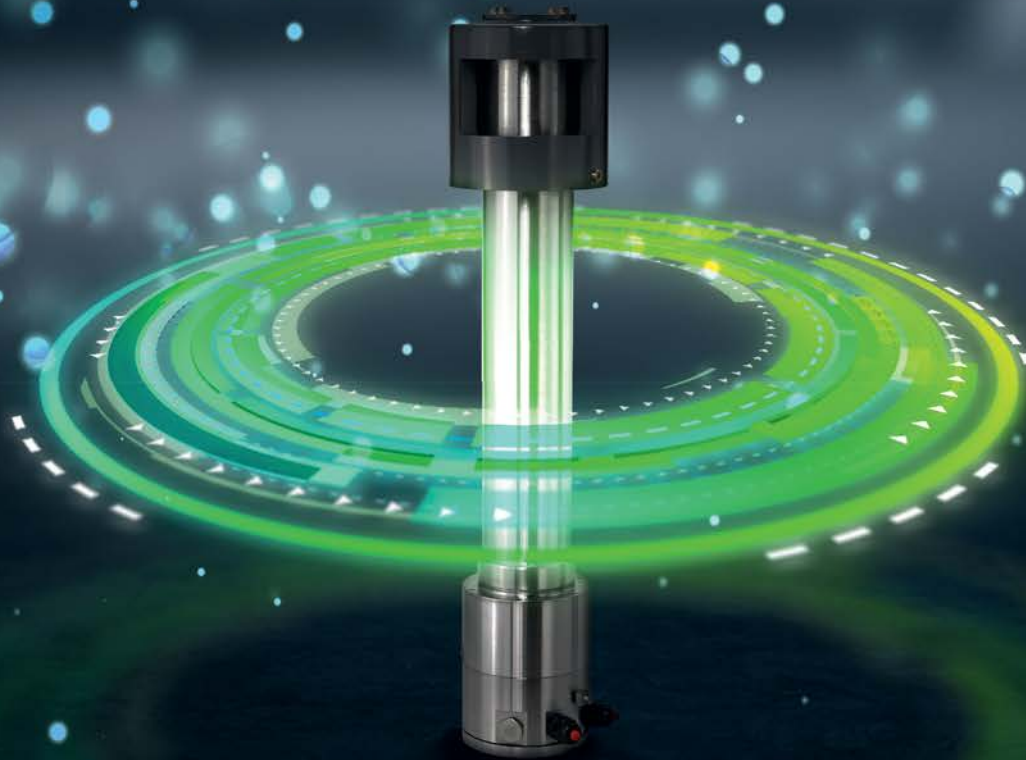
FEATURES:

- Control systems + automation
- Drives, motors + switchgear
- Measurement + instrumentation
- Transformers, substations + cables

03/2023

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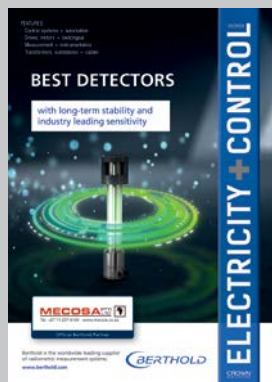
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(Read more on page 3.)

Editor: Leigh Darroll

Design & Layout: Darryl James

Advertising Manager:

Heidi Jandrell

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Is going off grid the best option?

Welcome to another edition of *Electricity+Control*. Reviewing the features this month, we include: Control systems + automation, Drives, motors + switchgear, Measurement + instrumentation and Transformers, substations + cables.

Although each month we present a different set of features, with some recurring bi-monthly and some quarterly, it strikes me that, taken together, these are at the core of any successful industrial enterprise – be it in manufacturing, processing, or any endeavour that requires the convergence of two key commodities of modern industry: energy and information.

Clearly each operations manager or plant manager needs to figure these out in the context of their own plant – but for everyone, the bigger challenge right now relates to energy.

I wonder how many people remember the confusion Eskom caused when it embarked on an energy efficiency programme a few decades ago. Of course, Eskom was promoting a very good idea and positive action: use energy more efficiently. Yet at the time, many folks could not get their heads around why a utility company that makes its money by selling energy, was asking them to use less!

Similarly, I recall Crown Publications produced several very helpful Energy Efficiency handbooks – and again, many folks genuinely viewed this as unnecessary – given how cheap electrical energy was at the time.

But now we live in a world where we do need to consider even the standby energy consumed by any device we may deploy on our plant. So much has the world changed.

The challenges we face now are far greater than simply the cost of energy:

Ian

Ian Jandrell

PrEng IntPE(SA), BSc(Eng) GDE PhD,
FSAAE FSAIEE SMIEEE

we live in a time when the reliability of our energy supply from the national utility has become predictably worse and worse – to the extent that some view it as a 'National State of Disaster'. Well, it has been that for some years already – and it's fairly difficult to imagine how a formally declared state of disaster will secure the ability to replace, maintain and repair plant that has been pushed too hard for too long.

One of the consequences of running the generation plant too long and too hard – and possibly damaging parts of it with out-of-spec coal – is that going off grid is a reality that many are now considering. To what extent can we, as households, businesses, or industrial enterprises, become self-reliant – going off the grid as far as we can? The regulatory environment around this seems to have been way stickier than one would have imagined – although there may be some movement now?

It is a path being chosen increasingly by those that can afford to do it. It may actually not be a cheaper option – but it leaves one with the absolute sense that your energy supply is in your own hands – and can be managed. And it brings the duty of care over the system to you, so you have control over it.

The worry, of course, is that many of the big energy users (and small users) may never return to utility power – leaving the utility short of income (or needing to increase the costs to users simply to make up the deficit). But perhaps that need not be a worry at all.



CONTENTS

FEATURES

CONTROL SYSTEMS + AUTOMATION

- 4 Switching connectivity up a gear – advancing Ethernet with TSN

CC-Link Partner Association - Europe

- 6 IP67 PLCs control autonomous conveyor modules

Frank Paluch, Turck

- 8 Products + services



DRIVES, MOTORS + SWITCHGEAR

- 11 Factors to consider in selecting VSDs

Adrian van Wyk, Referro Systems

- 14 Products + services



MEASUREMENT + INSTRUMENTATION

- 18 Smart instrumentation for green hydrogen production

ABB Measurement & Analytics

- 20 Products + services

TRANSFORMERS, SUBSTATIONS + CABLES

- 24 Managing balance in utility power systems

Novatech Automation

- 25 Products + services



REGULARS

- 1 Comment

Is going off grid the best option?

- 3 Cover article

The best detectors on the market from Berthold Technologies

- 31 Engineering the future

Is South Africa ready for the future of mobility?

- 32 Write @ the back

Mining companies can find opportunity in changing ESG trends



The best detectors on the market from Berthold Technologies

Berthold is an expert in radiometric measurements, specialising in solutions for density, point level, continuous level, and multiphase/density profile measurements. Its expertise is reflected in its products' performance. Where other technologies must be constantly recalibrated or replaced due to corrosion or process build-up, Berthold's products provide more accurate and reliable measurement without intrusion into the process and are not affected by volatile or caustic processes.

Highly sensitive detectors

Compared to competitors' products, Berthold's detectors, with industry leading sensitivity, achieve better accuracy with the same source or can even extend the useful life of aged and low activity sources. Depending on the application, the source activity can be reduced by up to 80%. The detectors' sensitivity describes how efficiently radiation is converted into a useable signal (that is, by 'counts').

Especially in low-radiation conditions, the company's highly sensitive detectors improve the signal to noise ratio, resulting in the outstanding measurement performance for which Berthold systems are renowned.

Detector stability

In addition to increased sensitivity, the detectors feature other distinguishing patented technology. All the detectors incorporate cosmic ray technology, which curbs temperature drift to $\leq 0.002\%/^{\circ}\text{C}$, and XIP (X-Ray Interference Protection), which automatically detects interference and protects the user's control system from false level fluctuations.

The long-term stability of a detector is extremely important for consistently high-quality measurement performance and accuracy during the entire operation. Long-term drifts of detectors' sensitivity can be caused by temperature changes and aging. If these go unnoticed and uncompensated for, they can cause considerable loss in production yields and product quality.

The accurate and reliable operation of Berthold detectors is guaranteed for the full duration of operation. Integral automatic sensitivity monitoring and adjustment functionality keep the sensitivity constant and correct for any external influences – irrespective of temperature changes and aging effects.

Due to the company's innovative and patented technology of using cosmic rays as a very stable radiation reference, Berthold detectors achieve this outstanding stability.

Functional safety

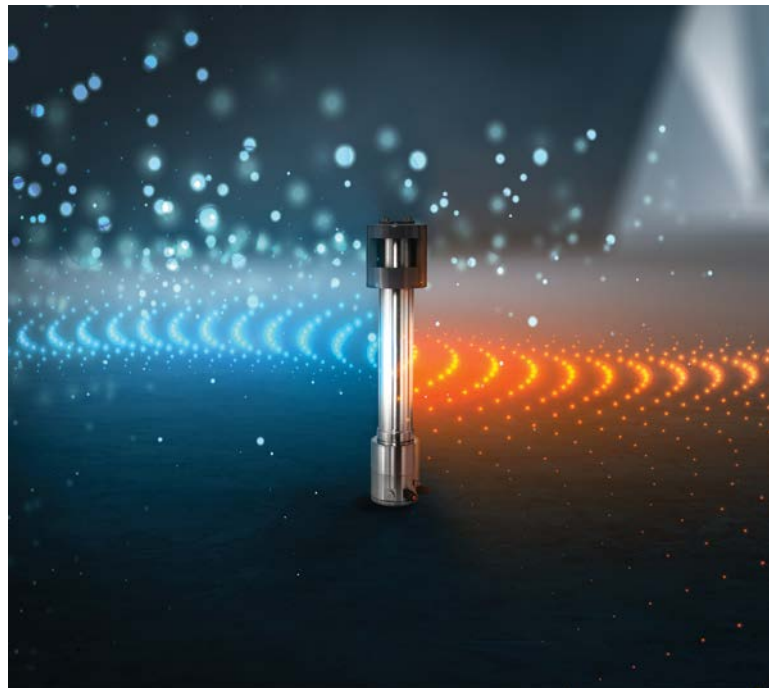
The high reliability of the measurement is supported by im-

portant diagnostic functions, such as, among others, permanent monitoring of the detector function in comparison with cosmic background radiation. This guarantees outstanding operational safety.

The cosmic radiation control also makes it possible to maintain the required source activity very low.

Berthold Technologies stands for excellent know-how, high quality, and reliability. The customer is always the focus of its solutions. The company knows its business. Using its varied product portfolio, specialised knowledge and extensive experience, Berthold Technologies develops suitable solutions together with its customers for new, individual measurement tasks in a wide range of industries and applications.

Mecosa (Pty) Ltd is the sole business partner for Berthold in Southern Africa and has cooperated with Berthold for more than 35 years. □



Berthold's radiometric measurement instruments with industry-leading sensitivity, deliver consistently high-quality, accurate performance.

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Tel.: +27 (0)11 257 6100

E-mail: measure@mecosa.co.za

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Switching connectivity up a gear – advancing Ethernet with TSN

Time-Sensitive Networking (TSN) is an enabling technology and a vehicle for broader change in industrial networking, offering enhancements that prepare Ethernet for next-generation applications. Its key benefit is that it facilitates the creation of open, unified, convergent architectures that provide the possibility for significant productivity improvements.

For TSN to deliver its full value, end devices and network infrastructures need to support the technology. In this regard, compatible, certified network switches have already been released.

Here, Thomas Rodenbusch-Mohr, Product Cluster Manager at Hirschmann Automation and Control GmbH – a Belden Brand and CC-Link Partner Association (CLPA) partner, sets out the benefits of TSN and why the company is offering compatible products.

Convergence is a core aspect of future-oriented smart applications in various sectors, from manufacturing to transportation and energy automation. TSN can enable this, with its ability to deliver highly deterministic communications within standard, vendor-neutral Ethernet.

TSN can distinguish traffic, assigning priority levels to individual data packets and sending each stream over the network accordingly, observing their individual timing constraints. This means TSN can cater to the highest real-time communications demands of industrial automation applications.

In particular, TSN supports the integration of information technology (IT) and operational technology (OT). This innovation supports network convergence, allowing users to merge IT and OT traffic on the same wire, while still satisfying their individual communications requirements. In effect, a key added benefit TSN brings to industrial applications is the ability to drive the unification of networks that were in the past, of necessity, kept separate. This affords a reduction in network complexity and capex

investment. Additionally, the broader technology change that comes with TSN enables the creation of open network architectures. This will reveal a wealth of information that data scientists can leverage to support Industry 4.0 and smart applications. By making this information seamlessly accessible directly from the source, there is no need for gateways in between.

Additional features of TSN that are of high value to users, automation and machine vendors include backward and forward compatibility, which makes it possible to integrate existing and future Ethernet devices in TSN-capable networks with suitable, comprehensive migration paths. Further to this, the newly introduced TSN mechanisms are additions to the Ethernet toolbox. Hence, they offer the same network architecture flexibility and bandwidth scaling of traditional Ethernet.

Creating connected industries

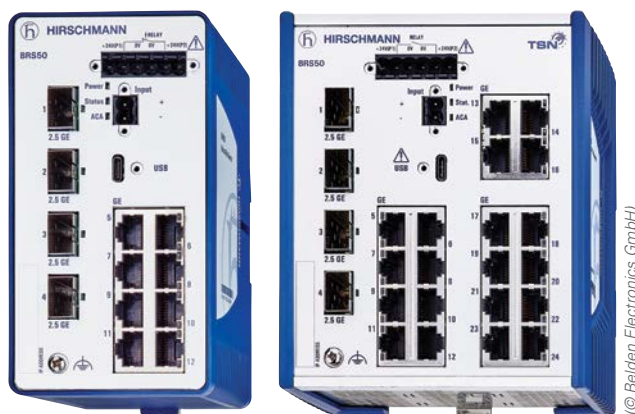
These competitive advantages are the foundation of cost-effective, cutting-edge networking capabilities. Factory and process automation are perhaps the fields that can benefit most from TSN technology and the changes it can bring. For example, critical traffic, like motion control, with precise real-time demands and traffic without real-time demands, such as bandwidth-consuming file transfers, can run simultaneously on the same network without interfering with each other.

Thus, network convergence enables distributed real-time control. As a result, complex machinery and numerous robots can interact with each other with higher precision and flexibility than was previously possible. Organisations can also advance key applications, such as predictive maintenance, that require the analysis of substantial volumes of sensor data. An open and converged network from the cloud to shop floor sensors also provides secure access to perform maintenance and other tasks remotely.

Furthermore, TSN offers highly accurate time synchronisation (IEEE 802.1AS) and mechanisms to control bandwidth use. These can be especially relevant in discrete applications as well as in process automation networks, providing accurate time for applications based on sequences of events.

Seizing the opportunity

Belden and its brand Hirschmann were among the first



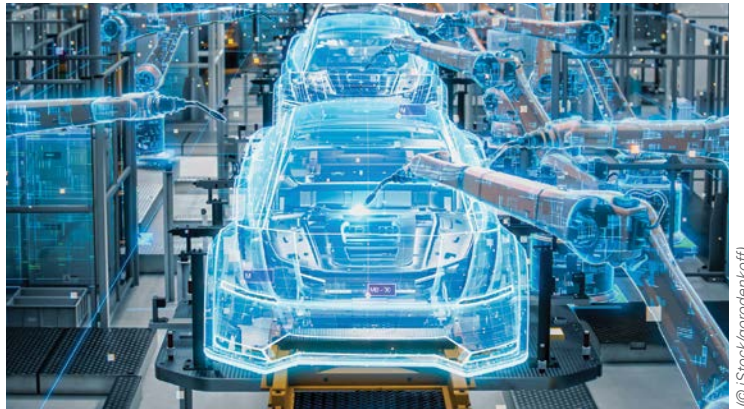
Belden has developed TSN compatible switches including the BRS504SFP8TX (left) and BRS50-20TX-4SFP-EEC (right).

(© Belden Electronics GmbH)

adopters of TSN to support their products into the future and customers' systems too. Belden is constantly pushing the boundaries of technology and, with this goal in mind, was among the standardisation initiators of TSN at the IEEE in the early 2010s. With products built on the strong foundation of standard Ethernet, TSN is a natural fit for Belden's portfolio, which includes market-leading industrial networking solutions that are used in the most challenging environments.

When looking at developing its first TSN-compatible products, Belden's RSPE and BOBCAT Managed DIN-Rail switches, the company selected CC-Link IE TSN as its underlying technology, the first open gigabit industrial Ethernet with TSN functions. The fact that the CLPA offered the first industrial TSN profile available for certification was an important factor in the decision. In addition, the organisation made good use of the new TSN additions to the Ethernet toolbox and selected the appropriate mechanisms to provide suitable communications over a vendor-neutral networking technology. This forward-looking vision empowered the CLPA to be ahead of others with regard to specification and certification.

In practice, it offers the most advanced ecosystem of TSN-compatible devices and controllers as well as clear migration paths for existing devices in CC-Link IE TSN networks. These features give vendors the opportunity to certify and upgrade their product portfolios with the technology and, at the same time, help machine operators transition smoothly towards complete TSN-capable environments. In addition, CC-Link IE TSN offers low



(© iStock/gordenkoff)

TSN can cater to the highest real-time communications demands of industrial automation applications.

complexity configurations and early certification routes.

There are three main advantages of being part of the CLPA: visibility as a leading automation provider, market entry and community access. For Belden, this means we are able to leverage a strong, established ecosystem of interoperable solutions and engage in valuable discussions with other industry players. This is key to understanding the most relevant technology requirements and gaining insights as well as providing early feedback on products to improve their development. With these elements of support, we can continue to move forward and serve our customers with a state-of-the-art offering. □

For more information visit: eu.cc-link.org

CONTROL SYSTEMS + AUTOMATION : PRODUCTS + SERVICES

Control-integrated vision solution

As a specialist in PC-based control technology, Beckhoff is constantly looking at ways to integrate all machine functionalities into a single control platform. This also includes image processing – on the software side since the launch of TwinCAT Vision in 2017, and now completed with the introduction of the comprehensive Vision hardware portfolio.

Beckhoff Vision offers machine builders and end users an image processing system that covers all the required components from software to lighting. Seamlessly integrated into EtherCAT-based control technology, it opens up competitive advantages for users, including highly accurate synchronisation with all machine processes, reduced engineering and hardware costs, and simplified commissioning and support.

In addition to the TwinCAT Vision software, the Vision hardware portfolio includes:

- Cameras – the area-scan cameras generate high-quality image data using colour and monochrome CMOS sensors with up to 24-megapixel resolution and 3.45 µm and 2.74 µm pixel pitch, plus transfer rates of 2.5 Gbit/s

- Lenses – the robust, industrial C-mount lenses provide for easy handling and high availability, with a VIS and NIR AR coating, up to 2 µm resolution, and image circles of 11 mm and 19.3 mm respectively
- Lighting – the multicolour LED lighting in three designs – area, ring, and bar lighting – produces constant lighting conditions for consistently high-quality images. It also creates optimum contrast between the inspection feature and its surroundings, even in spectrally adjustable pulse mode.

Complete units consisting of camera, lighting devices, and focusable lenses are also available.

For more information contact Beckhoff Automation.

Tel: +27 (0)11 795 2898

Email: danep@beckhoff.co.za

visit: www.beckhoff.com/en-za/



The new Beckhoff Vision hardware portfolio complements already available TwinCAT Vision software.

IP67 PLCs control autonomous conveyor modules

Frank Paluch, Sales Specialist at Turck

Self-driven electric eCarts from the Krups Group optimise the assembly and testing track in the battery pack production of German car manufacturers. Turck's robust IP67 PLCs provide the decentralised operation control of the individual conveyor modules.

Krupps Automation, with its main plant in Dernbach Rhineland-Palatinate, is one of the market leaders in assembly and test automation. The company specialises in automation systems for the efficient linking of assembly and testing stations. With the LOGO!MAT eCart, Krups offers a highly available conveyor system that breaks new ground – with actively powered, intelligent workpiece carriers that can rotate, lift, clamp or tilt workpieces.

Philipp Krups, second generation head of the company, explains the basic idea behind it. "In a conventional roller conveyor system the drive is located in the conveyor track. This involves a lot of mechanical parts in the track, and the associated amount of wear. With permanently installed systems, maintenance is therefore always a problem. We wanted to turn the system around and remove the maintenance from the track. We therefore developed a passive track that is completely maintenance-free. The



Philipp Krups, Krups Automation GmbH.



Christian Mies, Krups Automation GmbH.

technology and electrical system is now located in the carts, the so-called eCarts. These electrically driven carts have a self-diagnostic function and can be discharged from operation if required for preventive maintenance. This means downtimes are reduced and the track remains operational. It also makes later expansions to the conveyor line easy to implement. The eCart system furthermore makes it possible to implement more flexible production processes with smaller batch sizes. It could be described as an Industry 4.0 conveyor."

The system consists of a few standard modules: rotate modules, shuttle modules, stopper modules and indexers. These units are combined in a layout according to the individual customer's requirements and connected to the on-site control system of the plant. The conveyor system supplies the customer's production system with report data and enables the implementation of bidirectional communication interfaces. Several large German automobile manufacturers are using the systems in their battery production for electric vehicles.

Decentralised control

"Previously there was always a main controller, to which all signals were routed. This partly involved point-to-point wiring, but increasingly often decentralised I/O units. The problem here was the programming in one sequencer. However, if any condition at switch-on or after an emergency startup is present that is not represented in this sequencer, the user must move units by hand to restore a known situation," explains Christian Mies, Control Developer at Krups. "A conveyor system has to be programmed differently in order to eliminate the need for manual interventions. Conditions and appropriate reactions have to be defined for all situations." Ideally, every module



The eCart system takes the drive and thus also the need for maintenance away from the conveyor track, maximising the track's availability.

should be controlled autonomously.

Each module operates externally as a black box, which simply communicates bidirectionally with the central controller via a bus connection. The module runs its program in order to perform its particular task: rotating, transferring, traffic monitoring and reporting module status. Each module is therefore controlled – exactly according to the development – and implements all possible sequences. A plant controller is installed at the level above this and controls the overall flow. However, the actual positioning sequences and the monitoring of conditions is taken over by each controller at the module.

Consequently, Krups no longer has to intervene in the control of the overall plant, nor does the plant operator have to control the conveyor system modules. Only the communication between the general controller and the modules has to be implemented at base level. In-house, Krups calls these conveyor system modules which have their own intelligence ‘smart modules’. The company then looked for autonomous controllers which can be installed directly on the modules. That was 10 years ago.

Self-built IP67 controller

“At that time we looked for compact controllers with IP67 protection, but there was nothing on the market,” Christian Mies says. Krups first helped itself. “We had our own controller built on a board, fitted all M12 plug connectors and placed everything in a housing. The housing had to be provided with drill holes plus a pneumatic system and a display. These were big units and relatively difficult to manufacture. We had to have the boards built, the housings assembled and everything wired up. Although this was successful, it was a laborious task,” says senior boss Peter Krups, explaining the journey towards an in-house module controller.

An effective block controller

Since Turck launched its TBEN-L-PLC block controller a few years ago, Krups has been able to save the effort required for a self-build. The company is now using the IP67 controller in many machine models – not only in the eCart system. The control system for every conveyor

system element was written in Codesys. The communication to the drives or valve blocks and other components of the module is implemented via a bus interface, and the communication to the main controller is implemented mostly via Profinet. “We now have the benefit that the modules can be deployed immediately and without the need for any other field programming device; that means: replace, insert, data backup. In the ideal situation, the customer has to connect only the 7/8 inch plug connector for 24 volt and the Ethernet connector for the bus connection,” Mies says, highlighting the benefits for users.

He adds that for an international company like Krups even the range of protocols offered by the compact controller pays for itself “We can serve the US market with Ethernet/IP in exactly the same way as the European and Asian markets, where the protocols are mixed. We are currently concentrating on Ethernet/IP and Profinet, but Modbus TCP would also be possible, in principle, if this were required by a customer. Another benefit here is that all the Codesys licences are contained in the Turck device. The licence is there and we can use it, regardless of the fieldbus the customer uses. We can even use them when we sometimes need a small main controller because the master licences are also available.”

Saving power in battery production

The specifications of the eCart conveyor system in battery production make it clear that the manufacturer is committed to e-mobility. With 130 self-driven carts on about one kilometre of conveyor track, the stage of small series production has long been left behind. Krups usually installs around 70 turntables and about 140 stoppers on the track. Ten stoppers and all the rotary modules each use a TBEN-L PLC as a gateway to the customer’s main controller. This considerably reduces the number of bus nodes the customer requires.

To change direction, the carts are moved by transfer units to parallel tracks or their direction is changed by turntables. Unlike most conventional systems, in the eCart system it is possible to communicate with the carts. NFC (near field communication) units are provided at the stoppers in order



At the stoppers and other function modules, the eCart system communicates with the carts via NFC.



Before and after: The controller built in-house by Krups (left) worked well but, compared to Turck’s TBEN-L module (right), was much larger, more complicated to install and only worked in Profinet networks.



Turck’s TBEN-L-PLC controls the Krups conveyor system modules: communication to the periphery is via CAN and to the main controller via Profinet or Ethernet/IP.

to use the TBEN-L-PLC as a gateway to implement communication between the main controller and the carts. This means carts can be removed if necessary, depending on their state or the presence of warning messages. Another benefit is that when the carts are waiting, they do not consume any power – whereas in conventional roller conveyor systems the drives normally continue running – even if no boxes have to be moved.

The sensors and actuators of the modules are connected directly to the TBEN-L-PLC. The block controller provides eight universal channels on four sockets, which can be set automatically to

the required configuration as input or output. If other I/Os are required, Krups can expand the number of signals with the BL compact I/O module via the CAN bus connection.

In summary

With its eCart system, Krups Automation GmbH serves the increased requirements of modern assembly and test automation in terms of safety, low maintenance and communication. A maintenance-free track and intelligent self-driven carts, bundled with decentrally controlled system components, provide flexible and safe assembly automation. The individual modules of the track are controlled autonomously by Turck's TBEN-L-PLC. With the multibus-capable IP67 PLC, Krups implements standardised and optimised control sequences of the components. Customers benefit from fast commissioning, easy expandability and increased availability. □

The BL compact modules are likewise designed with IP67 protection and are mounted directly at the units.

IP67 saves wiring

It is not only Krups that has recognised the labour savings afforded by Turck's IP67 technology, its customers are also convinced by the solution. "Just routing the 24 V cables and signals to the twelve controllers on the stoppers and labelling would be very labour intensive. The price of the TBEN-L-PLC covers this easily," says IT Manager Christian Mies. The eCart system is energy-saving and fail-safe, and it enables more flexible processes as outlined in Industry 4.0 model scenarios and also already implemented. Through the communication with the workpiece carriers greater product variance can be achieved. □

For more information visit: www.turckbanner.co.za

CONTROL SYSTEMS + AUTOMATION : PRODUCTS + SERVICES

Automating agricultural equipment for smart farming

The major advantage of ISOBUS technology in the agricultural industry is that it allows for full compatibility between tractors and implements, no matter the brands or models. The Trimble® Field-IQ ISOBUS Liquid Control System is an ISO-compatible application control system that can be used on any implement applying liquid for a farming operation. Combining the modular Field-IQ architecture with the new Trimble Liquid Control ECU, it provides rate and section control solutions for a range of equipment – from sprayers to fertilisers and/or lime spreaders, manure spreaders, liquid toolbars, strip till toolbars, effluent toolbars and planters.

Trimble Agriculture supplies solutions that solve complex technology challenges across the agricultural supply chain. For over 30 years, it has created products to assist its customers grow their businesses. A member of Trimble's selected agriculture partner network, Vantage SSA (Pty) Ltd., based in Centurion, South Africa, represents Trimble Agriculture in the sub-Saharan Africa region through an extensive dealer network.

"We pride ourselves on being experts in precision agriculture," says Jaco Viviers, GM at Vantage SSA. The company positions itself as the farmers' 'Precision Agriculture Centre of Excellence', providing advice on the right combination of solutions and integrating the many complex processes across a farm.

"Our team has an extensive skillset in all areas of precision agriculture and is equipped to take the company's industry-level technical expertise, customer service and support capabilities to the farm," says Viviers. "We are committed to integrating and supporting a complete, end-to-end solution of hardware, software, positioning services and data for the specific requirements of each farming operation."



In the agricultural sector, ISOBUS technology enables full compatibility between tractors and implements.

Being the Africa partner of Trimble's elite agriculture network enables Vantage SSA to offer a range of benefits to its customers. These include a single source of expert, personalised precision agriculture consultation and local sales, plus maintenance and support services for all Trimble Agriculture products and solutions.

"We are skilled in combining agronomic recommendations with precision agriculture technology. For farmers, we alleviate the stress and time demands caused by trying to coordinate multiple vendors," says Viviers. He says the combination of Vantage SSA's expertise with precision agriculture hardware, software and service enables farmers to plant smarter, grow better and harvest more.

A particular advantage of the Trimble Field-IQ ISOBUS Liquid Control System is that it can connect any ISO terminal to the implement after the ECU (electronic control unit) has been configured. It can be installed using existing Trimble Field-IQ install kits and implementation is made easy with standard configuration and calibration screens.

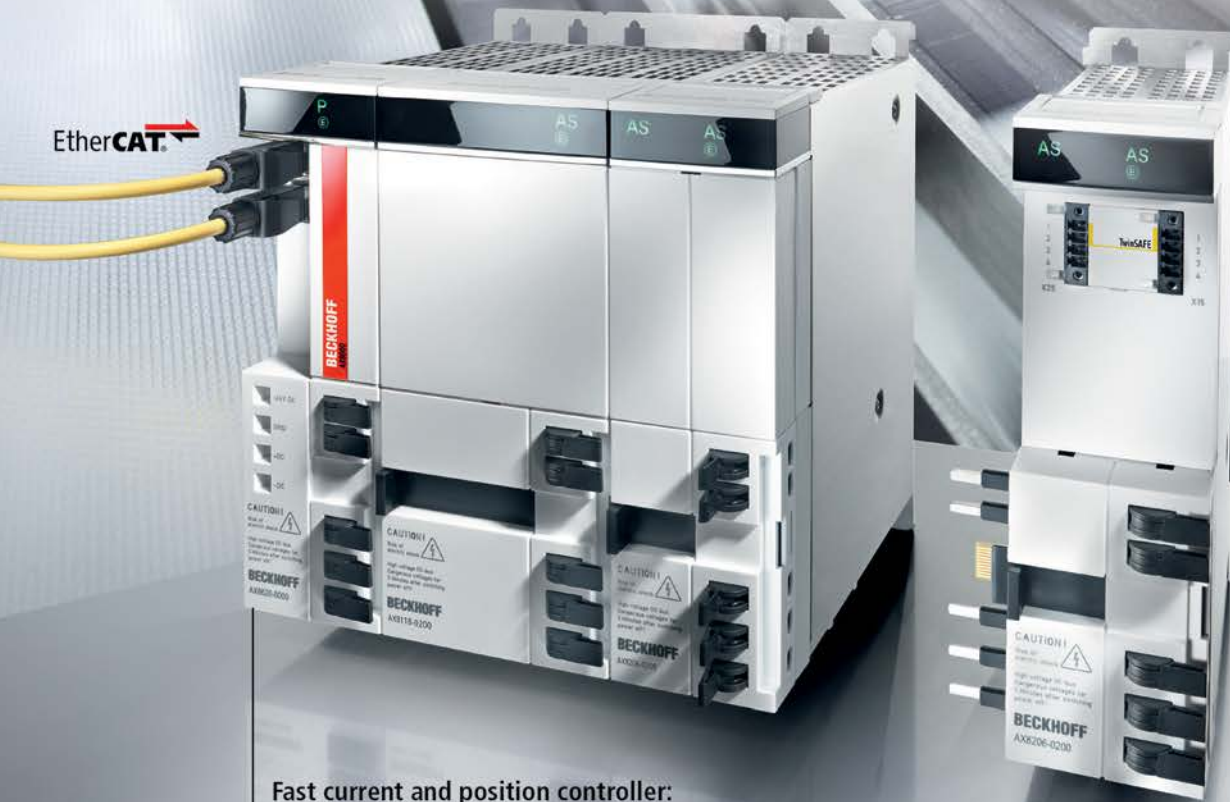
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Scan to discover
everything you need
to know about the
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New Automation Technology

BECKHOFF

Africa Automation Technology Fair

The Africa Automation Technology Fair is scheduled to take place from 9 to 11 May 2023 at Gallagher Convention Centre, north of Johannesburg. It will present the latest trends and developments in automation technology.

The event offers exhibitors the opportunity to showcase their latest products and innovations, gain access to the buyers and markets across the African continent, connect with decision-makers, exchange new skills and knowledge, identify new market trends and opportunities, and build brand awareness.

For visitors, AATF offers an opportunity to network with industry experts and discover new technologies and solutions. This year it will focus on developments in the fields of industrial automation, process automation, robotics and smart manufacturing.

The 2019 show featured 150 exhibitors and was attended by some 4 500 visitors. Key industries represented included electrical, mining & metals, manufacturing, automotive, materials handling, agriculture, chemicals,



AATF will present the latest trends and developments in automation technology.

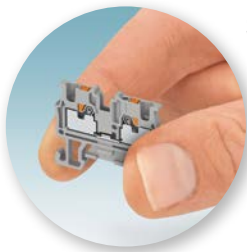
construction technology and communications.

AATF has been running for 25 years. It attracts visitors and exhibitors from around the globe and is recognised as the most comprehensive and focused automation technology event in Africa. This year the event will be co-located with Future Manufacturing Africa and Infosecurity Africa, extending its reach into closely related market sectors.

Registration for AATF 2023 is now open.

For more information visit:

www.africaautomationtechnologyfair.com



The miniature terminal blocks are designed to suit increasing miniaturization in machine building, switching device and control cabinet building.

Small terminal blocks for maximum benefits

Terminal blocks in miniature format from Phoenix Contact can be wired and mounted in various ways in the narrowest of spaces. The miniature terminal blocks can be supplied with push-in or screw connection technology, to suit different applications.

Miniature terminal blocks are a particularly good choice to match the increasing miniaturisation in machine building and switching device and control cabinet building. Despite their small sizes, they benefit from the advantages of Phoenix Contact's Clipline Complete system with large-area labelling options for all terminal points, simple potential distribution using standardised

plug-in bridges, and test accessories. The miniature terminal blocks offer flexible mounting options on the small 15 mm DIN rail. Plug-in solutions ensure a modular and time-saving design. The portfolio also includes ground terminals of the same shape. These have the suffix PE and comply with the provisions of the IEC 60947-7-2 standard.

For more information contact Phoenix Contact SA.

Tel: +27 (0)11 801 8200

Email: info@phoenixcontact.co.za

Visit: www.phoenixcontact.com/en-za

Paper machine rebuild for Sappi North America

Sappi North America has selected Valmet to supply an extensive rebuild of its Somerset paper manufacturing facility in Skowhegan, Maine, in the USA. Previously, Valmet rebuilt the paper machine 1 (PM1) and, following that success, Sappi has again chosen Valmet to rebuild the paper machine 2 (PM2).

With the PM2 conversion from coated woodfree graphic paper to solid bleached sulphate board, the machine capacity will be increased from 240 000 tons to 470 000 tons per annum. The start-up of the rebuilt machine is scheduled for mid-2025.

"Valmet has proven to be a trusted supplier to Sappi over the years and we're pleased to work with them again on our PM2 project. This

investment is fully aligned with our Thrive25 strategic focus to reduce our exposure to graphic paper and transition our portfolio to packaging and speciality papers, pulp and biomaterials," says Michael Haws, President and CEO, Sappi North America.

PM2 will be rebuilt using some of the most advanced packaging manufacturing technology to produce a variety of packaging and coated paper products. It will involve modifications and new machine parts in the existing machine and the mill will benefit from Valmet Industrial Internet and automation solutions including a new quality measurement system, a process control system, web monitoring and web inspection systems.

Sappi North America, Inc. is a subsidiary of Sappi Limited headquartered in Johannesburg, South Africa.

For more information visit: www.valmet.com

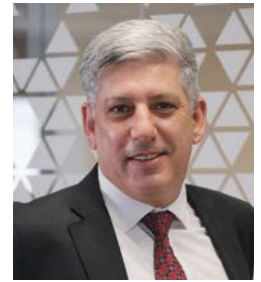


The rebuild of PM2 at Sappi North America's Somerset facility will include machine modifications and new parts, a new process control system and more.

Factors to consider in selecting VSDs

Adrian van Wyk, Managing Director, Referro Systems

Variable Speed Drives (VSDs) are used as a means of controlling the speed, torque, acceleration, deceleration and direction of induction and permanent magnet (PM) motors. VSDs can reduce energy consumption by operating at speeds that vary over time based on changing loads and changing process requirements. They provide soft-start capabilities and can increase operating efficiencies and reduce operating costs. However, the process and driven equipment will dictate the impact and value of specifying VSDs for motor control.



Adrian van Wyk, MD,
Referro Systems.

Does the process need them?

Key questions to ask before specifying VSDs are: does the process need them and will they provide the best solution for the application? This will ensure a due return on investment if you choose to go ahead with the installation of VSDs. They are highly flexible and technologically advanced motor control products. It is important to call on technical expertise to carry out an evaluation for a particular application, someone with extensive knowledge and experience of VSDs who can ensure that you get the desired result without incurring indirect costs that can accumulate through the lifecycle of the installation.

Even if VSDs are already in use on the site, it is worth re-evaluating the installations to determine whether they are necessary. This should be based on how they benefit the process and, if the process has changed over time, that would almost certainly have an impact. If, for instance, a motor on the plant is being run at full speed and can accelerate over a long period, the rate of change may well be the desired result, but the VSD losses over time may outweigh the short-term benefit.

Another scenario may be that there is insufficient energy to start a motor. In this case a VSD can be a good solution as it requires minimal energy to accelerate the motor to full speed, when compared to traditional full voltage across-the-line (or DOL – direct-online), electro-mechanical starters or digital soft starters.

It is well known in industry that in varying the speed of a centrifugal pump, for example, the saving in energy is calculated as the square of the speed, in most instances. However, if a process does not allow for the speed to be varied, there is no reason to install a VSD to save only, potentially, on starting current, but introducing other losses as a result (of the VSD). There is a substantial cost difference between a VSD and traditional fixed speed starter technologies. In short, if a process does not and will not benefit by varying the load speed, the use of VSDs may well be introducing unnecessary additional losses.

VSDs have their own requirements

VSDs have their own specific requirements depending on the particular VSD chosen and/or the application. Firstly, a power loss (kVA) of two to three per cent is incurred immediately, if the load is to be run at full speed.

Further, the rated ambient temperature for a VSD to operate within is typically 40°C but can be as high as 70°C with derating, and further derating factors may take effect due to altitude, for instance. As VSDs, particularly in retrofits, are often required to be physically protected in small cabinets or small rooms due to limitations on space and flexibility – and to meet specific IP ratings due to the environment, ventilation or forced cooling may be needed to prevent overheating. This may require the installation of air conditioning, all at an additional cost which needs to be factored into the overall cost of the installation.

It is also important to take into account the introduction of capacitive coupling into the motor circuit and supply side harmonics reflected into the power infrastructure – and the impact they may have. If a lengthy cable is used between the VSD and the motor, the impact of the capacitive coupling issues can result in the deterioration of the motor windings and failure over time. VSDs using IGBT switches for motor frequency control are very efficient because of their high switching speed. However, the high-speed switching also results in much higher electromagnetic interference (EMI). Typical noise suppression solutions include ensuring all components are grounded



All VSDs are different. It is important to consult an expert to advise on the best solution for a given application.



Where processes will benefit from varying the motor speed, VSDs support operating efficiencies and reduce operating costs and energy consumption.

appropriately; using a suitably shielded power cable to connect the variable speed drive to the motor, and correctly connecting the shield to the drive, motor ground locations and potential earth locations; using a built-in or external EMC (electromagnetic compatibility) filter; using twisted control wiring leads; and running power and control wiring separately. RF filters installed in the VSD circuit reduce the radio frequency interference.

Another factor to consider is that the supply transformer switching effect can damage a VSD if the impedance variance is not taken into account and can also introduce harmonics. This can be mitigated by adding an input line choke or dc link inductor, but it is important to understand if and when and why this is necessary.

These considerations point to the need for a thorough technical understanding of each specific application as there may be requirements for additional hardware to be installed into the circuit to prevent harm to the rest of the installation over time. If these factors are not taken into account, the lifespan of the motor and the VSD may well be shortened and equipment around the VSD may also be negatively affected.

Maximising return on investment

Most modern VSDs are designed to last for more than 20 years. Where VSDs have been installed already for a long time, they may be nearing end of life. The manufacturer may or may not have provided ample notice of obsolescence. This brings with it issues of support becoming limited and spare parts scarce and expensive or non-existent. In turn, this can lead to extended downtime in the process plant. With advances in technology, the communications network within a VSD may become obsolete – and replacing the obsolete network may also mean replacing the VSD simply due to its age and network connectivity limitations.

Manufacturers often supply various options of VSDs, and they may have a replacement to suit the application without too much fuss. However, some older technology products cannot be upgraded, whereas more modern products usually offer firmware upgrades and, in some cases, automatic setup and startup capabilities that assist in reducing the time needed for installation and to start operating. Some brands are more aggressive on the technology curve with a

strong focus on usability and customer interface diagnostics that can provide information on mean time to failure in order to facilitate preventive maintenance well before failures occur.

All VSDs are different

For plant operators faced with a soon to be obsolete VSD that is becoming increasingly difficult to maintain, there is the option of upgrading to the latest technology, and it is important to understand the replacement technology. There are a number of other considerations too, including spares holdings and commonality with other products in the range, such as I/O cards, keypads, software tools and other ancillary equipment. It is more cost-effective to carry only one set of spares that can be used across a range of products. Checking all these factors will support a well informed change.

Most modern VSDs are designed to be more compact and modular with ancillary equipment that can be used across the range. They also incorporate more features. What is especially important is the impact they may have across the entire process. There are always unique challenges to every installation. For example, rather than installing a VSD close to the supply transformer with a long cable to the motor, as mentioned above, it may be more appropriate to install a VSD with a higher IP rating closer to the motor that does not require an inline choke or a motor terminator, which will have a positive effect on the longevity of the motor. Some VSDs now have an input line choke built into the drive and others offer as standard a dc link inductor within the drive. When specifying a VSD it is important to take into account the entire motor control process to ensure optimum efficacy.

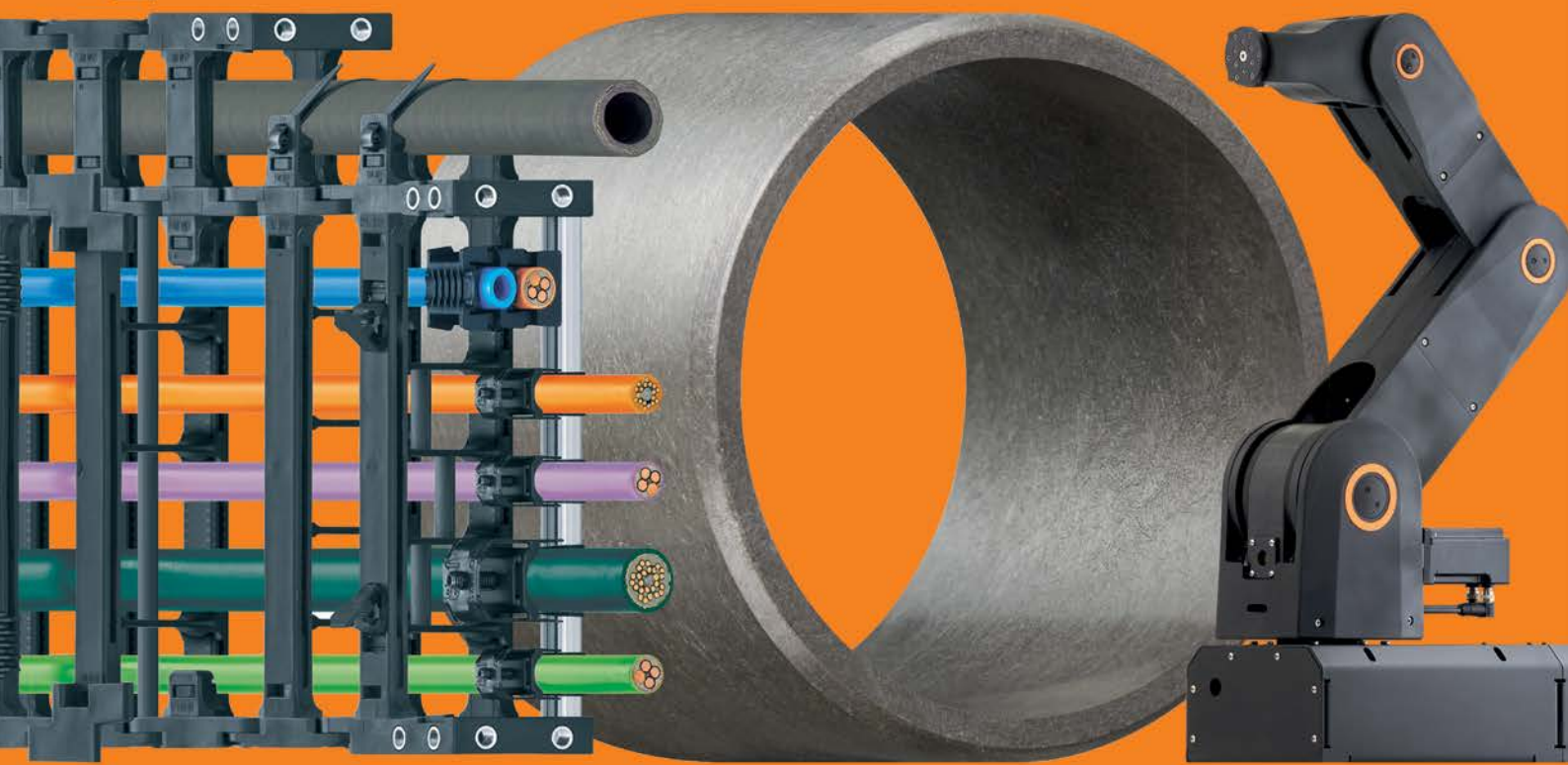
Assess the merits of change

There is a strong case for brand loyalty as this provides the plant operator with standardisation across the process with regard to maintenance and spare parts holdings. In addition, communications interfaces will integrate easily into the existing control platform. Training becomes simpler as programming, maintenance, troubleshooting and diagnostics will be standardised across a product range. This will ensure maximum benefit over the lifespan of the VSD with the support of fast and accurate troubleshooting, when required, to get the plant up and running again in the shortest possible timeframe after any stoppage or breakdown.

Retrofits, just like new installations, should be evaluated in each instance. It does not always follow that the way a VSD was installed in the past was the best way. It is also important to re-evaluate the payback in plant performance to determine if a VSD is the best option and, if so, should it be upgraded to a different model or brand or rather repaired. Consulting a supplier with technical expertise and in-depth knowledge of the workings and applications of a wide range of VSDs is helpful and will impact positively on your return on investment. □

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Dillon Govender,
Sector Specialist in
Business Development
at Zest WEG.

A range of electrical equipment for optimised chrome recovery plant

When platinum group metals and chrome producer Tharisa Minerals built its Vulcan ultra-fine chrome recovery and beneficiation plant near Rustenburg, it looked to Zest WEG for a range of electrical equipment.

The Vulcan plant, which began cold commissioning last year, is expected to improve the Tharisa mine's chrome recoveries from about 62% to around 80%. An important aspect of achieving this will be the performance and reliability of its electrical equipment, most of which was supplied by Zest WEG.

Dillon Govender, Sector Specialist in Business Development at Zest WEG says, "This was an exciting project for us, where we were able to demonstrate our broad offering of electrical solutions." The order included low voltage WEG motors and variable speed drives (VSDs), as well as soft starters, transformers, generators, motor control centres (MCCs) and distribution boards.

Motors and drives

Indicating the scale of the project, some 120 WEG W22 motors of 525 V capacity were supplied. In line with Zest WEG's commitment to supporting energy efficiency and the achievement of sustainability goals, these are IE3-rated premium efficiency motors.

"We keep extensive stock of the motors in South Africa, so there was no lead time for manufacturing or transportation for the client," says Govender. "Another advantage was that we were able to supply the motors directly to the pump vendor for the project, where the motors were to be fitted. This was a service we offered to the client, to help streamline the project and simplify logistics."



The standalone soft starter (185 kW/550 VAC) housed in an IP42 enclosure was designed for the tailings pumping motor control centre.

Govender adds that another competitive advantage of WEG motors from 132 kW to 500 kW, is the standard provision of an insulated end shield. This allows the motor to run with a VSD, without the need to add insulated bearings, and this in turn, makes maintenance easier as the motor can be fitted with a normal bearing.

With an ingress protection rating of IP66, combined with Class H temperature rise capacity, the motors are designed for long life and efficient power consumption. Govender highlights that Zest WEG offers a five-year warranty on these motors. Further enhancing the motors' efficiency are the 115 WEG low voltage VSDs supplied. Four of WEG's latest SSW900 heavy duty 185 kW soft starters were also supplied, complete with a three-year warranty.

"Most motors are VSD-driven, using our heavy duty CFW11 mining-spec system drive," he says. "Supplied standard with a safety stop relay function, the motors are rated SIL2 for low statistical risk of failure."

Three MCCs also formed part of the order – with two back-to-back and one front-and-rear configuration. Zest WEG manufactured the MCCs locally, in line with the IEC standards 61641 and 61439 – for internal arc protection. In addition, the company built separate freestanding panels for the VSDs from 250 kW to 500 kW, to facilitate better heat dissipation. For the same reason, the four soft starters were supplied in their own panels.

Ten distribution boards were locally manufactured for the project, built according to SANS 10142. These supply 230 V to 400 V currents to lighting and small power applications at the plant.

Transformers

"Another aspect of our supply package was three 2 000 kVA transformers, to step power down from 11 kV to 550 V," says Govender. "These copper wound, oil-cooled units were manufactured by Zest WEG locally, to SANS 780 specifications. And we built a smaller transformer for lighting and small power applications."

An important component of the plant was the emergency backup diesel generator, also designed and engineered by Zest WEG. This 550 V containerised unit is prime rated at 1 250 kVA and was delivered with a 12 000-litre diesel storage tank.

"Our design and engineering expertise gives us the confidence to offer this generator with a 12-month warranty – or 250 hours – from the factory acceptance test," Govender adds.

He emphasises the value to the customer of having easy access to the sales and technical support team in Zest WEG's Rustenburg branch. The branch, he says, is staffed to respond to queries on the full range of the company's equipment – and draws on the skills of specialists within Zest WEG wherever necessary.

For more information contact Zest WEG.

Visit: www.zestweg.com

Hybrid cables for brand-specific motors and drives

Energy and data transmission bundled in one cable: hybrid technology is increasingly gaining acceptance among drive manufacturers. In view of this ongoing trend, igus is expanding its chainflex cable portfolio with two new hybrid cables: the CF280.UL.H401 with PUR jacket suitable for Bosch Rexroth's modular drive system ctrlX DRIVE for synchronous servo motors of the MS2N series; and the proven hybrid cable for Siemens SINAMICS S210 drives, now with PVC outer jacket.

Hybrid technology has been one of the main trends in the cable industry in recent years. With over 30 different types of flexible hybrid cables, igus has the largest portfolio. This consists of two series: CF280.UL with PUR outer jacket and CF220.UL with PVC outer jacket. igus relies on two different jacket materials so the right one can be selected to suit different applications and external conditions. For example, the jacket made of oil-resistant PVC is the appropriate partner for use in the energy chain due to its high abrasion resistance, particularly when the application entails high cycle numbers in dry areas – as in woodworking machines, for instance. PVC is designed for ambient temperatures of +5°C to +70°C. PUR, on the other hand, has an exceptionally high notch and oil resistance. This makes the halogen-free PUR cables suitable for use in the energy chain, especially

with very high oil loads, as in a machine tool, for example. In addition, it works reliably in an extended temperature range from -25°C to +80°C.

The chainflex cables are available from stock, sold by the metre and as harnessed products, and are designed to match the well-known manufacturer standards. "To offer our customers more solutions for the drive systems of a wide range of manufacturers, we are continually expanding our cable range. Hence, the two new hybrid cables suitable for Bosch Rexroth and Siemens," says Rainer Rössel, Head of Business Unit chainflex Cables at igus.

By using chainflex cables, users save around 40% installation space in the energy chain and 43% material weight, compared to opting for separate servo and measuring system cables. The fact that the system needs to drive less weight also means a lower amount of energy is needed.

For more information contact igus South Africa.
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High-tech equipment and expertise to support Africa's growth

Despite the travails of the global economy and uncertainty in many countries, Africa will be the place to do business in the coming years. This is the view of Raymond Obermeyer, Managing Director of SEW-EURODRIVE South Africa. The company has worked successfully around southern, central and east Africa for decades and it is ramping up expansion as it embarks on a progressive strategy of establishing new branches.

"Customers around Africa know our brand well and respect the precision German engineering that underlies all our products," says Obermeyer. "They also rely on our strong service ethic, which is based on our culture of responsiveness and understanding customers' needs."

A key aspect of the company's high levels of customer support derives from its infrastructure and capability – as well as having a presence close to customers' sites. In addition, its newly built, expanded headquarters and assembly facilities in Aeroton, Johannesburg, ensure ready availability of stock and quick turnaround times for designed solutions.

"The development of SEW-EURODRIVE's new headquarters – worth around R500 million in infrastructure and stock – was a carefully considered investment in our future growth," Obermeyer says. "It has also enabled a three-fold increase in our stockholding, which is essential to ensuring customers get what they need, when they need it."

In addition to serving branches in Nelspruit, Durban, Cape Town and Gqeberha in South Africa, this new facility serves over 23 other countries in Africa through the company's established branches. It is this proven branch model that SEW-EURODRIVE is now rolling out. Moving gradually away from the distributor model of product sales and support, Obermeyer says four countries will be strategically selected each year for a branch establishment.

"Taking a phased approach to our growth strategy, we began establishing branches in our key growth areas of Zambia, the Democratic Republic of Congo (DRC), Kenya and Tanzania in 2022," he says. "Looking ahead, we aim to target around another four countries a year."

The model benefits customers as well as the host countries. For SEW-EURODRIVE, although the investment



The company is strengthening its presence on the continent by establishing new branches around Africa.

is higher, it gains more control over factors like service quality and performance. By appointing and training its own staff, the company can ensure it provides customers with a uniformly high standard of support, wherever they may be.

"This strategy also aligns with the growing trend in Africa towards localisation," Obermeyer highlights. "Countries are wanting to see more local benefit from economic growth, and a move away from relying on foreign companies and expatriate workers."

Building on the experience of running its own strong branch network in South Africa, SEW-EURODRIVE is enthusiastic about building capacity around Africa. This will include more formal training and mentorship of local staff in African branches – to service SEW-EURODRIVE motors, gearboxes, geared motors and other equipment already widely used on the continent.

"Our equipment can be found in a range of industries around Africa – from food and beverage to cement, mining and pharmaceuticals," says Obermeyer. "Our hands-on approach to our work means we understand the operating conditions in each country, and we have developed the expertise to deliver the way our customers require."

He points out that recent growth – and new potential – in most African countries is being driven by considerable investment in world class industrial facilities which demand high-tech equipment supported by qualified and experienced experts.

"This is where SEW-EURODRIVE is positioned," he says. "We are leveraging our experience in these markets to deliver the best quality equipment and components – supported by a high level of service and commitment to customers."

For more information contact SEW-EURODRIVE South Africa.

Visit: www.sew-eurodrive.co.za

SEW-EURODRIVE is ready to serve customers across the African continent.



Top supplier for switchgear solutions

Schneider Electric, a global leader in energy management and industrial automation, has been recognised as *Top Supplier 2022* by JB Switchgear Solutions, South Africa's biggest independent panel builder and manufacturer of prefabricated substations, containerised substations, and motor control centres.

JB Switchgear Solutions is a Schneider Electric panel builder partner and the only licensed BlokSET (low voltage switchboard for power distribution and motor control) solution partner in the country. Schneider Electric's team was awarded the accolade based on the criteria set by JB Switchgear, including timely quotations, technical consultation and expertise, support, equipment availability and supply.

"At JB Switchgear Solutions we forge strong partnerships with our suppliers and this has enabled us, in 10 short years, to establish our business as the biggest panel builder in the country. All our projects are executed in tandem with our partners, which is beneficial to all parties concerned," says Sharad Hingorani, Deputy Managing Director at JB Switchgear Solutions.

"Schneider Electric set itself apart in 2022 by offering exceptional products, consultancy services that of-

ten meant providing out-of-the-box solutions, and timely supply and delivery of equipment," he notes.

Xola Mpendukana, Power Products Division Account Manager at Schneider Electric says: "The team at JB Switchgear Solutions work under immense pressure, which is why they need a partner that can assist them every step of the way, ensuring they meet their deadlines, retain customer loyalty and grow their business.

"Schneider Electric and JB Switchgear Solutions' relationship is a full team partnership. Our Cluster President, Devan Pillay played a hands-on role, providing valuable consultation and support. We are thrilled to be recognised as their Top Supplier for 2022."

Sulayman Ally, Estimation Manager at JB Switchgear Solutions comments too, saying: "Schneider Electric offers a comprehensive set of solutions and services to many industries, which will enable us to grow and adapt as market needs evolve and change."

For more information contact Schneider Electric.
Visit: www.se.com



From left: Johan Basson, JB Switchgear Solutions MD; Reena Sharma, Channel Marketing Manager, Schneider Electric and Devan Pillay, Cluster President, Anglophone Africa, Schneider Electric.

Keeping crane applications in motion

Following the launch of its new crane and power transmission department, automation and cranes specialist CP Automation has added the Yaskawa CR700 ac drive series to its portfolio. Spanning 0.55 to 315 kW standard ratings and with higher capacity drives available on request, the new drive range is supplied equipped with crane- and hoist-specific software to ensure safety and precision. The new product will help customers adapt to the latest standards and market requirements, rather than having to rely on general purpose or outdated systems that are not designed for crane applications.

Cranes pose a high risk in industrial settings. Even a small crane, weighing 20 tons, operating in a factory, can experience a pendulum effect and a swaying load when stopped. For people working in the vicinity this could cause serious injuries and it can cause damage to surrounding equipment. Furthermore, the rigging equipment used on cranes is often designed for static loads rather than dynamic ones and a swaying load can put the system under added strain.

The CR700 series from Yaskawa is designed specifically for the crane and hoist industry and the drives incorporate a number of safety features. These include Safe Torque Off, a safety redundancy feature, as well as anti-sway control software. The drives also include a function that synchronises two motors using encoder feedback, which ensures the load is level and prevents any tipping, and removes the need for mechanical links that can wear or break over time.



The drives are designed specifically for the crane and hoist industry and incorporate a number of safety features.

Andy Swann, Business Development Manager for Cranes and Power Transmission at CP Automation says, "Previously, crane customers have relied on general purpose variable speed drives but integrating them into a crane system usually involved hours of programming. However, the CR700 is specifically a crane drive: it was created for crane original equipment manufacturers and crane repair, service and upgrade companies.

"The new drive series combines state-of-the-art hardware and dedicated crane and hoist software features to deliver a product designed for heavy industry," Swann adds. "It is equipped with Bluetooth and Wi-Fi options and can be linked to a smartphone or laptop, so users can easily make adjustments to a crane's performance remotely."

For more information contact CP Automation.
Tel: +27 (0)11 902 3579
Email: sales@cpaltd.co.za
Visit: www.cpaltd.co.za/

Smart instrumentation for green hydrogen production

As a source of power, green hydrogen is showing great promise – to become a fuel that can contribute to meeting the world's rapidly growing energy needs and decarbonising energy production. In this article, ABB outlines the main drivers behind the push for green hydrogen, how it is produced, and the role that can be played by the latest generation of smart measurement instruments and analysers in the production process.

Countries worldwide are looking for alternative sources of energy and many are turning their attention to the potential of hydrogen. In 2020, about 87 million tons of it were produced globally, and projections envisage a significant increase in the near future. Although considerably less harmful to the environment than traditional fossil fuels, hydrogen's impact is not negligible, particularly when it is produced using fossil fuels.

Increased effort is therefore being focused on the development of clean or green hydrogen, which is produced through electrolysis, splitting water into hydrogen and oxygen, using electricity from renewable sources with low or no carbon emissions. As such, the process presents significant potential to reduce energy costs and the carbon impact of energy generation.

Green hydrogen is a clean-burning fuel and produces only water as a byproduct. With more renewable energy sources being brought online, the cleaner nature of green hydrogen presents a solution to reducing emissions and ensuring an abundant supply of hydrogen for use in industrial processes.

However, production of green hydrogen, especially at a large scale, presents its own challenges. To ensure effective and safe operation and, at the same time, achieve maximum productivity, efficiency, and purity of the hydro-

gen gas product, processes need to be controlled with a high degree of precision.

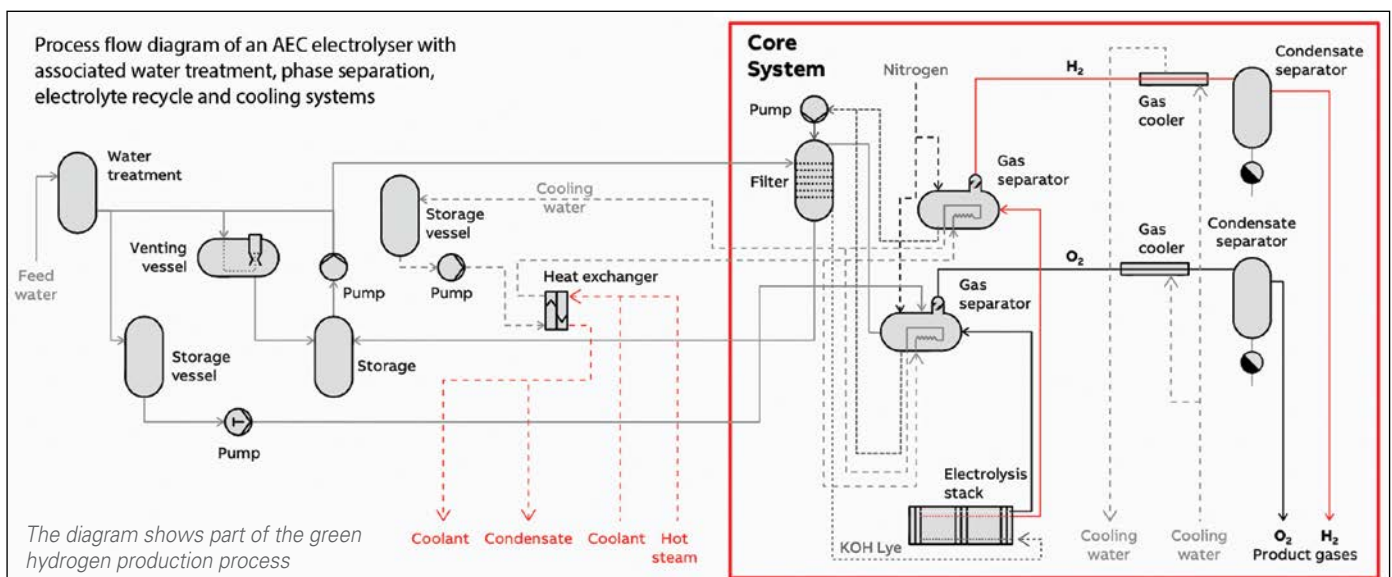
Optimising electrolysis

There are three main types of electrolysis technologies used to produce green hydrogen: alkaline electrolyte cells (AEC), polymer electrolyte membranes (PEM/PEMEC), and solid oxide electrolysers (SOE/SOEC). Each has its own advantages and disadvantages. PEM, for example, allows a faster ramp-up, and SOE provides high efficiency, but also requires high operating temperatures. Of the three, AEC electrolysers tend to have the lowest CAPEX requirement.

Whatever their respective merits, all three methods rely on accurate measurement of a range of different parameters, each of which is important in optimising the performance of the electrolysis process. Controlling a hydrogen electrolyser of any kind is crucial to ensure safe operation, efficient power to hydrogen conversion, and appropriate quality control for purity. Temperature measurement is also required to avoid overheating in the electrolyser stack.

Smart measurement devices

Recent advances in measurement technologies enable the continuous measurement of the critical parameters



relating to the performance of the electrolysis process. Digitally-enabled devices, connected via the cloud, provide greater accuracy and faster response times than analogue equivalents. This can help operators to detect anomalies and potential faults before they manifest as real risks disrupting the process or causing damage to equipment. Remote monitoring allows for parameters to be analysed without the need for physical inspection, and for maintenance teams to use their time more efficiently, allocating duties where they are needed, when they are needed.

Digitally-enabled devices can also help to improve the simplicity of reading and interpreting measurements. Digital interfaces can capture and display a greater range and depth of information, allowing operators to gain a more detailed understanding of operating conditions, equipment and process performance, and the status of the measurement equipment. Readings can also be combined with other measurements, to provide a more holistic view of the electrolyser system's performance. Interfaces can incorporate automation to provide the relevant information to the right person, when they need it, helping to facilitate more agile and informed decision making.

Gas analysis

Sensitivity is critical in gas analysers used in electrolysis. The process creates chemical reactions, which can cause small concentrations of oxygen to build up in the hydrogen stream, and vice-versa. The electrolyser stack assembly can also potentially leak gas from one side of the electrolyser cell to the other. This can produce hazardous conditions and gas analysers must be sensitive enough to detect potential safety risks and trigger a safe shutdown if required. ABB's EasyLine EL3060 gas analyser, for example, is designed specifically for applications in hazardous areas and incorporates different options for measuring hydrogen accurately down to -0.1 vol.% to 0-10 vol.%. The gas analyser is housed in a flameproof control unit and a touch screen allows safe operation without the need to open the housing.

Liquid level measurement

As well as measuring for potential gas leakages within the electrolyser and cross contamination between the oxygen and hydrogen streams, it is important to detect and measure the presence and volume of liquids. Raw hydrogen gas contains electrolyte vapours which must be separated from the gas. Typically, there will be an initial knock-down phase separator to allow gas and liquid separation after the electrolyser. The hydrogen is then cooled, and a second separation step removes the condensate.

The gas solution is pumped to the separator and then recirculated back to the electrolyser. To avoid the pump running dry and hydrogen then entering the pump, resulting in it flowing to the wrong part of the electrolyser, it is critical to monitor the water in the knock-down phase separator. A too-low level should trip the recirculation pump, and extremely low levels should trigger a safe shutdown of

the electrolyser and initiate a nitrogen gas purge. Level monitors used in this part of the process should be ATEX-certified, like ABB's KM26 level gauge.

Temperature measurement

Overheating is a risk in any electrolyser. Renewable sources of energy like solar and wind energy, are variable in their nature and sudden ramp-ups can result in the electrolyser drawing more current, and creating more heat. To mitigate this, water is pumped around the electrolyser to cool it, but to trigger that action, temperature measurement is required. Platinum resistance thermometers, which detect temperature by measuring electrical resistance, are typically used here.

A similar solution can be used in the de-oxo stage, where traces of oxygen in the hydrogen are converted to water in an exothermic catalytic reaction. It is important to monitor the temperature of this process to ensure the reaction remains under control and the temperature does not exceed safe levels.

Pressure measurement

Certain types of electrolysers operate at elevated pressure. This is important if the gas is to be used at high pressure, as pumping at higher pressures is much more energy-efficient compared to compressing the hydrogen gas after the electrolyser. As with many processes, over-pressurisation of vessels and equipment can create potentially hazardous conditions, so accurate pressure measurement is critical to ensure safe operation.

One issue that can affect pressure transmitters in hydrogen production is hydrogen permeation, where a hydrogen molecule splits into two hydrogen ions, which then penetrate the pressure transmitter diaphragm. This is a leading cause of pressure transmitter failure. ABB has developed an 'H-Shield' titanium-based binary nano coating for its transmitters, which forms a protective coating across the surface of the diaphragm. It provides high resistance against the permeation of hydrogen ions and still allows sufficient flexibility for the diaphragm to move in response to changing pressure conditions.

Towards a cleaner, greener future

With its potential to reduce the negative byproducts of fossil-fuelled electricity generation, green hydrogen presents an exciting new possibility in the pursuit of sustainable energy. It is expected to become an important part of a more sustainable energy mix.

By ensuring accurate and reliable measurement of the many parameters involved in controlling the green hydrogen production process, smart instruments and analysers are playing an important role in responding to the challenges involved in making the process safe, effective and financially viable. □

For more information visit: www.abb.com

Enabling early leak detection in boiler tubes

The Inspecta Automatic Purge System, designed, engineered and manufactured in South Africa, is a cost-effective, ambient-air purge system to remove the fly ash build-up within Inspecta pipe-sets, for leak detection in power stations. And it does not require either compressed air or an additional power source to operate.

Instrotech designed the successful Acoustic Steam Leak Detection System (Inspecta ASLD) and has developed a fully automatic purging system that can be easily retrofitted to existing Inspecta installations. The new automatic system eliminates routine manual purging of the pipe-sets and maintains the leak detection system at peak performance, without manual intervention.

Installed in most Eskom power stations, Inspecta ASLD systems use acoustic detection technology which detects tube leaks less than 2 mm in diameter in the large boiler structures. The coal used by Eskom has a very high ash content, so a considerable amount of fly ash remains after combustion. The fly ash swirls around inside the boiler and quickly blocks the 'listening' pipe-sets that contain the sensitive leak-detection microphones. Unless the systems are cleaned frequently, either manually or automatically, their ability to detect the leaks early is significantly degraded.

Cost savings case study

The Inspecta ASLD has been shown to detect steam tube leaks reliably and accurately. To achieve this, the system must be correctly calibrated and the listening pipe-sets kept clear of any obstruction that would reduce their sensitivity. Experience has demonstrated that if there is any obstruction that reduces the sensitivity by more than 10%, it will result in a measurable degradation of the Inspecta ASLD and a delay in the detection of a tube leak.

Figure 1 illustrates that in order to optimise the performance of the leak detection system, the pipe-sets, particularly those located in the combustion areas of the boiler, should be cleared of fly ash build-up every one and a half to two hours. It is not practical to do this consistently and reliably using a manual purging system.

If the fly ash is allowed to build up over a period of 5



Figure 1 shows the rate at which sound level deteriorates over time due to fly ash build-up. The pipe sets need to be cleared at regular intervals to maintain effective leak detection.



The Inspecta Automatic Purge System in application.

to 6 hours, this will result in a serious degradation in the sensitivity and effectiveness of the leak detection system. Under such degraded conditions, tube leaks may only be detected after progressing for some time. Such delays may well result in extensive secondary tube damage and, in turn, extend the downtime required to repair the damaged boiler.

Comparative cases of early detection and delayed detection of tube leaks highlight the positive impact that an effective leak detection system can have in reducing the consequent extent of damage and the costs of downtime for repairs.

Early detection of a tube leak

In the case where a leak was detected promptly and the boiler shut down before significant secondary tube damage had occurred, an outage time of two days was needed before the boiler was brought back online.

Delayed detection of a tube leak

In the case where detection of the tube leak was delayed and the boiler shut down two hours after the boiler cited in the first case, it is assumed that the tube leak happened quickly and created significant secondary damage, so more than 40 tubes were damaged. EPRI^[1] information (EPRI 2003) confirms that the boiler outage time increases steeply as secondary damage increases. In this case, it took 11 days to repair the boiler – which resulted in 11 days of lost electricity production.

Retrofitting the automatic air purge system

The Inspecta APS system can be installed into an existing Inspecta ASLD configuration simply by replacing the existing Inspecta pipe-set with an Inspecta APS-enabled pipe set. All existing plant wiring remains the same.

If there is a delay in the detection of a fast-progressing tube leak by just a few hours, the downtime to repair the boiler can increase by more than five times compared to a leak that is detected earlier.

Installing Inspecta APS on a boiler ensures the
Continued on page 21



Early detection of boiler tube leaks in power stations has a significant impact in reducing damage and downtime.

Continued from page 20

pipe-sets are automatically kept clear of fly ash, so the sensitivity of the Inspecta steam leak detection system is not compromised. This, in turn, enables the system to detect small tube leaks reliably at an early stage.

Operating automatically, the system has the advantage of removing the potential risk of human error from routine maintenance because it does not require any human intervention to function.

Inspecta APS is purpose-designed to work in the extreme environmental conditions of a power station boiler house and the system incorporates AI-driven adaptive performance.



The APS is designed and manufactured in South Africa.

If early leak detection is achieved by installing Inspecta APS, and consequently reducing downtime for leak repairs in a large generation unit by only one day, the savings in electricity production loss exceed the cost of the system tenfold.

Note:

[1] EPRI, the Electric Power Research Institute, is based in Washington DC in the USA and has offices around the world.

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Tel: +27 (0)10 595 1831

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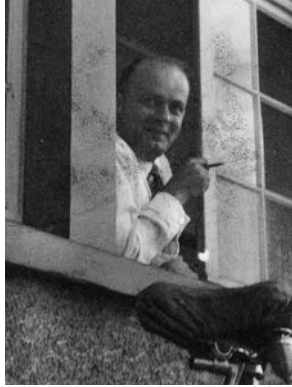
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Part of your business



When L Hauser KG opened for business in 1953, it was headquartered in Ludwig Hauser's apartment in Lörrach, Germany.

Success into the third generation

Celebrating its 70th anniversary, Endress+Hauser looks back on seven eventful decades. It was in 1953 that Swiss engineer Georg H Endress, just 29, and German head of a cooperative bank, Ludwig Hauser, 58, came together to create a company. Although seeming an unlikely pair, the two complemented each other well: the vision and drive of one was as important for success as the prudence and experience of the other.

From the back room into the world

L Hauser KG opened for business on 1 February of that year. The young company was headquartered in Hauser's apartment in Lörrach in Germany, financed with modest start-up capital of 2 000 deutsche marks. The company was named after Ludwig Hauser's wife, Luise, who is listed in the commercial register as the shareholder.

It started with the sale of innovative electronic level sensors that filled a market niche. It wasn't long before Endress began to develop instruments on his own. In 1955 he registered his first patent with what is now known as the Swiss Federal Institute for Intellectual Property. Production took place in rented spaces, with the employees distributed across several buildings that they, teasingly, referred to as the 'United Hut Works'.

Opening new markets step by step

In 1957 the company began trading under the name Endress+Hauser – and experienced strong growth. It continued to carve out new niches. Georg H Endress compared his approach to 'rolling out the dough'. He continually expanded the portfolio by incorporating new measurement principles and pursued business opportunities in other countries. The first foreign subsidiary was established in 1960 in the Netherlands. Other sales centres followed almost every year.

The company expanded its portfolio through acquisitions and start-ups. Measurement value recording, liquid analysis and flow measurement engineering became additional fields of activity, followed later by pressure and temperature measurement technologies. Endress+Hauser evolved into a full-range provider for the process industries. As the Hauser era came to an end, the Endress family became the sole shareholder in 1975.

Global structures, universal culture

Klaus Endress took over the reins of the group from his father in 1995. Over the following years he expanded the business beyond process instrumentation into services and automation solutions. He also tackled the challenges of doing business in a globalised world. After establishing sales centres around the world, production also went global and modern IT enabled interconnection.

For 19 years Klaus Endress put his personal stamp on the group and on the corporate culture. He recognised loyalty and responsibility as core values in the relationships between customers, employees and shareholders. The future of the family business was close to his heart. He drove forward work on a family charter in which the shareholder family stated that Endress+Hauser should remain a successful family-owned company. With the death of Georg H Endress in 2008, this became his legacy.

Digitalisation and analysis

In 2014, Matthias Altendorf took over as CEO. He is not a member of the Endress family but has been working at the company for over 25 years. Laboratory analysis specialist, Analytik Jena was already part of the group. Further acquisitions strengthened process analysis and the measurement of quality parameters. In addition, Altendorf drove the focus on digitalisation in products, in customer interactions and in business processes.

During the coronavirus pandemic, this extensive digitalisation proved its worth. Endress+Hauser was able to support customers remotely and coped well with the crisis. But the challenges continue. The Russian attack on Ukraine resulted in harsh sanctions and Endress+Hauser stopped work in Russia. In addition, the conflict clouded the economic outlook.

In its 70th year

Nevertheless, Endress+Hauser is moving into its anniversary year with confidence. The group supports customers in tackling major challenges such as digitalisation and decarbonisation and contributes to core supplies that support the nutrition and health of people. The company is on a sound foundation; its global footprint ensures stability. And the shareholder family has everything in place to ensure a smooth handover of responsibility to the third generation.

For more information visit: www.endress.com

Ifm's inductive sensors can be used in diverse applications.



One sensor for different applications

In factory automation, applications with coolants and lubricants, or in mobile applications, ifm's inductive sensors provide universal usability combined with high performance, temperature stability and protection ratings from IP65 to IP69K.

They offer high sensing ranges and an almost flush installation, providing optimum protection

against mechanical tolerances. Damage to the sensor is thus minimised as far as possible. The installation is simple, a straightforward screw in until the end of the thread and a secure fit is guaranteed.

For more information contact ifm South Africa.

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The hygienic solution to pressure surges in plants

Valve specialist GEMÜ, which is based in Ingelfingen, Germany, and operates internationally through a network of commercial partners, has developed the GEMÜ 652 pulsation damper. Based on the company's tried and tested diaphragm valve technology, it is also suitable for use in sterile applications. This means it is completely drainable and CIP/SIP capable, taking the specified draining angle into account.

In many production plants, unwanted pressure surges arise, generated by switching on pumps, by temperature changes in enclosed liquids or by quickly switching valves, for example. Opening valves can also result in pressure surges if the media supply is at a high level and the fluid column to lower plant components suddenly starts moving.

Such pressure surges can damage plant components such as filters, sensors, pumps and piping. Likewise, the pressure surges can result in shut-off valves briefly opening inadvertently. This, in turn, can result in possible contamination of the medium. In the worst case, it can result in downtime due to repair work being required, or a loss of product.

GEMÜ has introduced the GEMÜ 652 pulsation damper as a solution to this problem. The unit is designed to

open up as much volume as possible in a given operating range and thus absorb and compensate for the pressure surge. A sealing weir is not included in the body, so the damper is not suitable for shutting off media. The expansion volume is opened up by the moving diaphragm.

By using different actuator sizes and spring sets, it is possible to adjust the operating range and the volume that can be compensated for. Increased expansion volume can be achieved by installing multiple pulsation dampers in series.

The control air connector is used only for assembly. Actuation via control air is not required for operation, as its function is accomplished solely using spring force.

The GEMÜ 652 pulsation damper is available in the nominal sizes DN 15 to DN 80 (diaphragm size 25 to 80). To ensure flexibility for different applications, the valve bodies and diaphragms are available in various materials and designs. Due to the diaphragm valve technology used, the product complies with the current standards in the foodstuffs and pharmaceutical industries, such as BSE/TSE, FDA, USP Class VI and Regulation (EC) no. 1935/2004.

For more information visit: www.gemu-group.com



The GEMÜ 652 pulsation damper.

Intra-group collaboration delivers the solution

When sourcing instrumentation to supply a complete solution to meet a client's requirements, sometimes the optimum response comes from collaboration between companies within the same group. Martens and Val. Co, both members of the GHM Messtechnik Group of companies, do this with their temperature measurement transducers and temperature probes.

Jan Grobler, Managing Director of GHM Messtechnik South Africa said, "The MU125 Temperature Measuring Transducer from Martens can integrate the Val.Co Thermo VST Temperature Probe into its functionality. The shared technical expertise from both companies enables us at GHM to customise instrumentation to a client's specific requirements and to ensure the instrument delivers high-quality performance at a cost-effective level. The transducer and probe are suitable for use across all industries where temperature measurement is required," he said.

The Martens MU125 converts a temperature measurement value or resistance measurement value from various sensors to a current signal of 4...20 mA. The universal configurability of the measuring inputs reduces the stock requirement for various applications.

It has a universal input for PT100, PT1000, thermocouple, NTC and resistance measurement value. The zero point and limit value can be adjusted via trim potentiometers on the front. The housing width of 12.5 mm enables space saving in the switch cabinet.

Val.Co's compatible Thermo VST Temperature Probe offers temperature sensors in compact form for simple and efficient control, measurement and monitoring of temperature in industrial and OEM applications.

The Thermo VST Temperature Probe is easy to install, compact and rugged. It has a maximum operating pressure of 50 bar and, as a minimum, an IP65 protection rating. The temperature probe is available with sensors PT100, PT1000, PTC and NTC.

"The intra-group collaboration on interconnecting technologies offers all the advantages that would be expected from a single source of supply in terms of technical support and servicing. The GHM Group of companies is well known for its Centres of Excellence and technical innovation, and it makes sense for customers to benefit from the companies' technical collaboration, delivered to the German standard of high-quality instrumentation associated with our group of companies" Grobler said.

**For more information contact Messtechnik SA.
Tel: +27 (0)11 902 0158
Email: info@ghm-sa.co.za**



The Val.Co Thermo VST Temperature Probe can be integrated into the MU125 Temperature Measuring Transducer from Martens to deliver an optimum measurement solution.

Managing balance in utility power systems

A small utility in Tennessee in the USA installed a complete automated power factor balancing system without complex supervisory control and data acquisition. NovaTech Automation outlines how the system works.

For the power generation industry, maintaining power system balance as closely as possible to the ideal power factor (PF) of 1.000 by using correction capacitors and other technology is critical. Power factor is a measure of how effectively electricity is used, with a PF of 1.000 benefitting both the customer and utility, and a low or high PF indicating poor use of electrical power. A low power factor can overload generation units making them work harder to produce the same amount of power. A high power factor can cause instability to equipment on the distribution network as the voltage rises beyond normal capabilities. In contrast, improving the PF can maximise current carrying capacity, improve voltage to equipment, reduce power losses, and lower electricity bills.

“For small municipal utilities (and co-ops in the US) the challenge in maintaining proper power system balance is that they are more susceptible to large industrial loads and typically do not have complex SCADA systems to automate the process,” says Ryan McAuliffe, Sales Engineer at NovaTech Automation. “In addition,” he notes, “smaller utilities may not have enough operators to monitor the power factor manually and control it on a 24/7 basis.”

As a substation automation company NovaTech Automation has served the power transmission and distribution market for over 30 years. Among other technologies, it offers cost-effective, self-contained, automation platforms which use programming logic schemes to maintain power system balance, minimising the need for manual oversight and control.

“Today, automation platforms can maintain system balance with PF at virtually 1.000 with accuracy to three decimal places. The control system calculates whether the

power system is out of tolerance, and if so, initiates a correction using the capacitor banks to keep the power factor at 1.000,” says McAuliffe.

Automating system balance

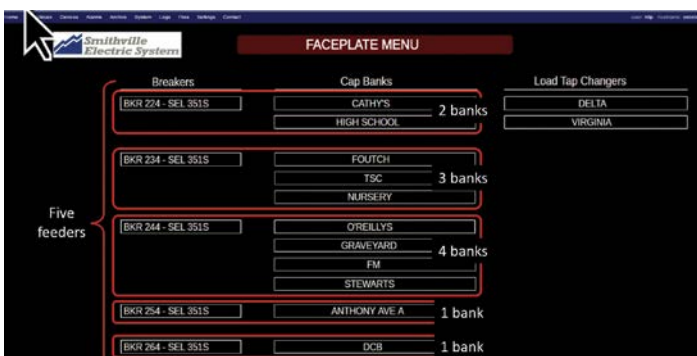
In a recent case, a small municipal power utility in Smithville, Tennessee in the US, required an automatic capacitor control logic scheme for its distribution network.

“The municipal utility has a small distribution network and is contracted (with a major Transmission Network Operator), under penalty of a fine, to keep the PF of the power system as close to 1.000 as possible. However, the system includes a big industrial customer, so the utility needed a better way to manage the PF,” says McAuliffe.

The utility has two substations with interconnecting feeders through its distribution network, with the feeder circuit breaker on either end acting as the open or closed point. The capacitors are positioned outside the substation fence at various locations on those interconnected feeders.

As a solution to better manage the PF, the utility chose to implement a complete integrated power balancing system, including capacitors, a capacitor bank controller, circuit breakers, and a controlling RTU.

All monitoring, control, visualisation, and security of the integrated utility power balancing system is provided by the OrionLX Substation Automation Platform from NovaTech. The OrionLX is a communication and automation processor that can be integrated with almost any equipment, and usually with microprocessor-based relays, meters, and other IEDs (intelligent electronic devices) as well. It can connect to a SCADA (supervisory control and data acquisition) system or can function itself as a basic SCADA system.



11 capacitor banks on five feeders are controlled automatically by the power factor balancing system.



Operators can zoom into animated emulations of individual capacitor bank controllers and force controls.

The system uses open-source web technologies and preconfigured template pages. This simplifies the building of interactive SCADA and local HMI screens enabling users to view data from connected IEDs and RTUs (remote terminal units) using standard web browsers. Engineers can open multiple browsers to see the graphical interfaces for the different substations and key remote monitoring features on different tabs, which eases network monitoring. Multiple users can be logged in simultaneously.

McAuliffe says, "With the substation automation platform, the utility did not need a dispatcher for PF balancing, only a supervisor to oversee the facility."

He says the platform's System Balance scheme helps to ensure each substation maintains a 1.000 power factor. The scheme will initialise values and then load all previous retentive values or default values if there are no retentive values. With the scheme, an overall leading power system state will turn off one or more capacitors, and an overall lagging power system state will turn on one or more capacitors, providing alerts and control.

To ensure that individual feeders are in balance and within tolerance, a second logic scheme has been proposed for Individual Feeder Balance. This will run every

five minutes after completion of the primary scheme and is needed due to the configuration of the utility's distribution network assets. Although total substation power factor can be balanced, it is possible to have two feeders out of balance in the condition of one lagging and one leading. The secondary scheme looks at individual feeder power factor tolerance and makes corrections as needed.

Together, the primary and secondary balancing schemes provide integrated VAR regulation and optimisation. They automatically switch capacitor banks in and out to maintain power factor very close to balance, summing PF on each feeder and comparing it with the metered value reported to the power provider. The automation system includes features to reduce wear and maintenance, such as never switching the same capacitor bank twice in a row. It also maintains the ability to control all capacitor banks manually and provides web-based HMI for monitoring and control of breakers and IEDs in substations. □

NovaTech Automation is represented in South Africa through ACTOM.

For more information visit: www.novatechautomation.com

TRANSFORMERS, SUBSTATIONS + CABLES : PRODUCTS + SERVICES

Safe dry-type transformers for outdoor applications

Dry-type transformers traditionally have been used indoors because of their intrinsic safety. However, with purpose-designed IP-rated enclosures they can also be used in demanding outdoor applications where there are high levels of dust and moisture. Trafo Power Solutions can design enclosures that, for example, keep out fine coal dust and ensure the transformer is effectively cooled.

"The absence of oil in dry-type transformers makes them safe and suitable for many indoor applications," says David Claassen, Managing Director of Trafo Power Solutions. "However, we are installing them increasingly in demanding outdoor environments due to their safety, reliability and low maintenance cost."

Although dry-type transformers are air-cooled, Claassen explains that the enclosures are carefully designed to facilitate adequate cooling. The temperature rise of each transformer needs to be considered in the enclosure design, together with the available footprint on the customer's site – so that the dimensions of the enclosure are suitable.

"Transformers must of course be protected from water, as well as from dust which can inhibit heat losses and potentially lead to short circuits," he says. "Our IP-rated designs ensure we meet the demands of the outdoor conditions on a given site and the cooling needs of the transformer so that it operates optimally and safely."

Ingress protection or IP rating is a ranking of the level of protection against ingress of dust and moisture that an enclosure can provide. In an IP rating of 65, for ex-

ample, the first digit refers to the level of solid particles being excluded – and the second digit refers to the moisture level. Trafo Power Solutions regularly designs transformer enclosures for IP ratings as high as IP65 or IP66.

"This means we can provide a level 6 protection against dust, which is essentially dust tight," he says. "The level 5 or 6 moisture protection confirms that the enclosure will protect the transformer against jets of water and water from heavy seas."

Claassen notes that most enclosures are designed to disperse heat by the natural flow of air. However, he says, there are various levels of temperature rise associated with a transformer's specific insulation class, so other technologies can also be applied. Certain applications will require a forced air system, operating in a closed loop to ensure sufficient insulation from outside conditions.

"If more cooling is needed, there are also technologies which use water as a medium to remove heat from an enclosure effectively," he adds. "And we can address other challenges too, such as the risk of condensation where outdoor temperatures are very cold."

Trafo Power Solutions collaborates closely with its Italy-based technology partner, TMC Transformers, to design the enclosure at the same time as the transformer – in order to deliver optimal results for the customer.

For more information visit: www.trafo.co.za



Local transformer specialist Trafo Power Solutions can design and supply dry-type transformers in enclosures with an IP65 rating.

Locally manufactured electrical equipment for BESS projects

Last year (2022) Eskom launched the first phase of its two-phase battery energy storage system (BESS) programme with its appointment of two international companies to oversee the design, execution and management of the programme.

Moving forward, the companies, Hyosung Heavy Industries of South Korea and Pinggao Group of China, appointed local engineering, procurement and construction (EPC) contractors to execute the BESS projects for the initial phase, which Eskom characterises as the 'proof of concept' phase.

This was followed by the EPC contractors awarding contracts to local manufacturers and service providers to provide the equipment and services required for the projects.

For the BESS programme the government has lifted many of the restrictive local content requirements that standardly apply to state-driven capital projects – as they do, for example, in the national Renewable Energy Independent Power Producer Procurement Programme.

Steve Jordaan, Divisional CEO of ACTOM Power Transformers, noted: "The relaxation of the local content requirements opens the door to suppliers from other parts of the world to participate in the BESS projects, increasing the level of competition that local suppliers have to face. As a local manufacturer, we understand that we cannot rely on protectionism and need to compete on a global platform and we have structured our manufacturing operations and product offerings accordingly.

"The initial BESS projects have unusually short timelines to completion of works," Jordaan added, "and this was to the advantage of local suppliers already in good standing with Eskom and with already approved products; they were saved from the time-consuming design and approval processes which many overseas suppliers would be obliged to go through. The developers, EPC contractors and in turn, the client, have the added benefit of local support for the product over the life of the project," he said.

These advantages apply to all the ACTOM Transmission & Distribution divisions that have been awarded contracts to manufacture and supply electrical equipment for the BESS projects: Power Transformers, MV Switchgear, High Voltage Equipment and Distribution Transformers.



An ACTOM Power Transformers 40 MVA Class 1 power distribution transformer in a substation.

Power transformers

In early September 2022, Power Transformers was awarded a contract for the manufacture and supply of three 40 MVA power transformers for the 132 kV/22 kV collector substation currently under construction for the 80 MW Skaapvlei project in the Western Cape – the biggest of the BESS projects being undertaken by Pinggao in the current phase. The EPC contractor for Skaapvlei is Midrand-based Proconics.

Jordaan noted, "The transformers for Skaapvlei are repeat designs of units we've previously produced for Eskom. This means we have not had to design and obtain design signoffs on them, helping significantly in enabling us to manufacture and supply them within the exceptionally short contract period of only seven months."

MV switchgear

The MV Switchgear division was awarded contracts in June and July of last year for the manufacture and supply of medium voltage primary switchgear and ring main units for the collector substations of three BESS projects being developed under Hyosung's overall control. These are the 40 MW Pongola and 8 MW Elandskop projects in KwaZulu-Natal and the 20 MW Hex project in the Western Cape. The EPC contractor for Pongola and Elandskop is Roodepoort-based Tractionel Enterprise, and Besamandla of Cape Town is the EPC contractor for Hex.

"The existing 11 kV Hex distribution substation's switchboard, which consists of MV Switchgear's SBV4E gear, is being extended to serve as the collector substation for the

Continued on page 27



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Continued from page 26

Hex project, for which we are contracted to supply and install four more SBV4E indoor panels," says Rhett Kelly, Design & Development Manager for the division.

The primary switchgear to be supplied for the 22 kV Pongola collector substation comprises nine panels of GMAe gas-insulated fixed pattern indoor switchgear from Schneider Electric, with which ACTOM has a long-standing local, value added reseller agreement. For the 11 kV Elandskop collector substation the division will supply a four-panel board of its premier brand AMV12 air-insulated withdrawable pattern indoor switchgear.

MV Switchgear's gas-insulated RMV ring main units will be deployed in all three of these BESS projects. Six 11 kV units will be supplied for Hex, three 11 kV units for Elandskop and twelve 22 kV units for Pongola.

Kelly says, "For all three projects we are required to provide custom-designed internal arc classified enclosures to house the various combinations of extensible and non-extensible RMV ring main units, each with a separate low voltage auxiliary compartment to house the protection relay and supervisory control and data acquisition (SCADA) equipment. All the various switchgear products have been through strict Eskom evaluation processes, including desktop, factory and sample evaluations," he adds.

High voltage equipment

The High Voltage Equipment division has been awarded contracts for the supply of various substation equipment for Hyosung's Pongola, Elandskop and Hex projects as well as Pinggao's 80 MW Skaapvlei and 9.5 MW Paleisheuvel projects in the Western Cape, with Proconics being the EPC contractor for both. The equipment to be supplied by the division for these five projects comprises disconnectors, voltage and current transformers, circuit breakers and surge arresters ranging from 6.6 kV to 132 kV.

Distribution transformers

ACTOM Distribution Transformers was contracted in mid-2022 by Besamandla, the EPC for the Hex project in the Western Cape, to supply 11 kV 360 A 400 V NECRTs for the project's collector substation. These units are scheduled for delivery in March 2023.

NECRTs, which combine neutral electromagnetic couplers with neutral earthing resistors and an auxiliary transformer in one unit, are designed to act as shock absorbers when earthing power transformers with Delta connected windings. They limit the earth fault current under abnormal conditions. The particular units for the Hex collector substation are designed to limit the earth fault current to 300 A.

For more information visit: www.actom.co.za



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Energy management in mining

Ahead of the Investing in African Mining Indaba (Mining Indaba) which took place in early February 2023 in Cape Town, Malvin Naicker, Managing Director, Hitachi Energy, Sub-Saharan Africa, noted that the event's theme of 'Climate-Smart Mining' reflects the global shift to renewable energy to deliver on the promise of a carbon-neutral future. "To limit the impacts of global climate change, we need to move away from fossil fuels and look to renewable sources of energy – solar, wind energy and hydropower – to convert into electricity. Electricity will become central to the entire energy system," Naicker said.

In South Africa, mines, like all other business and industry sectors, are grappling with energy security due to unreliable utility generation. Hence the industry is moving ahead with plans to replace conventional generation with renewable sources under their control that may also be remote and wheeled to different sites through the grid. Hitachi Energy offers long-established expertise in managing electrical energy and a range of energy management solutions for mining and other industries.

Naicker highlights the opportunity that the new era of 'smart energy' offers mines to migrate to an integrated electricity mix and presents some of the energy



Modular mobile substations provide a rapid-response solution for major grid disruptions.

management solutions that Hitachi Energy offers to support them in this transition.

As most mines are in isolated locations, on-site energy management is critical to maintaining power and productivity. The first step away from fossil fuels may be to a hybrid system with which mines rely less on diesel and more on renewable sources for power generation. From a hybrid model, mines can become self-sufficient, transitioning to grid-connected microgrids for localised power generation.

Energy management then becomes particularly important as less grid-provided power is used. Effective energy management and optimisation to enhance reliability and resilience in on-site power supply can be achieved in several ways, but mine operators that establish their own grids are much better positioned to reap the benefits of system flexibility that affords the greatest potential to reduce CO₂ emissions.

To overcome the problems associated with long distance transmission and integration of renewables in off-grid locations, mining companies are looking to assimilate technologies that ensure power reliability and efficiency. Usually, they need a solution designed for both grid-connected and off-grid applications, complying with grid codes and standards, and at the same time reducing operating costs.

Larger mining operations that rely on a mix of energy sources – including diesel, batteries and renewable energy – need a modern network management or SCADA system that enables them to integrate increasing data flows to manage and optimise operations.

Hitachi Energy offers a single family of products and solutions providing benefits at every point of the mining value chain.

MicroSCADA X

This system provides complete functionality for real-time monitoring and control of primary and secondary equipment in transmission and distribution substations. Processes can be controlled, field crews managed and customers gain a high level of service with a single system.

MicroSCADA X is designed for substation automation and power network management applications. It can be scaled from a compact single computer communication gateway for monitoring applications in substations to hierarchical and redundant network control systems, managing tens to several hundreds of thousands of data points.

Continued on page 29

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Continued from page 28

Grid edge solutions

For customers looking to achieve energy autonomy, to unlock new economic opportunities or to manage renewables and distributed energy resources, Hitachi Energy can support them through the transition.

Part of its growing digital ecosystem is the e-mesh™ portfolio of solutions which combines advanced analytics, energy management software and hardware systems with battery energy storage.

Grid-eXpand™ is a range of modular, prefabricated grid connection solutions that make it faster and simpler to expand power grid capacity efficiently and accelerate the transition to a more sustainable energy system. The Grid-eXpand™ solutions are engineered, assembled and factory-tested by Hitachi Energy before delivery, ready for speedy and easy energisation on site, reducing site-based construction risks. The solutions can be tailored to meet specific needs and grid code requirements. They are scalable to allow easy upgrade or expansion and are replicable to enable fleet harmonisation and to reduce complexity in the installed base.

Site installation can be up to 40% faster, the footprint up to 60% smaller and civil works up to 70% lower in costs than for conventionally built grid connections, which require extensive construction work and equipment assembly on site.

Containerised and mobile substations

Containerised mobile substations are sheltered and therefore ideal for applications in challenging environments, including areas with high pollution, high humidity, extreme temperatures or exposed to sandstorms.

Mobile substations are complete plug-and-play solutions comprising trailer- or skid-mounted modules for fast and easy transportation and energisation. They provide a rapid-response solution for major grid disruptions, backup supply, grid expansion and other needs.

Surge arresters

Surge arresters are an essential component in ensuring the stability of the electricity network as they provide primary protection against atmospheric and switching overvoltages.

Hitachi Energy has more than 75 years' experience in designing and manufacturing surge arresters. It offers a range of products for low, medium and high voltage applications, comprising solutions for ac and dc systems up to 1 100 kV.

Together with its customers and partners, Hitachi Energy is committed to accelerating the energy transition towards a carbon-neutral energy system.

For more information visit: www.hitachienergy.com



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SA manufactured cable glands for NASA's Artemis ML2

50 years ago, on 14 December 1972, man last walked on the surface of the moon and NASA's Apollo lunar space programme then drew to an end.

In the same year, CCG was founded in South Africa and first started manufacturing Captive Component Glands.

NASA has committed to returning to the moon by 2025 as part of its Artemis space programme, which is the first phase of its plans to send humankind to the moon and on to Mars.

The programme requires a massive investment in new rocket and spacecraft technology as well as the Ground Launch Control Systems – GLCS – and the Mobile Launcher known as the ML2.

ML2 is the primary interface between the GLCS and the Space Launch System – SLS – rocket and the Orion spacecraft. It serves as the platform for all SLS and Orion integrated stacking operations, as well as structurally supporting the stack during prelaunch preparations, its roll out onto the launch pad and during the launch procedure.

ML2 and all its related mission critical equipment is designed to stabilise the rocket and spacecraft, which weighs about 2 700 tons once loaded with liquid hydrogen (H_{2(l)}) and liquid oxygen (LOx) and must also withstand the severe launch blast environment during lift off.

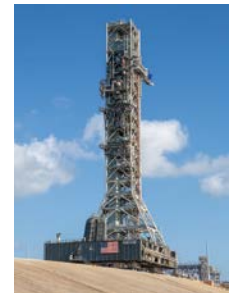
Multiple umbilicals on the swing arms on the ML2 tower will provide the critical power, data, remote monitoring and control, propellants, fluids, gases, sound suppression, imagery, and communications necessary for launch.

The launch team, sitting in the Launch Control Centre's Firing Room 1, will send remote commands to the SLS rocket and the Orion spacecraft via the ML2 tower umbilicals.

Bechtel Corporation is the primary contractor building the tower, a structure some 110 m tall and weighing about 5 200 tons. NASA's Exploration Ground Systems is overseeing the build to support the first launch of a Block 1B SLS rocket, scheduled for Artemis IV. The structural design of the ML2 will incorporate many lessons learnt, and modifications made, from ML1, which was used to launch Artemis 1 on 16 November 2022.



CCG cable glands have been specified for installation on electrical and electronics cabinets that will support the launch control subsystem for the ML2 tower.



Equipment used on such a prestigious space project has to perform to the highest engineering standards.

Based on a proven technical design, Bechtel Engineering and Sidus Space selected CCG cable glands for installation on unique electrical and electronics cabinets that will support the launch control subsystem and ground special power subsystems. To ensure mission critical power and data cables are terminated and perform under the most arduous conditions experienced during launch, independent performance testing for extreme high and low temperatures, pressure testing to the equivalent of 85 atmospheres, high pull-out loads and vibration resistance tests to North American and various other international certification standards were considered essential.

In the 50th anniversary year of CCG's founding and of NASA's last lunar landing, CCG is honoured to be involved in a small part of one of humankind's greatest technological and exploration challenges of sending people once again to the moon and future manned missions from the moon on to Mars.

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Is South Africa ready for the future of mobility?

Mpho Dipela, Chairman and shareholder of Legacy Motor Group

The global drive to reduce emissions coupled with significant advances in technology have accelerated the electrification of transport globally.

According to the International Energy Agency, just 120 000 electric vehicles (EVs) were sold worldwide in 2012, compared to the new record of 6.6 million sales achieved in 2021 – with electric cars representing nearly one in ten of all car sales globally. For 2022, statistics indicate that electric car sales could reach new highs again, with two million sold in the first quarter of the year alone – a 75% increase from the same period in 2021.

Successes in the development of new battery-powered electric vehicles and plug-in hybrid electric vehicles have seen European policymakers declare that the region will implement a ban on the sales of petrol and diesel cars by 2035.

For South Africa, this announcement is particularly significant given that the European Union represents nearly two-thirds of the local automotive sector's export market and in 2021 accounted for R105 billion in sales. The high cost of remaining fixated on internal combustion engine vehicles would therefore be disastrous for the automotive industry and for the country, considering the importance of the industry as a key economic driver and job creator.

This underscores the need for an urgent shift in our own automotive manufacturing production, away from internal combustion to battery-powered engines. But as the world switches to EVs, the question inevitably arises: is South Africa ready to embrace the future of electric mobility?

Three roadblocks on the journey to electrification

The first barrier inhibiting uptake is Eskom's power constraints, which now manifest in continuous days of loadshedding at higher or lower stages.

The strained power grid and continuing loadshedding are not only an obstacle to individual EV users. The greater risk for the nation is that increased adoption of EVs will only add to demands on our energy infrastructure and increase the risk of grid overload. Additionally, the national utility's reliance on coal-powered stations and fossil fuels such as diesel will continue to counteract the effectiveness of EVs in cutting emissions.

To overcome these obstacles, we first need to get the basics right in terms of securing reliable energy supply and decarbonising the grid – issues that we have been trying to solve for nearly 15 years. This said, developments in battery technology are enabling faster charging times and longer ranges, substantially reducing the overall energy demands of electric vehicles.

The next major barrier is rolling out the necessary public charging infrastructure, given the many demands already extant on government's limited infrastructure budget. Few South Africans would be able to afford the cost of installing a home-charging station, which is also usually only possible for those with garages or assigned parking spots on their properties.

As a result, many people would be reliant on public charging facilities, which are not yet widespread and are still unevenly

distributed. A 2022 EY study found that concerns regarding a lack of charging stations are the top inhibitor preventing consumers from purchasing EVs, globally.

To solve the problem, innovators around the world are introducing new solutions such as wireless charging technology that is able to recharge EVs while they are moving using special charging strips placed on electric road systems. The roads, in turn, are powered by national grids or solar fencing.

Although this offers an appealing response to the longstanding challenge of providing adequate charging capabilities and range in EVs, it seems like a towering goal for a country with a vast road network spanning some 750 811 kilometres, and in which, reportedly, nearly a third of paved roads are ranked as being in a poor to very poor condition. The obstacles are not insurmountable, but solutions would require strong political will, and the willingness to consider options such as public-private partnerships.

Thirdly, there is the barrier of prohibitively high upfront purchase costs, preventing most households and businesses from making the switch to electric vehicles – especially against a backdrop of soaring inflation and rising interest rates which are increasing the costs of borrowing.

Although EVs offer the benefit of lower maintenance and running costs, the cost of acquiring an EV is currently more expensive than that for their petrol or diesel equivalents. For fleet owners involved in high-mileage services such as taxi operators and delivery companies, this is particularly concerning given potential constraints on their service capacity.

Again, developments in battery technology are gradually reducing the expense of EVs and increasing their range, but uptake may be slow without the addition of other financial incentives or subsidies.

At the same time, the growth of Mobility-as-a-Service (MaaS) models among younger generations, particularly in Europe, is disrupting the automotive sector by reducing the need for car ownership, enabling people, in effect, to rent vehicles on demand via a mobile application. However, as with ride-sharing applications like Uber or Bolt, this will likely represent a viable solution only in urban rather than rural areas, and for a country like South Africa, that risks aggravating its geographic inequality.

Whether we are ready or not, the future of mobility is arriving, complete with its own set of unique challenges and opportunities. So, as we look ahead to 2023 and beyond, government and the private sector will need to work closely together to rise to these challenges, or risk inflicting irreparable harm on our economy and society.

For more information visit: www.lmg.co.za



Mpho Dipela, Chairman, Legacy Motor Group.

Mining companies can find opportunity in changing ESG trends

Garyn Rapson, Partner, Nomsa Mbere, Partner, Jaqui Pinto, Senior Associate, Paula-Ann Novotny, Senior Associate, and Dalit Anstey, Knowledge Lawyer, at Webber Wentzel



*Garyn Rapson, Partner,
Webber Wentzel.*

Mining is critical to development, but development needs to be sustainable. The mining industry is susceptible to global changes in capital allocation and regulatory reform. Mining companies that can demonstrate responsible and sustainable mining practices can set themselves up to take advantage of ESG (environmental, social and governance) and sustainable finance trends and requirements.

The increasing prominence of ESG concerns presents an opportunity for mining companies to be proactive rather than reactive and to engage with ESG themes and issues. Here we identify some of the key ESG themes that present mining companies with new business opportunities.

The Just Energy Transition

The 'Just Energy Transition' points to the phasing out of coal and other fossil-fuel linked minerals in the energy generation sector, globally. It is a framework that seeks to ensure equitable shifts to a low-carbon economy and society through social inclusion and the eradication of poverty. It aims to protect the environment as well as livelihoods, to ensure no-one is left behind. South Africa's Just Transition Framework document provides that between 2040 and 2050, coal will largely be phased out and people in the communities that until now have been involved in the coal sector will engage in other livelihoods. This is bolstered by and must be understood against the backdrop of the country's obligations in terms of the Paris Agreement, which has seen governments, including the South African government, enacting legislation and regulations restricting fossil fuel use and exposure (both direct and indirect).

South Africa has historically relied on its abundance of coal reserves to fuel baseload power and the economy. There are several pressure points for mining companies with respect to the global energy transition, including funding pressures from some financial institutions and lenders, and shareholder activism regarding fossil fuel finance. Stock exchanges around the world are expanding their disclosure obligations to include ESG factors.

Mining companies are looking to diversify portfolios to include the 'minerals of the future'. With the transition to a lower carbon economy, particularly in respect of key 'at risk' value chains such as the coal sector, come significant opportunities in the form of new mineral prospects and new industries (green hydrogen, electric vehicles). Exploration activities and acquisitions are likely to see growth. Partnerships with companies inside and outside the mining sector will be important.

Decarbonising mining operations

With the aim of reaching net zero, many of the largest metals and mining companies have set target levels

to reduce greenhouse gas emissions or are already claiming carbon neutrality. This is driven by the Paris Agreement, the Intergovernmental Panel on Climate Change, shareholder and stakeholder expectations, and financial institutions and stock exchanges. Investors' capital allocation decisions increasingly view climate change as a material financial risk.

With the focus on decarbonisation, many mining companies are repurposing. There is a risk that 'carbon-washing' re-branding is underpinned only by their current limited action on climate impacts and narrow net-zero focus. We are seeing increasing claims being brought for alleged 'greenwashing', which essentially means making misleading statements regarding one's green credentials.

Recent amendments to electricity legislation are paving the way for greater private sector involvement in South Africa's electricity industry. So far, some mines have taken up the opportunity to establish renewable energy facilities at their sites to power the mines and ancillary operations, reducing their respective carbon footprints. There are also opportunities for mines potentially to feed excess power generated on site back to the grid. Other initiatives aimed at building resilience include energy efficiency projects, waste recycling and water treatment.

The Fourth Industrial Revolution

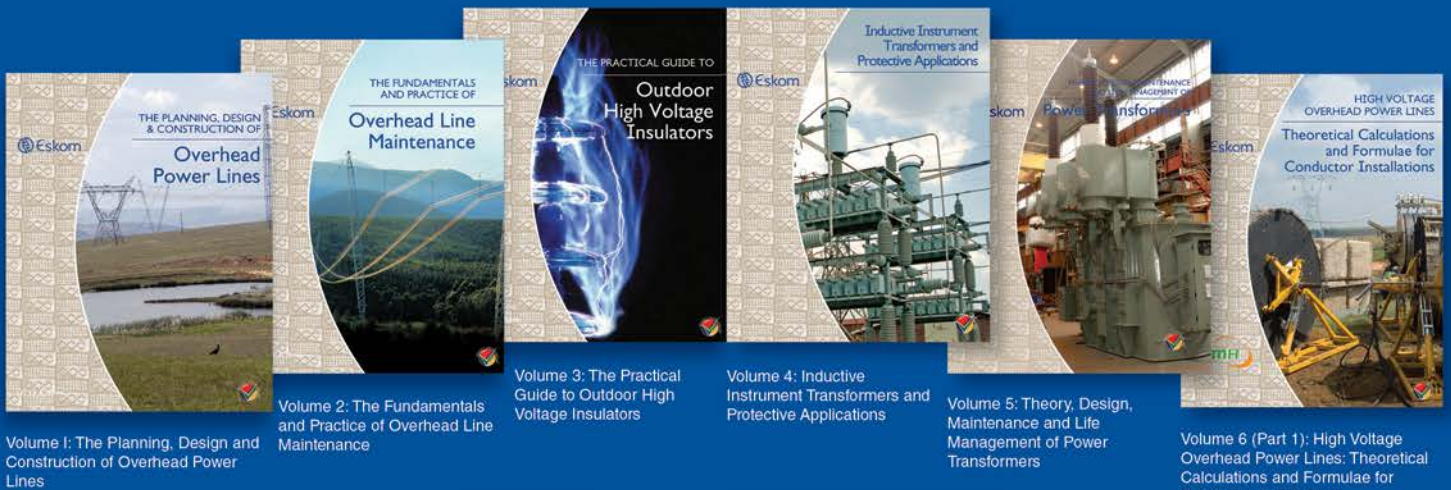
The Fourth Industrial Revolution is seeing the ongoing transformation of traditional industries such as mining with the increasing use of smart technologies. Automation, digitalisation, analytics, and artificial intelligence are changing the way mines operate.

Automation and mechanisation in the mining sector can have positive net effects for the adverse environmental impacts of mining operations (for example, technologies that eliminate the need for physical prospecting or exploration activities obviate such impacts). Technology can also assist in areas such as mine health and safety and reducing accidents and fatalities. The benefits of this are already evident.

However, an increasing reliance on automation and mechanisation means workers will need to be reskilled and redeployed to higher-value, technology-driven jobs – and that will require proper planning, funding and the engagement of all stakeholders, to ensure the transition in South Africa is just for the specific context of the country.

For more information visit: www.webberwentzel.com

The Eskom Power Series was conceived in response to the continuing worldwide loss of critical technical skills and experience. The aim of the series is to promote international best practice, including experience accrued by Eskom over the years, as a guide and legacy and to serve as a source of reliable, reputable and highly technical information.



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Volume 2: The Fundamentals and Practice of Overhead Line Maintenance

Volume 3: The Practical Guide to Outdoor High Voltage Insulators

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Volume 6 (Part 2): High Voltage Overhead Power Lines: Theoretical Calculations and Formulae for Transmission Line Towers

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Volume 8: Power Quality in Electrical Power Systems: A Holistic Approach

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Volume 10: Thermodynamics for Students and Practising Engineers



Volume 11: Thermal Sciences for Engineers

Volume 12: Basic Engineering Toolbox

Volume 13: Applied System Dynamics with South African Case Studies



Volume 1: Procurement Management Key Concepts and Practices

Based on the success of the Eskom Power Series and the Eskom Leadership & Management Series, the Professional Development Series was created. It aims at developing various professions within South Africa so that large state-owned enterprises and the private sector can grow and facilitate job creation in the country. Unlike the Power Series, both the Eskom Leadership & Management Series and the Professional Development Series have a broad readership, including those residing in the private sector, State Owned Companies (SOCs) and academic institutions.

The Eskom Leadership & Management Series was introduced by Eskom at the request of readers and stakeholders of the Power Series who felt that the series should be expanded to include non-technical topics. These topics are often not well understood by technical practitioners and can pose a risk to the sustainability of their businesses. To date, the Power Series team, with assistance from experts in the various fields, has produced two volumes.

Volume 1: Mentorship and Coaching

Volume 2: Winning with People ... Insights for Leaders and Organisations

Eskom has also published: GENERATION, TRANSMISSION AND DISTRIBUTION: A large Southern African utility. This is an introduction to the technology that has developed, over time, in response to growing demand in the electricity utility industry in South Africa. It provides a 'soft-landing' for those who need, or want, to engage with the technology in a large electricity utility.



Measuring flow with ultrasound

The SU Puresonic ultrasonic sensor

The SU Puresonic detects flow rates of up to 1000 l/min with high precision. Thanks to ultrasound technology, this also applies to ultra-pure water with low conductivity as produced in reverse osmosis plants. The signal strength, which can be used as a quality and maintenance indicator, is also continuously detected.

The measuring pipe of the SU Puresonic is made of stainless steel and is free of measuring elements, seals and moving parts. This means that faults due to damage, leaks or blockages are excluded from the outset, as are design-related pressure drops.

This new product and more will be shown at the upcoming Africa Automation Technology Fair in May 2023 at Gallagher Convention Centre in Midrand, Johannesburg. Register FOC, click on QR code.



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