Locally made GRP boxes are rapidly displacing imported steel boxes all over SA.

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Ultra-compact: the versatile AX8000 multi-axis servo system.

EtherCAT

Safe:
17 drive-integrated TwinSAFE functions

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- Free combination of modules as required:
  - Power supply module, 20 A, 40 A
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- Current controller cycle time of 62.5 µs (down to 16 µs)
- Position controller cycle time of 62.5 µs
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Highly scalable:
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The modular AX8000 system complements the highly scalable Beckhoff Drive Technology portfolio: In addition to the TwinCAT software motion control solutions and scalable motor series, a wide range of drive controllers is available, from compact drive technology in I/O terminal format to powerful AX5000 Servo Drives. With freely combinable drive modules, the AX8000 multi-axis servo system can be scaled to demand. It delivers high-performance drive technology and enables optimised space utilisation in any control cabinet.

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New Automation Technology **BECKHOFF**

energy + information in industry

Allbro's Allbrox enclosures are made using SMC, a glass reinforced polyester well known for its exceptional durability. *(Read more on page 15).*

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Meeting the skills needs of the economy

Recently I had the absolute pleasure of addressing the AGM of the Electrical Engineering and Allied Industries Association (EEAIA) in Johannesburg. It is a member association of the Steel and Engineering Industries Federation of South Africa (SEIFSA) and is far and away the largest and most representative industry association in the electrical manufacturing and supply sector in South Africa, with a membership of over 160 companies.

The association asked me to say a few words around the issue of engineering education, and it was a good time, as a number of innovations have emerged in engineering education recently.

I shared the experience in undergraduate engineering programmes at the University of the Witwatersrand, but I am aware of other universities and universities of technology where these models are currently also rolling out.

All these initiatives are part of a plan that has been developing for the best part of the past decade. The plan is to address the rapidly changing needs of the profession, as well as to allow students increasing flexibility at the undergraduate level.

At the outset, let me, of course, point out that the Engineering Council is very happy with this!

So, although part of a bigger grand plan, some of the most recent developments have been in the planning phase the longest. I will mention only two here.

First of all we semesterised everything: no more would there be year-long courses – the courses would all be broken into self-contained parts – part 1(a) and part 1(b), for instance. That has introduced the flexibility to allow a student who has failed a module, to repeat that module immediately in the next semester.

However, as the facilities and staff at our tertiary institutions are fully committed, it was decided that this could only be realistically done if the second session of the module was presented at night class. So we met with our colleagues from Wits Plus – the part time studies unit of the university – that has thousands of students, especially in commerce and humanities, attending classes at night.

We introduced night classes in engineering for every first and second year module. Clearly, night classes did not clash with any day classes (which we now refer to as mainstream classes), so students could attend their lectures and labs in the evening.

By now we have the full first and second year in engineering courses up and running at night class. And the impact on throughput (students now meeting the requirements to proceed to the next year of study) has been spectacular. Furthermore, it is not only students from Wits who attend these night class modules; other universities have now allowed their students to select these courses to gain credits for modules they failed at their institutions.

As a further option, we allowed students to register exclusively on the part-time programme. After all – it existed! In 2018 we had 20 course-registrations from students who met our minimum entry requirements but were not given offers to the mainstream. The deal we made with the students was that, providing they passed everything at night class, we would find a way to accommodate them in the mainstream the following year.

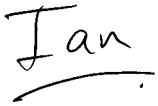
This year, 2019, we have 120 course-registrations from students who have opted for the part-time option exclusively. That is over and above those using night class to repeat failed modules. These 120 students are spread across the five engineering schools, with Electrical and Mechanical Engineering being the most popular.

The second major intervention was based on our own experience with internal 3+2 programmes – and how that has grown to include partner institutions. For instance, internally, students can complete a Bachelor of Engineering Science (BEngSc) in Biomedical Engineering, or Digital Art – and transfer into the third year of an engineering programme. The same can be done with certain BSc programmes – such as the BSc in Chemistry.

Now we have a 3+2 programme running in partnership with the University of the Free State (UFS), guided by Louis Le Grange. On completion of the degree in Bloemfontein, the student can transfer into the third year of an engineering programme at Wits. To date we have welcomed three cohorts from the UFS, and they have flourished in the engineering programme.

As a result of this partnership, UFS now has a wonderfully equipped School of Engineering Sciences – a precursor, we hope, to a fully-fledged School of Engineering on its Bloemfontein campus.

These, to me, are innovations that need to be rolled out rapidly, and nationally, to assist us in meeting the skills needs of this economy.



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

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Insights on **digital transformation** in the mining industry

AT A GLANCE

- There is a new mindset in the southern African mining industry. A key realisation is that change is inevitable.
- The mining industry has been surpassed in the technology stakes by other industries. It has the opportunity to cherry-pick what will work best for it in terms of digital innovation.
- It is important to dispel the notion that the digital transformation journey is complicated and costly. There is tangible low-hanging fruit that can deliver immediate results.

At the 5th annual Natural Resources Forum in Johannesburg, leading mining companies Debswana and De Beers gave key presentations about how they are implementing digital transformation in their operations. The forum was hosted in September by French software leader Dassault Systèmes.

Accessing data from more than one kilometre underground is a particular challenge for the Debswana Diamond Company of Botswana. Brian Chimoba, Principal - Business Process Integration at the company, said the diamond-mining giant is leveraging the 3DEXPERIENCE® platform, Dassault Systèmes's flagship digital platform, to optimise its geoscience, mining and production operations.

De Beers was represented at the forum by Giel Marais, Senior Automation and Information Manager, and Freddie Breed, Senior Mining Engineer. They gave a joint presentation on how the Venetia Underground Project is aiming to develop an integrated management solution for the entire operation.

Both companies represent a new mindset in the southern African mining industry, according to David Osborn, Managing Director of Dassault Systèmes in South Africa. While the local mining industry remains a tough environment, due to a combination of political, economic and social factors, a key realisation is that change is inevitable.

"Now that we have the challenges mapped out, mining companies are acknowledging that if they continue with business as normal, results will not improve. The industry has to take a different approach. Due to the fact that it has been stagnant for so long, it has been surpassed in the technology stakes by other industries – such as manufacturing, automotive, aerospace, and oil and gas. The mining industry has the opportunity to cherry-pick what will work best for it in terms of digital innovation," Osborn said.

Mining companies like Debswana and De Beers have recognised the significant value inherent in such an approach. "The key is collaboration. We might not have all the solutions at hand, but together with our partners, we can solve customers' problems. Our main goal is to help establish a future-proof mining industry based on digital innovation," Osborn said.

Raoul Jacquand, CEO of the GEOVIA brand from Dassault Systèmes, emphasised that the positive experience of mining companies like De Beers and Debswana was creating a snowball effect in the local mining industry. "Hearing what our clients have to say about their experiences in implementing our solutions, and how they are collaborating with us, is so much more powerful than our voice alone."

This is why Dassault Systèmes established the Natural Resources Forum as an interface with the local mining industry.

"We also realised that, in the conventional way of doing things, the mining industry was jumping too quickly to the 'how'. Companies were more interested in the functionality and features required to solve specific technical problems, for example, rather than stepping back and taking time to revisit the 'why?' and the 'what?' – actually to serve a business purpose.

"The main aim of the Natural Resources Forum is therefore to offer clients an opportunity to understand our role as a business partner interested in the overall outcome. Of course, resolving the technical issues is still paramount, but we can achieve so much more through a holistic approach.

"This has been a mindset change as much for us as for our clients, and it is an evolutionary process documented by the Natural Resources Forum over the years," Jacquand noted.

A Microsoft HoloLens mixed reality smartglasses presentation – exploring a virtual mine.

The forum has also been key to showcasing the user-friendliness and flexibility of the 3DEXPERIENCE® platform, which is completely scalable according to clients' specific requirements and operations.

"The fact is that any mining company wanting to embark on the digital transformation journey can start off small. We want to dispel the notion that it is overwhelming, complicated and costly. There is tangible low-hanging fruit, like simple enterprise collaboration, that can deliver immediate results."

Jacquand highlighted that the secret to the longer term success of embracing digital transformation in the mining industry is maximising the potential of big data. "Traditionally information has been synonymous with a mining company's competitive edge, but the digital platform reveals that democratising data unlocks its value so much faster. It allows mining companies to address an entire spectrum of issues on a single level, which means that a unified solution is entirely feasible."

He also pointed out that the 3DEXPERIENCE® platform is more of an enabler than a replacement for any existing or competing systems. "It is completely scalable and it is a vehicle for innovation. It needs to be open by nature, and able to interact with existing systems. It is there to give a direction for the future and assist mining companies in orientating their business strategies. It reduces complexity and guides businesses in the right direction towards clearly-defined goals."

This is where the 3DEXPERIENCE® Twin of the Mine concept plays an important role. A holistic virtual twin of a mining site can optimise operations through simulation. Exploring different scenarios in a virtual space enables mining companies to simulate any eventuality and plan accordingly.

The virtual twin is a powerful instrument to engage all stakeholders. "What digital transformation achieves is to break down physical and organisational boundaries, which is essential for innovation. The mining industry is highly technical and this has resulted in a series of silos developing over time.

"The 3DEXPERIENCE® solution brings these vertical silos together on a lateral level to leverage change and achieve a complete mining value chain." Jacquand further emphasised that, "While automation in the mining industry has always been thought to be synonymous with job losses, different opportunities will instead be presented, and current roles transformed rather than replaced."

Dassault Systèmes, 'The 3DEXPERIENCE® Company', is a French software company headquartered in Vélizy-Villacoublay, France. It develops 3D design, 3D digital mock-up, and product lifecycle management (PLM) software and markets its software and services to support industrial processes by providing a 3D vision of the entire lifecycle of products from conception to maintenance. Dassault Systèmes has customers in the aerospace and defence industries, architecture, engineering and construction, consumer goods (distribution), FMCG (distribution), energy and processes, industrial equipment, and other sectors.

Optimal cost/benefit in partial **automation of engineering processes**

AT A GLANCE

- E4TC developed a methodology to quantify the potential for automation in typical engineering workflows for machine manufacturing.
- The path to higher efficiencies in the value chain is mapped out from standardisation through to automation at each work step.

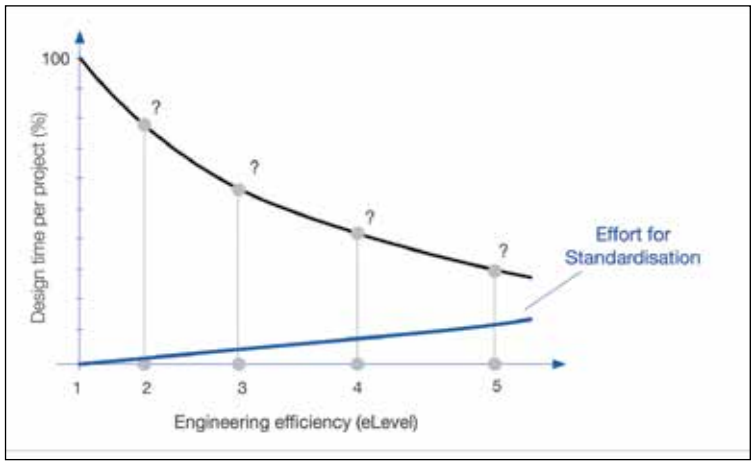
Following investigations into the strategic digitisation of design and control engineering and the technical layout of machines and plant systems, the European 4.0 Transformation Centre (E4TC) at RWTH Aachen University has published a 38-page research report titled Engineering 4.0. The report is based on an eight-month field study of German machine manufacturers, engineering offices/hardware planners, and component manufacturers.

For the first time, the methodology developed to quantify available potential in engineering and measures to be taken enabled a well-founded consideration of current engineering workflows for series production and special machinery manufacturing. Its central finding: a partial automation of engineering processes achieves an optimal cost/benefit ratio. The new Engineering 4.0 study – available exclusively from EPLAN – highlights interesting fields of action for efficiency in engineering. The path to higher efficiency in the value chain is mapped out using traditional methods, from standardisation through to automation.

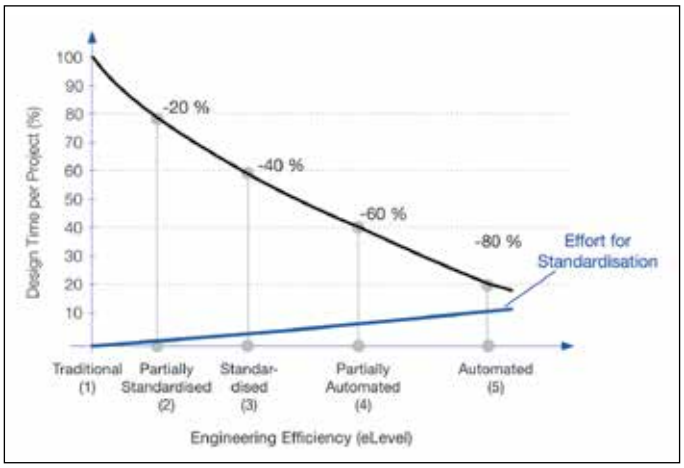
The scientists at E4TC in Aachen, Germany, initially introduced a model of the engineering workflow and created an evaluation matrix with five efficiency levels. The 'Efficiency Level' matrix contains detailed descriptions of the methodology/workflow and is accompanied by a 'Use Level' matrix, which describes and evaluates the use of CAE software as a basic prerequisite for Engineering 4.0. A total of ten process steps characteristic for engineering in machine manufacturing (series and special machinery) were examined. The engineering workflow model generated comprises the typical work steps of the ordering cycle.

Engineering workflow model

The researchers focused on the work fields of engineering, design, bills of materials,



Design time and effort for standardisation can be measured according to the level of engineering efficiency.



Results: Reference Engineering Efficiency Curve.

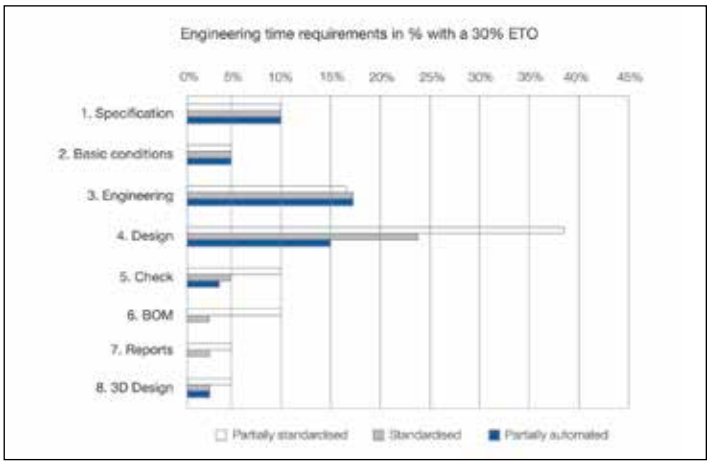
reports, control cabinet layout and devices and templates. The reasons for this are clear: "The dependencies on customers or partners in these process steps is sometimes relatively low or non-existent," says E4TC Managing Director Dr Thomas Gartzen. "Companies are completely in control in these areas to tap into potential time and cost savings through standardisation or automation projects." The path to higher efficiencies in the value chain is mapped out using traditional methods, going from standardisation through to automation. To be able to evaluate the efficiency of each work step, the study scaled the workflow methodology in five stages – where the efficiency level (eLevel) of engineering can be located.

Increasing potential

Using the collected data, the researchers determined that companies can become 20% more efficient from eLevel to eLevel. Device-oriented work methods bring about a 25% time saving for schematic creation. Users spent half as much time creating schematics with a circuit library for product functions. Introducing partial automation brings an additional 25% time saving for creating schematics and creating all reports is completely eliminated by introducing standardisation.

EPLAN provides software and service solutions in the fields of electrical, automation and mechatronic engineering. The company has developed one of the world´s leading design software solutions for machine and panel builders. EPLAN also works as a partner to streamline challenging engineering processes.

Standardised and customised interfaces to ERP and PLM/PDM systems ensure data consistency along the whole value chain. Working with EPLAN enables communication across all engineering disciplines. In small or large enterprises, customers can apply their expertise more efficiently. EPLAN works with customers and partners to advance integration and automation in engineering. Worldwide, the company supports over 55 000 customers, focusing on efficient engineering.



The typical time required for the engineering steps (1-8) in percentage terms, assuming eLevel2.

E4TC Managing Director, Dr Thomas Gartzen: "The study focused on work fields and process steps where companies are completely in control to tap into potential time and cost savings through standardisation or automation."

Software for smart cameras, vision systems and more

With ASSTech's new product offering from Wenglor, two- and three-dimensional data from smart cameras, vision systems and control units with 2D/3D profile sensors can be evaluated via a central software platform: uniVision 2.1. The standard software is used to analyse images and height profiles in industrial image processing. Users can achieve a finished vision application intuitively in a few steps and without programming knowledge. Costs and training are thus reduced.

The uniVision software is structured like an intelligent toolbox. The algorithms for image and height profiles are similar and can be used on different platforms. The measurement module runs on smart camera as well as vision systems, for example. Users have up to 25 different software modules available (measurement, threshold value, cluster, OCR, pattern matching, tracking and others) as well as 14 different templates (read 1D codes, presence check, detect pattern or colour), depending on the hardware selected. Training tutorials are accessible online via video and an assistant is available for smart cameras, to guide users through the settings step by step.

Wenglor has ensured that the software for all hardware components can be set up quickly and easily, with no programming knowledge required of the user. In order to simplify use of the software, predefined templates can be selected and used for the most common standard applications. If additional individual settings are required for a project, the full range of more than 25 software modules is available. Images, co-ordinate systems or values can be combined as required, providing newcomers and experts with maximum application freedom.

uniVision 2.1 also performs well in integrating hardware and software in existing plants and systems. Process data can be processed via standard connections such as digital IOs, or via TCP/IP and UDP. For robots from well-known manufacturers such as Yaskawa, Fanuc or Kuka, the software also offers suitable interfaces for easy integration of control units with 2D/3D profile sensors in tracked welding applications.

According to ASSTech, UniVision stands out in the market in terms of function and modular design, as no other product combines more software and hardware know-how on a single platform.

ASSTech Process Electronics + Instrumentation was established by Anastas Schnippenkötter in 1996. The company has grown to become a well-respected supplier of instrumentation and services to major manufacturing and process plants. It is the official representative of several internationally recognised manufacturers for Southern Africa. The range it represents, largely from Germany, makes up a cross-section of process control and monitoring instrumentation and sensors. ASSTech also offers consultative advice and assistance in specifying equipment to ensure its customers purchase the most suitable solutions.

For more information contact
ASSTech Process Electronics & Instrumentation.
Tel: +27 (0)11 708 9200, email: info@asstech.co.za

Wenglor's uniVision 2.1 provides a central software platform to monitor and analyse data from smart cameras, vision systems and two- and three-dimensional profile sensors.

Time-saving features in ARCA-IEC enclosures

Fibox has introduced further enhancements to the UL-listed, NEMA 4X, ARCA-IEC non-metallic polycarbonate cabinet series.

The snap-in lockable inner front door and an easy-to-mount DIN rail frame solution kit provide time-saving advantages in assembling cabinets.

The lockable door was designed to fit perfectly without needing tools or hardware. The DIN rail kit allows the user to build up the rail outside the enclosure and then slide the rail assembly into the enclosure base and connect any wiring.

The ARCA-IEC polycarbonate enclosure offers outstanding impact resistance. It is watertight and UV-resistant and will not rust, flake or bloom like steel or fibreglass.

Manufactured in Fibox's Wi-Fi friendly polycarbonate, a robust high-impact-resistant thermoplastic, the ARCA-IEC will not dent or crack but flexes and returns to its shape. The formed-in-place PUR gasket makes an airtight seal keeping components dust-free and dry. The ARCA-IEC also weighs considerably less than other cabinets and is easier to modify than cabinets made of metal or fibreglass.

These are just some of the features that make the ARCA-IEC an ideal NEMA 4X cabinet for automation controls, instrumentation and monitoring applications. The cabinets are available in vertical and horizontal orientations.

The ARCA-IEC polycarbonate enclosure has high impact resistance, is watertight and UV-resistant and designed for easy DIN rail assembly.

For more information contact Vepac Electronics. Tel: +27 (0)11 454 8053, email: sales@vepac.co.za

Leading TSN technology at SPS 2019 in Nuremberg

The CC-Link Partner Association (CLPA) will showcase its latest open network technology, CC-Link IE TSN, in action, at SPS - Smart Production Solutions 2019, scheduled to take place 26 to 28 November in Nuremberg, Germany. By combining time-sensitive networking (TSN) with gigabit bandwidth, CC-Link IE TSN has pioneered TSN adoption for open Industrial Ethernet development.

John Browett, General Manager, CLPA-Europe, says, "At the show the CLPA will demonstrate this pioneering technology in products and solutions from its key technology partners."

Browett adds that CC-Link IE TSN's technology leadership position was established at SPS IPC Drives 2018. Its launch at the 2018 fair marked it as the first open Industrial Ethernet technology to combine open gigabit Ethernet with TSN.

Visitors at SPS 2019 will see a live demonstration of a CC-Link IE TSN network environment. This will show how critical control data can be seamlessly integrated with TCP/IP traffic on gigabit Ethernet, enabled by TSN support. In this way, manufacturing industries can handle the large volumes of data that characterise Industry 4.0 applications, and bridge information technology (IT) and operational technology (OT) systems to achieve peak performance.

At the show, the CLPA will also present the comprehensive range of CC-Link IE TSN development options available. From chipsets to software stacks, these will help product developers to adopt and make the most of the new technology. End users, in turn, will be able to implement an appropriate migration path to move from current Industrial Ethernet systems to future orientated TSN-based networks.

Visitors to the show will see how a growing number of CLPA's partners have committed to offer development options for automation vendors interested in adding CC-Link IE TSN connectivity to their products. Various CLPA partners, such as Hilscher, HMS, MESCO, port and SILA, will showcase how their technologies, products and services can assist device developers and manufacturers with this process.

Browett says, "The CLPA's industry-leading role is based on our ability to address new and evolving industry needs promptly. We were the first to offer gigabit bandwidth for open Industrial Ethernet, and following that, the first to combine this bandwidth with TSN.

"We look forward to sharing the latest milestones and developments that are shaping the future of this technology. Anyone interested in learning more about how to develop CC-Link IE TSN compatible products or using the technology on the factory floor, can visit us at SPS 2019."

The CLPA is an international organisation dedicated to the technical development and promotion of the CC-Link family of open automation networks. Its key technology, CC-Link IE TSN, combines open Industrial Ethernet gigabit bandwidth with TSN, making it an ideal solution for Industry 4.0 applications. The CLPA currently has over 3 600 member companies worldwide, with more than 1 900 certified products available from over 300 manufacturers.

For more information email: john.browett@eu.cc-link.org or visit: eu.cc-link.org

The CLPA will showcase the latest developments in its open network technology, CC-Link IE TSN, in action at SPS - Smart Production Solutions 2019.

One sensing range for all metals

Versatile Kplus inductive sensors, available from ifm electronic ZA, have the same sensing range for all types of metal. This makes them suitable for the detection of aluminium, for example, where conventional sensors show a considerably reduced sensing range.

Moreover, high switching frequencies allow for the monitoring of fast-moving targets.

The sensors are compact enough to fit even where space is at a premium. They are immune to electromagnetic fields and can therefore operate reliably even next to electric brakes. The wide temperature range of -40… 85°C allows for universal use in industry and the high protection rating IP68 / 69K ensures reliability. In addition, the resistant sleeve of the stainless steel version makes this model suitable for applications that entail continuous contact with oils and coolants. The M8 Kplus sensors are now also available in all common cable versions.

For more information contact ifm electronic ZA. Tel: +27 (0)12 450 0400, email: info.za@ifm.com

Kplus inductive sensors have the same sensing range for all types of metal, including aluminium.

Information gateways enable big picture view

The business case for automation and remote monitoring and the role of IoT in this continue to grow as customers seek ways to cut costs and gain a single view of systems.

Customers looking to manage infrastructure, sensitive equipment, energy and water distribution remotely, or respond accurately to environmental threats such as fires or flooding, can do so at scale and across multiple sites with a Point of Presence Convergence gateway. When multiple devices are deployed, they can create a full view of events and help ensure the even distribution of services, such as power and water, in a multi-site environment.

This offers a solution for manufacturers, industrial sites and infrastructure operations teams, among others that need to monitor multiple and often disparate and siloed systems and applications across a specific geographic area. A series of point of presence convergence devices can be run to provide insights into multiple events. They can also be used to automate otherwise manual activities, helping a service provider meet service level agreements (SLAs), for example, and reduce costs of unnecessary callouts and delays to customers.

Inus Dreckmeyr, CEO at Netshield South Africa, says, "The devices monitor every aspect of a critical system at a granular level. Service providers looking to monitor remote high sites, branch offices and mobile applications can zoom into the environment to view who has accessed the installation, monitor cyclical events, check the power feed, the temperature, flooding and humidity. The same application can be used to monitor substations in remote areas, for example. The convergence gateways create a single view of multiple remote sites or different instances and applications on a single dashboard."

By connecting IoT sensors to monitor multiple applications that could potentially disrupt business, such as power, temperature, humidity, flooding, access control, energy consumption and security systems, the application becomes almost limitless. In warehousing environments, for example, transport companies can use the point of presence gateway together with a remote locking system when transporting goods to different destinations.

With the integrated API, database information can be pivoted between various databases and information from events from different sources can be converged – and used in a customised, holistic dashboard that brings together silo-based information into a single view. This convergence simplifies remote support by providing an overall view of systems and events.

Dreckmeyr says, "In terms of an SLA, a company can cut costs by up to 45%, considering callout costs, travel and delays. By using the remote management features built into the devices, such as remote power reset and remote network management, unnecessary support costs and downtime for the client can be avoided.

"In our experience the gateways are particularly useful for companies that have multiple instances of an application they need to track," he adds. "The power of automation that IoT sensors give us is staggering, especially when deployed at scale and when they are used to alert users to events, monitor environments and provide proactive insights and actions."

For more information contact Inus Dreckmeyr at Netshield. Tel: +27 (0)12 841 0320, email: sales@netshieldsa.com

Enabling more effective use of digital data

At SPS – Smart Production Solutions 2019, taking place from 26 to 28 November in Nuremberg, Germany, Siemens is presenting industry-specific applications and future technologies for digital transformation in the manufacturing and process industries. Under the banner: 'Digital Enterprise – Thinking industry further!' it will be showcasing products, solutions and services from its Digital Enterprise portfolio, which help customers to reduce their time-to-market and to increase productivity, flexibility and environmental efficiency.

At the show Siemens is introducing a newly developed complete system for industrial operation and monitoring. The web-based visualisation system comprises Simatic WinCC Unified visualisation software and a new generation of Simatic HMI Unified Comfort Panels. With Sinumerik One, the company is presenting a CNC system for the digital age. By seamlessly combining the virtual and real world, this system makes machine tools more productive, reduces time-to-market and increases machine performance. As part of Digital Connectivity, Siemens is also presenting new CloudConnect products that enable data from plant to be transferred quickly, easily and securely to the cloud.

The integration of cutting-edge technologies in the portfolio offers companies in all industries new opportunities to make better use of the rapidly growing volume of data in industry. These range from the use of artificial intelligence and edge computing to future factory and process automation. Data sovereignty always remains with the data owner.

Using the example of the automotive industry, Siemens will demonstrate at the fair how development and production times can be reduced regardless of the engine concept (diesel, gas, electric). Fully automated manufacturing concepts with high quality and accuracy as well as industrialised additive manufacturing

Integrated IO-Link technology supports IIoT

Integrated IO-Link technology in FieldEcho® from SICK Automation enables full data accessibility and transparency across all platforms. IO-Link is an increasingly used manufacturer-independent communication standard that provides users with significantly more information, configurability and control. From installation to operation and maintenance of automation systems, integrated IO-Link technology provides clear advantages over analogue solutions.

The technology brings continuity of information from the sensor level to the automation and web worlds and is an enabler for innovative sensors. Sensors and actuators become active process participants in an end-to-end automation network. The FieldEcho® ensures the data availability required by Industry 4.0 and the Industrial Internet of Things (IIoT). It gives users platform-independent access to all IO-Link devices in an automation system in just one software tool.

With simple sensor technology, the user can establish a reliable communication channel, integrated into any existing network, to supply a wealth of information – in real time. With the FieldEcho®, the user can parameterise, diagnose and monitor all the IO-Link devices that are integrated into a machine or plant. From commissioning and runtime, to device replacement and maintenance, all the IO-Link devices in the plant can be monitored via any internet browser, throughout the plant's life cycle.

Regardless of the programmable logic controller (PLC), fieldbus or IO-Link master used, FieldEcho® automatically finds connected IO-Link devices. The remote access function enables all relevant IO-Link device data to be easily accessed, from anywhere. Remote diagnosis is then also possible, which can reduce maintenance costs and downtime. Manual download of IODD is no longer necessary, saving time and increasing efficiency.

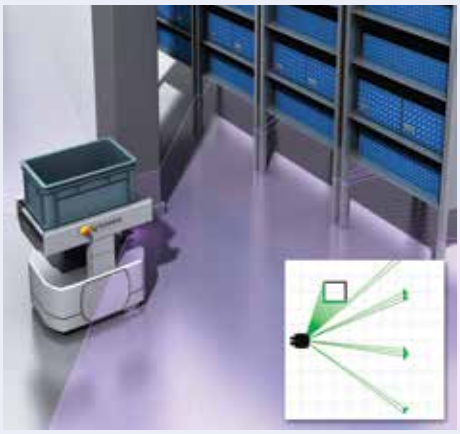
The FieldEcho® provides unlimited, bi-directional communication access to IO-Link devices. Covering the globally recognised PLC standard, it allows data to be exchanged between all configured IO-Link masters and devices clearly and conveniently. As a software tool it can also be used in browsers or integrated into HMIs.

Process and service data is available at the operational management level (MES), the enterprise level (ERP), for various cloud services and any customer-specific applications. The data can be used for subsequent processing – for example, for inventory, predictive maintenance or data analysis.

These advantages support Industry 4.0 solutions. The FieldEcho® IO-Link software enables continuous digital data transmission, allows standard non-shielded cables to be used, can receive new parameter sets within seconds, and makes plug-and-play a reality. Different parameter settings can be visualised, tested and optimised during integration and commissioning. Different parameter sets can be stored in the automation system and uploaded to the sensor during operation without delay. With the FieldEcho®, users can automatically and remotely configure sensors installed in locations that are difficult to access.

Matching automation technology with the Internet world, in line with Industry 4.0 standards, the FieldEcho® software tool ensures all relevant plant information is available globally on any platform.

For more information contact Grant Joyce at SICK Automation Southern Africa. Tel: +27 (0)10 060 0550, email: grant.joyce@sickautomation.co.za



The FieldEcho® gives users access to all IO-Link devices in an automation system, in just one software tool which needs no special hardware or protocol.

lead to increased performance, shorter setup times and a transparent battery development and production process.

The strengths of modular process plants will also be demonstrated using a 'plug and win' separator unit from GEA, automated with Module Type Package (MTP) and supported by web-based applications and digital services based on MindSphere. These apps increase the transparency and efficiency of the plant through optimisation of control circuits and maintenance schedules.

Putting AI services to work

Siemens service experts support digital transformation by providing services from consulting through implementation to optimisation. This also applies to AI-based services, which connect the field level to edge and the cloud. Data is analysed locally on the machine and subsequently in the cloud using AI-based algorithms. This enables the customer to predict unscheduled machine downtime and to adjust product quality. With Predictive Services, Siemens presents modular service packages for the early detection and correction of faults. In addition, with Closed Loop Analytics Services, Siemens shows how data analytics and AI can be used to unlock previously untapped potential in the production and process environment. Test applications can be reduced, manufacturing throughput increased and machine learning models improved with new data in MindSphere.

Siemens will also present a number of other new developments at SPS 2019 – for industrial operation and monitoring, in innovatice CloudConnect products that enable data to be transferred securely, in security services to protect productivity, digitalisation in drive technology and solutions for an intelligent and secure electrical infrastructure.

For more information visit: www.siemens.com

PC- and servo-based control for performance and flexibility

Thomas Kosthorst, Business Management Plastic Processing Machines, Beckhoff Automation

AT A GLANCE

- The six-way in-mould labelling machine from Beck Automation can produce up to 5 000 plastic lids per hour, each with its own design or an individual QR code.
- PC-based control and drive technology from Beckhoff provides for highly flexible machine design and precise motion control.

In-mould labelling (IML) is an ideal solution for today's customer requirements in the plastics industry, especially in the packaging sector. Companies need high-quality, durable machines with maximum availability that can produce a wide range of packaging designs with flexibility and minimal cycle times. Swiss speciality machine manufacturer, Beck Automation, uses PC-based control and drive technology from Beckhoff as its standard automation technology to implement such systems.

Family-run Beck Automation AG in Oberengstringen, Switzerland, founded in 1934, is a pioneer in the field of in-mould labelling systems, with more than 30 years' experience. Nino Zehnder, Head of Sales and a member of the executive management team says, to meet the needs of its customers all over the world, the company's product portfolio ranges from cost-effective basic machines to custom-tailored systems. A current example of innovative solutions from Beck Automation is a six-way IML system for decorating plastic lids. Zehnder explains: "This machine is for plastic containers used in the food industry. The most common items being made with it are lids to cover one-litre containers for products such as yogurt, but the same machine can decorate the body of the container."

IML as a flexible process

With in-mould labelling, a previously printed label that has the same base colour as the final product (for example, the lid of a yogurt container) is placed in an injection mould. When the plastic is injected, cools down and hardens, it combines with the label to form the finished product. "This process is more flexible than affixing printed labels," says Zehnder. "IML is especially suitable for packaging design in the age of Industry 4.0 and lot sizes of one, because you don't need to modify a printing machine for every change, which is expensive and time-consuming." The Beck Automation system can produce up to 5 000 plastic lids per hour, each with its own design, or even an individual QR-code if necessary.

For precision and durability, the IML system is mounted on a solid welded steel frame. The system attaches laterally to an injection moulding machine so that its servo-controlled shuttle arm can reach into the mould. When the shuttle arm moves into the open injection mould, it picks up six finished lids on one side while simultaneously inserting six new labels for the next injection moulding process. During this process, the IML machine inspects the lids with a vision system for quality assurance before stacking them. During the stacking process, the machine also separates the next six labels to place them on the main shuttle arm for the next insertion pass into the injection mould.

Zehnder points out the performance capabilities of the IML machine. "The entire cycle with six plastic lids takes only about four seconds. The machine also features exceptional flexibility. It can be adjusted for other lid sizes, shapes or quantities very quickly and easily. Another advantage is the automatic magazine changeover, which makes it possible to refill the labels without interrupting the process."

PC-based control technology

Christoph Jenni, Head of Software Development, says Beck Automation first decided to use PC-based control technology in 2011. "Even back then, PC-based control technology impressed us

with several basic advantages, such as the ease with which you can implement remote access for effective customer support. Another feature of PC-based control from Beckhoff is the ability to make system changes online. Compared to the previous PLC-based solution, we also benefited from the powerful axis control with extensive diagnostic capabilities as well as the fast and easy-to-use EtherCAT communication standard, which replaced the traditional individual wiring."

Zehnder also highlights the benefits of a Windows-based software system: "Its openness ensures maximum flexibility. For example, we can easily export data as an Excel file or use Windows' many capabilities for a user-friendly operator interface."

He adds that the worldwide availability of Beckhoff technology and support is important for a globally active company like Beck Automation. "Since our systems are extremely durable, we must ensure that the components are available for the long term. Even after 10 years or more, spare parts and newer, yet fully compatible products are still readily available."

Another factor is the exceptional modularity and scalability of PC-based control. Jenni says, "Depending on the machine's size and features, the control technology can be optimally adjusted without requiring much additional engineering. For example, we can easily adapt the number of servo axes to the respective requirements. And unlike other systems, PC-based control offers an unlimited number of I/O channels, which leaves all options open."

Servo drive technology

Beck Automation also employs Beckhoff servo drive technology throughout its new six-way IML system. The technology's easy configuration results in significant benefits, particularly during setup changeovers. The machine features four AM8000 series servomotors, which are controlled by TwinCAT 3 NC PTP software via two single-channel AX5103 and AX5118 servo drives or a two-channel AX5203.

The AM8063 servomotor with 29 Nm of standstill torque makes for a dynamic main axis. There are also two AM8032 (2.37 Nm) and one AM8033 (3.22 Nm) equipped with holding brake, which are used to implement, among other things, the shuttle motion: to guide the plastic lids along the inspection system in a sufficiently short cycle time. The servo drive technology is less jerky than pneumatics, which increases the machine's durability due to the reduced inertia forces. The other servo axes are used to take the labels from the magazine and to stack the finished lids.

Jenni notes one cable technology (OCT) as another positive feature. "OCT reduces the wiring and assembly effort significantly. And the electronic type plate makes it much easier to commission, troubleshoot and if need be, replace devices."

A Beckhoff CX5130 embedded PC with an Intel Atom® processor running at a clock speed of 1.75 GHz provides sufficient performance for all control and motion sequences. The broad spectrum of the Beckhoff Industrial PC portfolio is another critical advantage, says Jenni: "Depending on the requirements or the size of the machine, you can easily deploy more powerful IPCs or multi-core processor technology without having to change the control software. This makes us highly flexibly as far as system design is concerned."

The same applies to the TwinCAT software. "The existing motion control library has so far met all our requirements. We could even implement special features like data exchange via OPC UA easily with the help of a corresponding TwinCAT function." And the integrated TwinSAFE solution has delivered additional efficiencies, because the EL6900 TwinSAFE Logic terminal and the optional AX5801 TwinSAFE cards for the drives made it possible to reduce the wiring and the space requirements for the safety doors and the emergency stop function.

All images: Beckhoff Automation.

The CX5130 Embedded PC and the I/O level with EtherCAT and TwinSAFE terminals are very compact.

In each processing step, the IML system takes six labels at a time from a magazine and places them into the open mould of the injection moulding machine.

Two of the machine's four AM8000 servomotors move the main arm (motor on the right) and the shuttle (motor on the left).

Together with the AM8000 OCT servomotors, the AX5000 servo drives provide an efficient and dynamic motion control solution.

IE3 compliant motor control and protection

The growing move to using IE3 (Premium Efficiency) electric motors makes it increasingly important that the most appropriate starting method is selected to ensure optimum motor performance. The motor switching and protection components need to be engineered to meet the demands of the IE3 motor.

Generally, the most basic starting method for an electric motor would be a direct online starter or star delta starter. However, older generation switchgear has not been engineered for IE3 motor compatibility and may generate nuisance tripping, which is not only unwanted but can also have a severe knock-on effect in terms of operational productivity and efficiencies.

WEG IE3 compliant low voltage switchgear has been engineered to offer absolute reliability when it is used to start and operate WEG IE3 motors. Users can be confident that with WEG IE3 compliant switchgear, the drive system will provide high levels of energy efficiency over a long service life. This in turn, will translate into reduced total cost of ownership as well as enabling compliance with current environmental regulations.

Motor protective circuit breakers

Typically, motor protective circuit breakers are affected most when starting electric motors because of sensitivities to transients and instantaneous values of current.

WEG circuit breakers were evaluated specifically in terms of this and the multiple of short circuit release was changed from 12 to 13 times the rms value of the rated current. Following this modification, extensive testing was conducted to verify that, with these modifications, the whole range of WEG circuit breakers is IE3 compliant.

A WEG solid state overload relay and WEG motor protection circuit breakers and contactor systems.

Contactors

The full range of WEG contactors is also IE3 compliant. The application of sound engineering principles ensures that there is no reduction in mechanical or electrical lifespan, nor an increase in the contactor's coil consumption.

Overload relays

Overload relays are designed to protect motors thermally against overload conditions and, unlike motor protective circuit breakers, they are not sensitive to instantaneous currents. WEG solid-state and thermal overload relays conform to IE3 motor application.

As a leading manufacturer of premium efficiency (IE3) and super-premium efficiency (IE4) electric motors, WEG has developed in-house expertise in IE3 equipment conformity. All its current switchgear and protection devices can be used without restriction to ensure reliable operation of IE3 motors.

Zest WEG Group's technical team is available to assist customers in selecting appropriate IE3 compliant control and protection components to optimise the efficiency of motor installations. The company often adds new products to the WEG low voltage switchgear range, leveraging off ongoing research and development conducted by WEG Brazil. The products are available off the shelf from the Zest WEG Group's Linbro Business Park facility in Sandton, Gauteng.

Backed by SABS certification, the WEG switchgear product range is gaining ground in the mining, general industry, commercial and domestic sectors.

For more information contact Zest WEG Group.
Visit: www.zestweg.com

Vertical push-in connection for confined spaces

Phoenix Contact has introduced its innovative PTV terminal block series with side conductor connection. This provides for clearer wiring without bending radii in confined spaces.

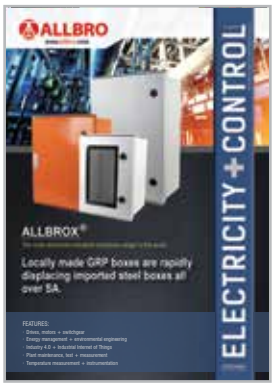
The conductor and connection marking is more easily legible.

This Phoenix Contact series features feed-through, three-conductor and four-conductor terminal blocks. Testing and bridging options are available on each terminal block. Disconnect and knife disconnect terminal blocks are also available. All terminal blocks are available up to a cross section of 4 mm².

The tool-free push-in direct connection technology of the PTV terminal blocks enables time-saving conductor connection. The connection principle and conductor routing are self-explanatory. Logistics costs can be reduced by using the standard accessories of the CLIPLINE complete terminal block system.

For more information contact Phoenix Contact South Africa.
Tel: +27 (0)10 801 8200, email: sbritz@phoenixcontact.co.za

The new PTV terminal blocks provide direct connection technology in tight spaces.



SA's most advanced range of industrial enclosures

It is a bold claim indeed to say that a South African manufacturer has the most advanced range of industrial enclosures in the world.

While there is no enclosure World Cup for the players to square off and prove such claims, there are some features built into the DNA of this nation's only home-grown range of enclosures that would arguably make it worthy of holding up such a trophy if it existed.

Not steel

The majority of electrical enclosures used in South Africa are coated mild steel. Standard off-the-shelf sizes used to be locally manufactured but the tide of low-cost imported steel products has almost completely displaced local steel manufacture in this sector. The probability that there is any local content in the boxes that are bought from stock from any electrical wholesaler in South Africa is close to zero.

Allbrox enclosures are not made from steel. Allbro compounds a special version of glass reinforced polyester (GRP) known as SMC (sheet moulding compound). This is a well-known composite material that is used in the manufacture of critical structural parts for jet skis, manhole covers, truck body parts, car parts and many consumer products that require durability greater than that steel can provide.

SMC enclosures have historically been about three times more expensive than steel enclosures. Allbro has changed the price position of SMC enclosures. Local mould manufacture, local raw material sourcing and compounding, local labour and local energy costs, when combined, make Allbrox the only SMC composite enclosure that can compete with cheap steel imports on price.

It goes without saying that the benefits of using SMC over steel are profound when end users are able to justify paying three times more for the benefits that SMC provides. In most applications, however, the vast price difference has been the driving force for accepting and standardising on inferior steel enclosures. Such compromise is no longer required for end users and equipment manufacturers in South Africa. The vastly superior SMC technology is now generally cheaper than steel.

Allbrox is without question the most durable SMC enclosure available worldwide. A unique coating process allows the enclosure to withstand decades of the harshest weather conditions. It is important to remember that the material underneath the coating is also able to endure decades of abuse from the elements. There is no enclosure in the world that will last as long as Allbrox.

Over the last five years the range has grown to include 19 part numbers covering a broad range of sizes. Industry in South Africa is rapidly recognising the benefits of this home-grown solution and more and more specifications are being changed to support the introduction of Allbrox as a plant standard.

The local support base for this breakthrough is a fundamental aspect for the success of the product range on a competitive world stage.

For more information contact Allbro.
Tel: +27 (0)11 894 8341,
email: new@allbro.com,
or visit: www.allbro.com

Generation X.e industrial gear units in SA

German drive engineering specialist SEW-EURODRIVE is bringing its Generation X.e industrial gear units to the South African market. This technology, first introduced at Hannover Messe in April 2019, represents the latest iteration of the company's successful X Series, which is widely used globally in industries as diverse as mining, cement and sugar mills, and power generation.

Raymond Obermeyer, Managing Director of SEW-EURODRIVE says the decision to introduce the latest series to the South African market responds to the overarching industry need for energy-efficiency and optimisation.

Specific client requirements addressed by the new series include: maximum drive utilisation, in the event of continuous operation under specified conditions; peak load, in the case of an irregular travel profile, frequent start-up, or occasional blocking; temperature and environmental factors such as the permissible surface temperature, degree of protection, permissible noise level, accessibility, and serviceability; minimum service requirements; and extended service intervals.

The new Generation X.e Series is particularly suited to harsh operating environments, as in mining and general industry. In such applications it offers savings in energy usage and reduced maintenance needs. Other advances in the design of the gear units include an improved bevel pinion housing, optimised bearing preload, a non-contact sealing system, a universal cover with a fan system, and optimised gearing topology.

Obermeyer highlights that the main benefit of Generation X.e is in the customer focus it brings to the tried-and-tested X Series. This is evident in the enhanced hardware together with an entirely new computing suite, embracing simulation, which means that a standard product can be matched to specific modifications and settings for different clients' requirements and operating conditions.

This 'smart' combination of separate measures and networked software tools allows users to configure their own customised gear units. It means that all industrial drives supplied by SEW-EURODRIVE now have the potential for specific optimisation – a key factor considering the constraints, rising costs and tight margins faced by many industrial sectors globally.

Generation X.e industrial gear units operate in a temperature range from -40°C up to 50°C and are available with a torque rating from 65 kN to 500 kN. All Generation X.e gear units for the African market will be assembled in Nelspruit in Mpumalanga. This guarantees a fast turnaround time and readily accessible parts support and service backup.

"It is no longer enough merely to sell products to customers," says Obermeyer. "We must look at customers' holistic requirements and how best we can provide a complete solution – including our ancillary technologies and value-added services as well – to optimise all their processes."

For more information contact SEW-EURODRIVE.
Visit: www.sew-eurodrive.co.za

The latest series of industrial gear units from SEW-EURODRIVE is designed to deliver energy efficiency and optimisation.

Switchgear for offshore mining vessel

The De Beers marine business unit recently embarked on a project to upgrade the power and propulsion system on its Gariep offshore mining vessel. The project will include modifications to the vessel to facilitate the physical and functional integration of new generating plant and a new electrically driven propulsion system. Additionally, the project will involve changes to support auxiliary, structural and control systems.

JB Switchgear Solutions secured the contract for the low voltage primary switchboard. The scope of the contract includes manufacture, factory acceptance testing, delivery, installation and 'C1' commissioning of the switchboard.

The marine-certified, 100 kA, 600 V, 60 Hz switchboard includes 1 x 6 300 A, 5 x 5 000 A and 2 x 1 600 A air circuit breakers. It is fed from four diesel-powered generator sets and includes synchronising capabilities.

Strict quality control procedures are in place at JB Switchgear and the manufacture and assembly of the switchboard will adhere to the applicable marine standard.

JB Switchgear is a Level 3 B-BBEE supplier and ISO-9001 listed for its quality management system.

For more information contact Johan Basson at JB Switchgear Solutions. Tel: +27 (0)11 027 5804, email: info@jbswitchgear.co.za

JB Switchgear has produced similar switchboards for previous projects.

BI now offers Varispeed drives

As part of the broader Hudaco Group, Bearings International (BI) is in a position to leverage synergies across the range of group companies within the group, so it can offer a complete product basket across its extensive branch network countrywide.

BI focuses on a number of core market sectors, including mining, agriculture, sugar, OEMs, steel manufacturing, FMCG, the automotive industry and cement, pulp & paper and chemicals, among others.

Victor Strobel, Offer Marketing Manager at the company, describes BI as "a house of world-class leading brands". Strobel says, "We are working closely with our suppliers and the larger Hudaco Group to unlock new opportunities and new markets, in South Africa and elsewhere on the continent.

"From bearings to variable speed drives (VSDs), motors, gearboxes, sprockets and chains, BI offers solutions for a diverse range of customers, applications and industries."

An example of BI's diversification into ancillary products is the addition of electronic motor control solutions from Hudaco Group company, Varispeed, to its existing range. Varispeed has recently launched its VDrivePlus and AlphaDrive-Micro VSDs.

The AlphaDrive-Micro VSD is a compact frequency inverter ranging from 0.2 kW to 5.5 kW, and available in 240 V and 400 V. Both the Varispeed VSDs offer a best performance-to-cost ratio, without compromising on quality and reliability. "In the current economic environment the market is very price-sensitive, so any energy efficiencies or cost savings we can offer are hugely beneficial," Strobel notes.

Certified in accordance with the latest European standards and regulations, the AlphaDrive-Micro and Micro Plus are suited to most drive applications in the South African market, in mining, food and beverages, manufacturing and agriculture.

The VDrivePlus is a much larger drive, ranging from 0.4 kW to 400 kW, and available in 240 V and 400 V. This more advanced VSD features advanced motor control based on DSP technology, together with 'smart' auto-tuning. Additional features include flexible inverter control, dual high-resolution analogue inputs, and free mappable I/O channels.

The Varispeed VDrive is a larger drive, ranging from 0.4 kW to 400 kW, available in 240 V and 400 V.

The Varispeed VSDs can be supplemented with the Bauer electric motor range from BI. This range of cast iron and aluminium motors meets customers' needs across multiple applications – from 0.18 kW to 355 kW 400 V and 525/550 V – for pumps, conveyor belts, sanding machines, cooling towers, crushers and pedestal drilling machines, among others. A major advantage for end users, and one of the key selling features of the cast iron range, is that the feet are removable and interchangeable, making it a multi-mount motor.

"BI is positioning itself as a total solutions provider – a single point of contact for all its customers' needs," says Strobel.

For more information contact Bearings International (BI). Tel: +27 (0)11 899 0000, email: info@bearings.co.za

Versatile drive system for tough industrial environments

BMG's range of Danfoss electronic, mechanical and intelligent mechatronic devices includes the VLT® AutomationDrive FC 300 series – designed for variable speed control of asynchronous and permanent magnet motors on industrial machines or production lines, in demanding applications and challenging environments.

The Danfoss VLT AutomationDrive FC 300 series, with intelligent drive functions, is based on a flexible, modular design to optimise energy savings, versatility, efficiency and maintenance.

The robust drive system, with reduced harmonic impact and a spark-free design, is protected against the negative effects of vibration, moisture and dust and can be used to operate pumps, conveyors, palletisers and material treatment equipment, ensuring optimum control and dependable operation over extended periods.

Mick Baugh, Electronics Manager, Electromechanical Division at BMG says, "The VLT AutomationDrive – which has received awards globally for innovation and its user-friendly features – reduces project costs and ensures low cost of ownership while maintaining high-efficiency processes. As with all Danfoss drives, the system is motor independent, offering customers the flexibility to select the most suitable motor for specific applications.

"Danfoss invests in advanced technologies on an ongoing basis to ensure all its systems comply with current and anticipated demands in the drives sector. The implementation of the VLT AutomationDrive system in a plant supports a seamless transition to Industry 4.0," says Baugh.

"The FC 300 series boasts hardware and software enhancements that maximise performance and a new Ethernet platform for improved communication. The range also encompasses new generation E-frames and lower temperature ratings," he adds.

The drive system is modular and adaptable, suitable for installation in different positions – close to the motor, in electrical panels, switch rooms or outdoors and as a stand-alone unit in the production area. It has an advanced thermal design and back-channel cooling, making it is one of the most compact and cost-efficient air-cooled drives in the range of 90 kW to 800 kW at 500 V.

The FC 300 series is also designed for simple installation, from wiring to programming and operation.

It is compatible with leading motor and fieldbus technologies; it offers web-based configuration, electronic data interchange (EDI) and access to engineering drawings and diagrams. The system also provides tools to reduce harmonics and calculate motor-drive system efficiency. There is a flexible interface to the drive data from multiple access points, including directly at the drive, via mobile applications, through an integrated web server and via cloud connectivity.

The standard functionality of the VLT AutomationDrive can be expanded by replacing mechanical controls with energy-saving electronic motion control. With the integrated motion controller, the VLT AutomationDrive 302 replaces more complex positioning and synchronisation controllers to save time and costs.

Application-dedicated functions for optimum performance include droop functionality for load sharing, an integrated brake control for the safe operation of hoists, and an integrated process controller for demand-based pumping solutions.

The drive system has an intelligent troubleshooting and remote access facility and features preventive and predictive maintenance functions. These ensure trouble-free operation with reduced maintenance costs and prevent unplanned downtime.

The VLT AutomationDrive can operate in tough industrial environments and on low voltage grids, including production facilities operating from 690 V mains networks. AC drives are available in various enclosure sizes and protection ratings, from IP20 to IP66. Integrated DC chokes and RFI filters in all units protect installations by minimising harmonic distortion and electromagnetic interference.

Typical applications for the VLT AutomationDrive FC 300 series include the mining and minerals industry, food and beverages, packaging, water and wastewater management, marine and offshore, chemicals, oil and gas, as well as cranes and hoists, elevators and escalators, and textiles manufacturing.

BMG has recently been appointed as a Danfoss DrivePro® Service Partner. It is the only company in southern Africa to achieve this recognition and one of the first 30 companies appointed as part of the programme globally.

Through this agreement, BMG provides a support service for VLT and VACON drives which encompasses troubleshooting, maintenance, repairs and replacements. As a Danfoss DrivePro® Service Partner, BMG also offers specialised training and technical support to improve productivity, performance and uptime over the full life cycle of Danfoss drives.

BMG's recent expansion of its distribution and engineering facilities in Johannesburg includes electronic workshops and a technical resources centre for the repair, maintenance and commissioning of the Danfoss product range.

For more information contact Mick Baugh at BMG.
Tel: +27 (0)11 620 1538, email: mickb@bmgworld.net

The Danfoss VLT AutomationDrive FC 300 series offers a flexible modular drive system for diverse industrial applications.

Localisation in manufacturing of motors and generators

ABB South Africa's facility in Alrode, near Johannesburg, was established in 1981 to produce high voltage (HV) machines and specialise in manufacturing components for motors and generators to order. With its commitment to localisation and skills development, including skills and knowledge transfer, and following a recent investment, the facility is now fully compliant with the Department of Trade and Industry's (dti's) >70% local sourcing regulations for public sector projects.

The facility has a working area of 6 000 m^2 and the motors and generators area is equipped with a 15-tonne high-speed balancing machine, cranes with lifting capacities of 80 tonnes, and a load test bay of 13.8 kV, 6 MW. It also houses a dedicated, state-of-the-art coil shop, part of ABB's commitment to the region and to modernising local manufacturing facilities in line with the best in the world. The factory is recognised by industry as a manufacturing site for machines for safe and classified areas.

Since it was established, the Alrode facility has produced more than 60 000 MW worth of motors, with ratings of up to 29 MW, 13.8 kV, running at up to 6 000 rpm. The largest motors have had up to 1 200 frames and 36 poles. Types include slip ring induction motors, cage induction motors, synchronous motors and generators with ratings of 550 kW to 20 MW, 355 to 1 200 frames, 50/60 Hz, 3.3 to 13.8 kV, variable and fixed speed.

"We have also designed and built some unique motors and generators tailored for the local market at this facility," says ABB South Africa's MOMG Regional Service Manager David Warne. "These have included customisable Q range machines (engineered modular motors) designed to replace current installations of older obsolete machines, or to comply with ever-advancing safe and classified area standards, or to meet increased performance requirements."

In respect of the dti's requirements for more than 70% localisation, ABB's Alrode motor facility is fully compliant in the following components and manufacturing processes: casting or frame fabrication, fabrication and stator-core winding, fabrication and rotor-core winding, accessories and assembly and testing of fully built units. This makes ABB one of only a few large OEMs in the country which fully meet the DTI's requirements in this regard.

Local manufacture has many benefits for customers: from ABB's higher B-BBEE rating as a supplier, to reduced costs, improved efficiencies and shorter turnaround times, as well as better after sales service and access to parts. A dedicated field service supports installation, supervision, commissioning, and a full range of field maintenance services.

For more information contact ABB South Africa. Tel: +27 (0)10 202 5617, email: sumaya.abdool@za.abb.com

ABB's Alrode facility near Johannesburg produces high voltage machines and specialises in manufacturing components for motors and generators, to order.

36 MW stator rewind for Sasol Secunda

Marthinusen & Coutts recently provided a solution to an irregularity that occurred in the stator of a 36 MW compressor motor at Sasol's Secunda plant.

The results of final tests, conducted by H.V. Test Field Services on the stator after M&C had completed the necessary repairs, were found to be the best among many such tests conducted on similar equipment over a period of several decades.

Initially, during a routine inspection in January 2018, a Sasol maintenance team discovered that the flux shield mountings on the stator were faulty. Sasol awarded M&C the contract to identify the cause of the irregularity and offer a remedy.

Rob Melaia, M&C Engineering and Technical Executive, said, "We tested the stator winding, which we found to be fine, but confirmed that there was a defect in the flux shield and recommended that it be repaired, as there was a risk of it damaging the winding if left to continue operating in its existing condition. To repair the flux shield meant also having to remove the winding and perform a rewind on the stator."

Sasol accepted M&C's recommendation and in August 2018 assigned it to perform the required repairs. "In addition to replacing the old bars with new bars purchased from a reputable coil manufacturer in the US, we made a specific modification to repair the flux shield to prevent a recurrence of the defect," Melaia said.

He explained that on investigating the defect M&C found that the electrical current, instead of flowing only in the flux shield as it ought to have done to prevent the core from overheating, had started flowing in the mounting bolts, so causing wear by electrical arcing in the mounting holes and the mounting studs.

The solution M&C's repair team provided was to fit copper braid straps from several points on the flux shield to the stator body, to reroute the current in such a way as to prevent a repeat of the damage that had been found. To confirm the effectiveness of the solution M&C arranged to have the refurbished stator tested by local independent test authority H.V. Test Field Services.

Partial discharge and Tan Delta tests were conducted, being the recognised tests for determining the integrity and efficiency of medium voltage windings.

M&C undertook the repairs to a large 36MW compressor motor stator at Sasol's Secunda plant.

The results showed:

- A maximum partial discharge of below 250 picocoulombs (pC) at 120% of phase voltage.
- In the Tan Delta tests the dielectric dissipation factor was found to be 65 x 10^{-4} at 20% of phase voltage and 105 x 10^{-4} at 100% of phase voltage.

"These test results were the best ever to be achieved among the numerous machines on which H.V. Test has conducted tests of this kind!" Melaia highlighted.

"We have every reason to be proud of this outcome as it says volumes about M&C's expertise in this field, in terms of correctly diagnosing and repairing faults in large rotating equipment, as well as providing the appropriate and most effective solutions for them," he said.

For more information contact Marthinusen & Coutts.
Visit: www.mandc.co.za

Final test results were found to be the best among many such tests conducted on similar equipment over a period of several decades.

LED tag counts down to maintenance

The innovative Brady Inspection Timer helps track maintenance routines by clearly showing on machines, equipment and tools when maintenance is needed. Its LED lights attract the attention of users and maintenance professionals from a distance and help prevent the use of uninspected or worn out equipment.

The Brady Inspection Timer clearly highlights when the next planned maintenance intervention is due. Versions are available that count down seven days, 30 days and 365 days. Each version is equipped with a dark green, light green, yellow and flashing red LED light that indicate a 'recently inspected' up to an 'uncertain' equipment status.

The inspection timer can be applied directly to almost any machine, equipment or tool easily, using an adhesive, Velcro, magnet, screw or zip ties. At the end of the predetermined inspection time interval, the tag can be reset as required, until the one-year-plus tag battery is spent. A battery status indicator constantly shows how much power is left.

Compared to other solutions, the Brady Inspection Timer's coloured LED lights can be seen from a distance and draw attention from users and passers-by. Machines, equipment and tools fitted with the inspection timer are easy to spot and the applicable maintenance intervals – determined by laws, regulations or company policies – are therefore not likely to be exceeded. In this way the Brady Inspection Timer supports timely maintenance interventions that in some instances can save lives.

For more information contact Brady South Africa.
Visit: www.bradysouthafrica.com

The inspection timer is a useful device that can be applied to machines, equipment or tools to keep track of maintenance routines.

Drones and rope access for power station inspection

Skyriders, a leader in the South African rope access industry, recently made use of the synergy between drone technology and traditional rope access in an inspection project at one of the country's oldest power stations in Mpumalanga. The fast-track project was undertaken together with partner company Nyeleti Consulting and involved the inspection of two 155-metre-high smokestacks.

The external inspection was carried out by a two-person team deploying high-tech drones fitted with high-definition 4K and thermal cameras. It was done to identify any hotspots that could indicate areas where the internal brick lining of the concrete wind shield had deteriorated. Skyriders Marketing Manager, Mike Zinn, says the thermal imaging was done early in the morning, before the heat of sun could have an impact on the smokestacks.

In the second part of the project, a two-person rope access team took core samples from the two smokestacks. This involved drilling 100-mm-deep holes into the concrete, and extracting samples to be submitted for laboratory testing – for compression strength and carbonation, among other measures.

"While a good visual inspection is essential and can provide a wealth of information, it is equally important for an engineer to understand the health of the concrete itself, as well as the reinforcing steel. These components give a good overview of the true condition of the structures," Zinn says.

After the core samples have been cut out, the holes are patched with an approved patching material to ensure the integrity of the structure. A detailed report is submitted to the client following the receipt of the laboratory results and informs future maintenance and repair work requirements.

Skyriders called on the particular expertise of Nyeleti Consulting as the company has the only CICIND (International Committee on Industrial Chimneys) accredited engineer in South Africa, an expert on industrial smokestacks and chimneys.

For more information contact Skyriders. Tel: +27 (0)11 312 1418, email: mike@ropeaccess.co.za

Skyriders used traditional rope access and high-tech drones fitted with thermal cameras in the high-rise inspection at an Mpumalanga power plant.

Next generation sensors for predictive maintenance

QM30VT Series vibration and temperature sensors from Turck Banner build on the capabilities of the QM42VT Series sensors they replace. They maintain all the same functionality, registers and scaling of the QM42VT Series and offer the further advantages of ultra-compact design (30 mm x 30 mm x 13.25 mm) and rigid metal construction which reduces resonant interference, enabling high accuracy in measurements. The new sensors are available in IP67- and IP69K-rated models and are some of the smallest sensors on the market.

Designed to fit easily in small spaces, the QM30VT Series sensors also have a thin, flexible cable and easy-to-use bracket options which simplify installation, even in hard-to-access positions. The sensors are available with IP67-rated sealed aluminium housing – suitable for use in most industrial applications, or with an IP69K-rated 316L stainless steel housing – for use in wash down environments.

Machine vibration is often caused by imbalanced, misaligned, loose, or worn parts. QM30VT Series sensors provide greater levels of accuracy in measuring RMS velocity and other vibration characteristics. They will detect even slight changes in machine performance, so potential problems can be identified early, before an issue can cause additional damage or machine failure and costly unplanned downtime.

The sensors provide for local and remote monitoring. Used in combination with the Wireless Solutions Kit for Temperature and Vibration, they generate view graphs of vibration data, create alerts, and store and analyse data from multiple assets. Alternatively, users can create their own solutions using Banner's Connected Data Solutions cloud software in combination with the sensors, radios or nodes, and a DXM Series wireless controller.

QM30VT Series vibration and temperature sensors can be used on any machine with rotating motion or vibration to:

- Expose machine performance issues caused by misalignment, unbalance, bearing failures, pump cavitation, blade damage, or other such problems
- Reduce downtime by providing predictive insights to potential issues before a failure can occur
- Establish more strategic scheduling of equipment maintenance
- Reduce spare parts inventories by providing predictive insights into future failures
- Monitor machines and collect data in diverse industrial applications.

The sensors can be used alone for simple monitoring and data collection applications, or as part of a comprehensive predictive maintenance solution.

For more information contact: Brandon Topham at Turck Banner. Tel: +27 (0)11 453 2468, email: brandon.topham@turckbanner.co.za

Vibration and temperature sensors in the new QM30VT Series are among the smallest available.

Drones can transform inspection, safety, compliance on mines

Percepto, a global market leader providing autonomous industrial drone solutions, participated at Smart Mining 2.0 in Toronto, Canada, in September, demonstrating how mining operations around the world are harnessing its Drone in a Box (DIB) solution to improve monitoring, inspection, security, safety and compliance.

Accessing essential data at a mining operation often involves personnel climbing on stockpiles with GPS equipment, 3D imaging and laser inspection, or hiring manned aircraft to fly over sites. The mining industry has been quick to recognise that drones offer a viable alternative to these costly and laborious processes. At Smart Mining 2.0, Percepto showed how the next generation of autonomous, artificial intelligence powered DIBs can collect, capture and analyse more data across more applications much faster, and at greatly reduced cost.

Chief Commercial Officer and Co-Founder of Percepto, Ariel Avitan, explains: "Conducting site surveys, routine noise and dust pollution assessments, daily inventory and equipment checks, perimeter security patrols and production forecasts can all benefit greatly from the aerial observations and data that our multi-mission DIBs can capture and transform into meaningful insights."

Autonomous drones also minimise risk associated with confirming the clearance of safety zones ahead of planned explosions and providing real-time situation monitoring in the case of an emergency. Avitan points out, too, how drones are supporting the increasing use of driverless vehicles: "Drones can assess large sections of roadways quickly and immediately notify personnel of any obstacles that may impede or damage vehicles and slow down operations."

Percepto's autonomous drones are making the benefits of drone technology more accessible for mining companies around the world. Avitan says, "Mining companies recognise the potential of the technology to transform their operations, but to date, the operational expense and availability of skilled pilots have proven prohibitive. With Percepto, once the DIB is deployed, the only cost is the electricity to power the system."

For more information visit: www.percepto.co

Infrared monitoring of kiln shells in cement production

By R&C Instrumentation

Extending the life of kiln refractories and preventing disastrous failures requires a good understanding of the condition of the refractory material. The easiest way to monitor the material's gradual degradation and to detect damaged or fallen bricks is to monitor the temperature of the kiln shell. Infrared technology has long been favoured to perform this task.

AT A GLANCE

- Infrared technology is commonly used to monitor the temperature of the kiln shell in order to track the effectiveness of the refractory lining and monitor its condition.
- Kiln settings can be adjusted to optimise production throughput and maximise refractory life.
- Temperature trends indicate when maintenance or replacement of the refractory lining will be required, so this can be scheduled to minimise downtime.

Sophisticated user interfaces have been designed to make the data easier to analyse and understand and recent demands have led to the development of products that do a lot more than measure temperature.

Perhaps the most critical step in the cement manufacturing process takes place in the rotary kiln. Here a flame that can reach temperatures of 1 900°C heats the raw materials to about 1 500°C. The materials become partially molten and a series of physical and chemical reactions convert the calcium and silicon oxides into calcium silicates, cement's primary constituent. At the other end of the kiln, the raw materials emerge as red-hot particles called clinker.

The kiln itself is a large steel pipe several metres in diameter and many metres long. In larger facilities, lengths of over 100 metres are not uncommon. To protect the steel from the intense heat, the kiln is lined with bricks of specially compounded refractory materials, typically a blend of various ceramic compounds. The material is compounded specifically for this application and has excellent temperature- and wear-resistance characteristics. Inevitably though, exposure to the intense heat of the kiln and the abrasive qualities of the cement leads to material degradation. Wear causes the bricks to become thinner and their ability to shield the outer surface of the kiln is affected. To maintain an adequate level of protection, at some point the kiln must be stopped and the bricks replaced.

Another concern is the potential for a single brick, or a small section of bricks, to come loose and fall. If this happens, the steel shell of the kiln will suddenly be exposed to intense heat and, unless action is taken quickly, it may be permanently damaged.

By monitoring the temperature of the entire kiln shell, the operator can determine the effectiveness of the refractory material. Any fallen bricks will be quickly detected and appropriate action can be taken to prevent further damage. Combining temperature measurement capabilities with a database of historical images allows the engineer to examine the temperature trends and to predict when the refractory lining will reach an unsafe condition. Scheduled maintenance can then be planned to replace the refractory lining with the minimum of downtime. In this way, the refractory life can be extended, providing cost benefits, and emergencies can be averted.

In addition, close monitoring of temperature will allow the operator to see the effect of the process on the refractory. Settings can be optimised to maintain the best possible combination of high production throughput and extended refractory life. It is therefore not surprising that this technology has been widely embraced by the cement industry for more than twenty years.

There are several systems on the market today with a variety of specifications and features. All, however, use infrared scanning technology to gather the temperature data. The technology is based on the fact that all objects emit infrared radiation and the intensity of this radiation increases with the temperature of the object. Measuring the intensity of the infrared energy provides the temperature of the target.

Infrared temperature sensors, widely used in industrial applications, contain a detector that will generate a current when exposed to energy of a specific wavelength in the infrared range (1 to 20 µm). As the intensity increases, so too does the current and thus the temperature of the object can be determined. Normally, these sensors use a range of optical elements and are focused on a specific point on the target and hence are termed 'point sensors'. By rotating a mirror, angled at 45° to the sensor, the energy from a wider field of view can be projected onto the sensor and, in this way, the temperature of an entire line on the target can be measured. These units, commonly known as infrared line scanners, are at the core of all kiln shell monitoring systems in use today.

When used to monitor rotary kilns, one or more line scanners working in parallel will gather data from a line along the kiln axis. As the kiln rotates, each new line of data is generated and thus the entire surface is 'mapped'. The data is transferred to a PC with application-specific software that converts it into a two-dimensional thermal image of the kiln surface. A trigger signal can be used to indicate each complete revolution of the kiln and the images will be updated on the completion of each rotation.

The software, typically loaded on a PC in the plant control room, displays each successive thermal image. The images illustrate a false colour representation of the kiln surface temperature. It is normal for the cooler areas to be represented by darker colours and the hotter areas to appear bright red or even white. Normally, the image will be displayed in real-time for the operator so that any significant changes can be seen quickly. Images will also be periodically saved to a history file allowing for later analysis. The data can be used to predict the lifetime of the refractory material and schedule replacement when it will limit downtime to a minimum.

While all infrared kiln shell scanning systems offer the basic functions outlined above, newer systems address other customer needs and offer expanded functionality.

One added function addresses the concern of shadow areas along the length of the kiln. With the wide field-of-view of the scanner, which can range from 80 to 120°, it is not uncommon that there may be several obstructions which prevent

In cement production kilns, infrared temperature sensors are widely used to monitor the temperature of the kiln shell in order to track the stability or degradation of the refractory materials in the kiln lining.

the scanner from 'seeing' the entire kiln shell. The obstacles may be buildings, power poles, or other equipment. Further, the drive wheels or tyres have a diameter significantly larger than the kiln itself and at the outer edges these too can produce areas shadowed from the line scanner.

The newest systems incorporate the use of single point sensors that are located such that they can 'see' the areas shadowed from the primary sensor, which will always be a line scanner. The data from the point sensor and that from the line scanner are knitted into one, seamless thermal image. Up to 32 point sensors can be installed and use multi-drop communication so that only one connection is needed back to the PC. As the software is integrating data from multiple sensors into a single image, 'dirty lens' warnings can be provided easily as an added feature. The software compares each data point with its adjacent points and, if the difference exceeds operator-defined limits, a warning is provided that the sensor may be partially obstructed by a dirty lens or other obstruction.

Another new function involves monitoring the temperature of the clinker at the hot end of the process inside the kiln. This is done using an infrared point sensor that 'looks' through a viewing port into the hot end of the kiln. The data is displayed on the same screen as the kiln shell thermogram, allowing the operator to monitor both steps of the process simultaneously. Because the environment inside the kiln is extreme, with many combustion by-products between the sensor and the target, a special two-colour sensor is used. This type of sensor views the target at two wavelengths and returns a value that is the temperature of the target rather than the temperature of the combustion gases.

An interesting innovation, although it does not even involve temperature measurement, relates to the rotation of the kiln. The kiln is typically driven from one end and its huge size and mass make homogeneous rotation quite a challenge. Particularly during speed changes, there is a tendency for some of the rotational energy input by the motors to cause the kiln to torque or twist rather than to rotate. While a small amount of torqueing is acceptable, too much twist will cause damage to the relatively fragile refractory material. The typical kiln monitoring system uses a sensor to measure each rotation of the kiln and trigger the display of each subsequent image of the kiln shell. By installing additional sensors, one at each tyre, the rotational speed of several points along the length of the kiln can be monitored. If the rotational speed varies along its length, this is an indication that twist is occurring. During configuration, limits to acceptable twist can be assigned and the system will trigger an alarm when these limits are exceeded.

However, returning to the infrared kiln shell scanning system, its main purpose is to monitor and report on the condition of the refractory lining in the kiln. Most programs on the market offer some degree of refractory management. Usually, there is a location within the program to record the type of refractory used along each segment of the kiln. This information, alongside the temperature trend data, enables the kiln operator to make informed decisions on how to modify the kiln settings to maximise refractory life or when to schedule downtime to replace the refractory bricks.

Some systems offer an advanced refractory management capability where the user inputs certain critical data on the refractory type and the system then monitors the condition of the bricks and reports on refractory wear. While these systems are useful, it is important to ensure that the data entered into the program is accurate. Since all installations are inherently different, wear rates will differ too. Generalised predictions on the wear rate of a given material will inevitably lead to certain installations where the brick does not last as long as the system predicts. However, making decisions based solely on the predictions of such a system is unrealistic for most cement professionals, considering the potential risk of costly unexpected downtime.

There are many case histories that demonstrate the capability to extend refractory life through careful monitoring of kiln shell temperatures. Infrared temperature scanning systems have shown their usefulness in cement plants around the world. Modern systems are adding ever more functionality to provide the cement professional with timely and complete data. In an era where everyone is asked to deliver higher and higher efficiency, infrared scanning systems are becoming an essential part of the toolkit.

Maintaining TPW cells for accurate temperature measurement

Fixed-points, sometimes called intrinsic standards, are used to define the International Temperature Scale of 1990 (ITS-90). The most commonly used fixed-point is the triple point of water. The triple point is described as the temperature and pressure at which a substance can exist in equilibrium in liquid, solid and gaseous states. The triple point of pure water occurs at approximately 273.16 Kelvin, or 0.01°C and 611.657 Pa and is standardly used to calibrate thermometers.

Triple point of water cells, used to create this thermal equilibrium across the three phases of pure water, fulfil four critical purposes in respect of temperature measurement in industry.

First, they provide the most reliable way to identify unacceptable thermometer drift between calibrations – including immediately after a calibration if the thermometer has been shipped. Interim checks are essential to maintain confidence in thermometer readings between calibrations.

Second, they provide a critical calibration point with minimal uncertainties.

Third, for users who characterise probes using ratios (that is, they use the ratios of the resistances at various ITS-90 fixed points to the resistance of the thermometer at the triple point of water, indicated by 'W'), interim checks at the triple point of water allow for quick and easy updates to the characterisations of critical thermometer standards. These can be used to extend calibration intervals.

And lastly, the triple point of water is where the practical temperature scale (ITS-90) and the thermodynamic temperature scale meet, since the triple point of water is assigned the value 273.16 K (0.01°C) by the ITS-90 and the Kelvin is defined as 1/273.16 of the thermodynamic temperature of the triple point of water.

Good triple point of water cells contain only pure water and pure water vapour. There is almost no residual air left in them. When a portion of the water is frozen correctly and water coexists within the cell in its three phases, the triple point of water is realised.

Fluke Calibration's 9210 Mini Triple Point of Water (TPW) maintenance apparatus is available from Comtest. It is pre-programmed for the simple 'supercool-and-shake' realisation and maintenance of the 5901B Mini TPW Cell. The user simply inserts the cell, enters the 'freeze mode' via the front panel buttons and, in a short space of time, the 9210 will alert the user via an audible signal that the mini cell can be removed. Shaking it will initiate the freezing of a portion of the water. On reinsertion of the cell, the program can be changed to 'maintain mode' and then it is at 0.01°C for the balance of the day, with an uncertainty of only + 0.0005 °C.

Key features of the TPW maintenance apparatus include its providing for easy pre-programmed realisation of the TPW; it offers an inexpensive fixed-point solution; and it is easy to use – training can be completed in less than an hour.

For more information contact Comtest. Tel: +27 (0)10 595 1821, email: sales@comtest.co.za

Fluke Calibration's 9210 Mini Triple Point of Water (TPW) maintenance apparatus is available from Comtest.

Bimetal thermometer with switch contacts

WIKA's model TGS55 is a stainless steel bimetal thermometer that offers high reliability and long service life.

Wherever the process temperature has to be indicated onsite and, at the same time, circuits need to be switched, the bimetal thermometer with switch contacts finds its use.

Switch contacts make or break circuits, depending on the pointer position of the indicating measuring instrument. In the TGS55, the switch contacts are adjustable over the full measuring range and the instrument pointer moves freely across the entire scale range, independent of the setting.

The set pointer can be adjusted via the window using a removable adjustment key (mounted on the terminal box).

Switch contacts consisting of several contacts can also be set to a single set point. Contact actuation is made when the actual value pointer travels beyond or below the desired set point.

As switch contacts, inductive contacts and electronic contacts are available. Inductive contacts can be used in hazardous areas. For triggering programmable logic controllers (PLCs), electronic contacts can be used.

For more information contact WIKA Instruments. Tel: +27 (0)11 621 0000, email: sales.za@wika.com

The TGS55 bimetal thermometer is designed for applications where process temperature needs to be tracked and circuits need to be switched.

Key considerations in private power purchase agreements

Just more than two years ago, the first power was generated under the largest single rooftop solar power purchase agreement (PPA) in Africa, at Pick n Pay's Longmeadow Distribution Centre near Johannesburg. Energy Partners Solar – a division of Energy Partners and part of the PSG group of companies – completed Phase 1 of this project, which would eventually amount to 2.4 MW of solar generation capacity.

AT A GLANCE

- The 2.4 MWp solar pv system at Pick n Pay's Longmeadow Distribution Centre still sets multiple benchmarks for corporate and industrial solar power supply.
- Any investment in solar power is a long-term commitment. In private power purchase contracts, the efficient operation and maintenance of solar plant is crucial to performance and best handled by specialised O&M teams.

Apart from its scale, the 2.4 MWp photovoltaic (PV) system at the distribution centre still sets multiple benchmarks in the rapidly growing corporate and industrial solar power supply industry in Africa.

Manie de Waal, CEO of Energy Partners Solar, says that corporate and industrial PPAs with private service providers have become an important consideration for long-term business profitability in South Africa, as well as a way to reduce business risks in the shadow of irregular power supply and uncertainty around the future of the state-owned central grid.

He adds that two years ago, corporate SA had a cautious approach to exploring alternative sources of power. "Today there is no time for caution – it's time to take power back for the sake of our economy."

Some key facts about the solar PV system at the Longmeadow Distribution Centre system provide an idea of the scale and potential of this bold joint initiative, which was achieved without the need for capital investment from Pick n Pay. Energy Partners Solar designed, built and operates the PV system in its entirety.

Key facts – solar PV at Pick n Pay's Longmeadow Distribution Centre

- *2 400 kWp – system size*
- *7 200 – number of solar modules*
- *14 800 – number of roof brackets*
- *111 km – cable used*
- *82 200 MWh – estimated power generation over 25 years*
- *79 700 tonnes CO_2 – equivalent offset of solar generation*
- *30 000 ha – equivalent mature forest in CO_2 offset.*

As the Longmeadow system was contracted and built before November 2017, it was not restricted by current legislation which limits the system size of embedded generation to 1 MW. These restrictions would have halved the size of the Longmeadow system if it had not applied for a generation license from NERSA (the National Electricity Regulator of South Africa).

De Waal says, "Considering recent announcements by the Department of Mineral Resources and Energy (regarding the application for generation licenses for 1 to 10 MW embedded generation systems), there seems to be more political will once again to encourage bold initiatives such as this."

In this regard, he says, many companies that were restricted in system size over the past two years have shown interest in starting the submission process to apply to Nersa, to enlarge their systems and unlock the full potential for on-site solar power generation and consumption.

Reviewing the Longmeadow transaction, Henri van Eetveldt, Senior Solar and Storage Consultant

There are 7 200 solar modules in the 2.4 MWp PV system at Pick n Pay's Longmeadow Distribution Centre.

at Energy Partners, points to some of the important factors to be considered before entering into power purchase agreements of any nature.

Insist on a savings guarantee

To start, van Eetveldt says that every PPA should be based on a predetermined performance agreement. "The agreement should state explicitly how much the service provider's rate for electricity will be and provide a guarantee that these rates will always be meaningfully less than the tariff of the grid alternative."

The installation at the Longmeadow Distribution Centre was commissioned as part of Pick n Pay's fifteen-year campaign to halve its electricity consumption by 2025. The PV system is designed to reduce the retailer's total grid usage by a significant 6%, and the savings guarantee ensures that the service provider reaches this production target.

In addition, the client needs to ensure that the PPA contract guarantees annual energy production targets. If production targets are not met for any reason, the client should be able to claim penalties from the service provider.

Ensure a strong track record

According to van Eetveldt, the track record of the service provider should also be an important deciding factor when entering into a PPA. "PPAs are typically long-term agreements and it is important to partner with service providers who will be there in the long run in this fast-changing industry. This means choosing a partner that has adequate financial backing, and has already built up a reputation as a reliable service provider."

Another aspect where a strong track record is advantageous is in the drafting of contracts with new clients. "Contracts need to be updated regularly to ensure that they are watertight for all parties involved and you need a service provider who has enough industry experience to understand that a one-size-fits-all approach does not apply to PPA contracts. Each business has unique requirements, which need to be worked into a contract."

On the Longmeadow project, for example, Energy Partners Solar had to ensure that transparent buy-out values were written into the contract. This affords Pick n Pay the option to exit the PPA at any time, if the need arises.

Operation and maintenance efficiency is key

Any investment in solar power is a long-term (25 years and more) commitment. Solar power generation in the South African corporate and industrial market has grown rapidly over the past five years and currently exceeds 700 MW of embedded generation capacity.

"As many of these system owners have come to realise, the efficient operation and maintenance (O&M) of these assets is crucial and best handled by specialised O&M teams," says Dewaal van Heerden, Head of O&M at Energy Partners Solar, who will soon be monitoring and maintaining more than 50 MW of rooftop and ground-mount solar systems across Africa.

He points out that, "If the performance of a PV system decreases by as little as 12%, beyond the expected panel degradation, the losses to cost-savings will exceed the price of the entire system over its lifetime. Dirt and pollution can hypothetically reduce system performance by up to 40%, while micro cracks, potential-induced degradation losses and physical damage can cut performance by a further 32%."

The most important driver of savings on a PV system (apart from the avoided grid supply cost) is the actual solar yield that can be achieved. The O&M team's task is to ensure that this number is always as close as possible to the yield for which the system was modelled.

When judging solar yield a number of aspects should be considered:

- The original yield estimation without any soiling losses
- The allowance for soiling (especially difficult to estimate on rooftop systems)
- The weather patterns for the period under review
- The effect of factors outside the solar provider's control (load shedding or client shut-downs).

Van Heerden notes that since commissioning, the Longmeadow system has achieved the exact modelled yield (actual weather patterns delivered

The efficient operation and maintenance of embedded power generation assets is crucial and best handled by specialised O&M teams.

1.3% below modelled), while actually losing 0.9% to factors outside of the solar provider's control (such as load shedding).

He adds that there has been only a small impact on demand (kVA) charges at Longmeadow – as the site runs 24 hours a day, 365 days a year with a resultant 'flat' consumption profile. However, this was no surprise for the client, as the Energy Partners engineering team provided for this in its saving estimates.

Van Heerden recommends that potential investors in solar power pay detailed attention to any solar savings estimations presented by the service provider, as these can easily be overstated.

Ensure roof integrity

Van Eetveldt emphasises that the service provider party to the PPA must ensure that the integrity of the client's roof will not be compromised. "The roof can be the most expensive element of the building, which is why the service provider needs to ensure that there is no risk that it will suffer any damage as a result of the installation of the PV system."

A professional roof report by a structural engineer is crucial when designing the panel layout, he notes. "At the Longmeadow site, the extensive roof area allowed the installation team to distribute the weight of the system more efficiently. We were able to mount solar modules directly over the support beams of the roof, ensuring that the structure is subjected to the least stress possible."

He adds that the integrity of the roof also needs to be considered when planning the ongoing maintenance of the system. "Walkways need to be planned and installed so that technicians can access panels without causing any damage to the roof, throughout the life cycle of the system. An experienced service provider will also ensure that other risks, such as corrosion from concentrated drips, are mitigated."

Aim for full integration

Lastly, Van Eetveldt says that a PPA works best when it is integrated with other solutions that can further save on energy costs. "As an example, at the Longmeadow site, we identified an opportunity to pair the PV system with an outsourced lighting solution, which yielded additional savings. Similarly, solar panels and state-of-the-art outsourced refrigeration is among the best matches to save on operating costs. Integration with generators and batteries have also started to form part of some of our PPA agreements."

He points out that integrating PPAs and different cost-cutting saving services is a skill on its own. It is therefore important to have a service provider with the experience and capabilities to ensure that the combined solutions are effective.

De Waal says, "We predict that within a few short years PPAs will become the norm for businesses in South Africa – and not only solar PPAs. We see more clients turning towards full outsourcing of their utilities, which is a huge departure from the traditional 'all under one roof' approach. This speaks directly to the Energy Partners vision – to provide the cheapest, most reliable and most sustainable power, water, cooling and steam in Africa."

Founded in 2008, Energy Partners is a leading energy solutions provider in South Africa, providing clients with innovative solutions (including fully outsourced supply contracts in, for example, power, water, steam and cooling) to suit their needs. Energy Partners has built a team of talented individuals and robust processes which offer end-to-end solutions and integrate the different components of energy optimisation to deliver optimum results, including capital solutions that put clients in a positive cash flow position from day one. Industries in which Energy Partners specialises include: food retail, retail, healthcare, hospitality, food processing and logistics.

PSG Group is an investment holding company consisting of underlying investments that operate across industries which include financial services, banking, private equity, agriculture and education.

At the Longmeadow site, the extensive roof area enabled the installation team to distribute the weight of the system efficiently, ensuring that the structure is subjected to the least stress possible.

Mini grids offer potential for **universal energy access**

AT A GLANCE

- Decentralised mini grids, powered by solar energy, can support rural economic development.
- This is demonstrated in the case study on Onibambu in Nigeria.
- The technology exists. We need to develop local skills to manage mini grids.

At the recent World Economic Forum (WEF) on Africa, held in Cape Town in September, Caspar Herzberg, President, Middle East and Africa at Schneider Electric, was part of the panel discussion on Universal Energy Access, on the first day of the conference. This discussion was linked to the track focused on: Shaping the Future of Energy.

More than 600 million people in sub-Saharan Africa do not have access to electricity. This impacts severely on ambitious aims for inclusive growth. The panel discussed what models could support the continent in reaching universal energy access by 2030 – ranging from renewable energy storage to smart grids and more.

"It is easier to supply energy to urban areas, but urbanisation is not a positive phenomenon. If one travels around Africa and looks at the power lines above and townships below, the difficulty is in the last 50 metres, where there are many social issues," Herzberg said.

"Globally, there is a trend towards decentralised grids and, with mini grids, we have the opportunity to create an integrated approach, to make cities more liveable and efficient. Equally, we want to focus on mini grids in rural areas, to reverse the trend of rural-urban migration.

"One thing we have found is that when you put a functioning mini grid, with a business model, in a previously disconnected community, it reverses that trend and creates a new local hub. An excellent example of this is the Onibambu, Nigeria case study, where Arnergy, a Nigerian solar power company, solved rural electrification in collaboration with Schneider Electric and the Bank of Industry (BOI)." (See below)

"Providing access to energy to 600 million people in sub-Saharan Africa may seem an attractive investment opportunity from the sheer numbers,

Rural Nigerian mini-grid creates business

To provide rural off-grid electrification to communities across Nigeria, as a means of curbing rural-to-urban migration and promoting security and development in non-urban centres, the Bank of Industry (BOI) rural electrification projects began with Arnergy at Onibambu/Idi-Ata.

Onibambu is located in the Ife-North local government area of Osun state. It is a village of about 200 houses, which have never been connected to the national grid. The inhabitants rely on candles, kerosene and a handful of petrol generators to run their businesses and daily lives. The community is situated close to the Obafemi Awolowo University, an hour from the major city of Ibadan and another hour and half from Lagos. The indigenous people are traders, artisans (basket weavers) and farmers.

In its rural electrification initiative, BOI awarded GVE and Arnergy contracts – in the form of loans – to develop solar microgrids in six rural communities across all geopolitical zones of Nigeria. These projects constitute a pilot programme to lay the groundwork for many more such projects in the future. The microgrid solution chosen was designed as a 24 kWp system, capable of servicing 200 rural homes and businesses with minimal load. In addition to the solar microgrid, 22 streetlights were provided along the major routes and key points of the community, improving security and brightening up the village at night.

Schneider Electric's Conext family of solar and battery-based inverter/charger systems, with online monitoring, was selected as the most reliable technology

but if it were easy it would already have been done.

"The challenge is the business model around mini grids. What do people do with the energy, how do we integrate mini or microgrids into local economies, how can this be done sustainably and, more importantly, how do we maintain and operate microgrids? To make this work, basic electrical skills are needed, at scale, and that is where a public private partnership needs to work to build these skills. Schneider Electric is not just about building factories but is also concerned with investing in people and skills development, as we have done in South Africa for over 30 000 people.

"Further, there is the question of off-grid and on-grid, but this can be managed by the digitalisation of the smart grid to ensure integration. The technology is available, we now need to deploy a national matrix so that the off-grid/on-grid interface can be well managed. There is no real conflict between the two. It is more about how they can work together to support universal energy access. This is an expertise that Schneider Electric can offer," Herzberg said.

Caspar Herzberg, President, Middle East and Africa, Schneider Electric.

Schneider Electric provides digital solutions for energy supply, energy management, efficiency and sustainability. It combines world-leading energy technologies, real-time automation, software and services into integrated solutions for homes, buildings, data centres, infrastructure and industries. Schneider Electric is committed to unlocking the possibilities of an open, global, innovative community.

for the initiative. The installation included MPPT 80 600 PV solar charge controllers and XW+ hybrid inverter chargers, at an estimated loan cost of N75.8 million (Nigerian naira). Arnergy is using the Conext insight monitoring solution to ensure that its microgrid is performing according to specification. It also monitors how much energy is being consumed by the people.

A prepaid metering package was set up to aid the repayment process. A pay-as-you-go scheme was introduced, where members of the community pay for just the amount of electricity they need. A household can pay as little as N100 or N200 to meet its electricity needs.

The broader goal of this project is to stem the tide of rural-urban migration and the Onibambu project surpassed all expectations. The population of Onibambu has increased and the village has become an example of urban-rural migration. Businesses from neighbouring towns are moving to Onibambu.

Impacts to micro, small and medium scale businesses have been immediate. Four new businesses were set up in frozen foods and refrigeration. For instance, a resident trader, who used a generator to power her freezers, often paying over the market price for fuel, can now run her business successfully. In another example, a blacksmith from Modakeke was contemplating closing his business due to the high cost of powering his forge, until he heard about the microgrid system 30 km from him. He now runs a successful workshop in Onibambu.

High-pressure gas metering stations

South African company Energas Technologies, a leading supplier of high-end and specialised equipment to the oil and gas industries in Africa, has supplied a high-pressure customer metering station (HPCM) to a customer in Mozambique.

Energas specialises in the supply of complete skid-mounted HPCMs for natural gas. The skid-mounted stations are designed, shop fabricated and assembled, fully tested and packaged before being transported to site.

The skid includes filtration, pressure reduction, over-pressure protection and metering. The station supplied to Mozambique will reduce the pressure from 55 bar (inlet line pressure) down to 1 to 3 bar (outlet pressure to the user) within one stage of pressure reduction. The station has a single run and a flow capacity of 200 Sm^3/h. A second run can be added for redundancy if required.

The station includes the skid frame, piping, insulation joints, pressure regulator valve, slam-shut valve, pressure relief valves, gauges and isolation valves. It is designed according to ASME B31.8 (gas transmission and distribution piping systems).

Natural gas, as an alternative energy source to electricity, diesel, coal or LPG, is a reliable, clean, safe and affordable solution for industrial users requiring energy for heating processes. Natural gas can be supplied via a pipeline network or by means of compressed natural gas cylinders to users not close to a pipeline.

For more information contact Laetitia Jansen van Vuuren at Energas Technologies. Tel: +27 (0)11 397 6809, email: laetitia@energas.co.za

The skid-mounted high-pressure gas metering station was shop fabricated and assembled, fully tested and packaged before being transported to site.

ACI technology in surge arresters

In South Africa and internationally, we are seeing transitions in power supplies. DEHN's new Advanced Circuit Interruption (ACI) technology is equipped to deal with the issues being brought about by new energy mix possibilities, as well as the ongoing uncertainty surrounding stable supply from the national grid.

Hano Oelofse, managing director at DEHN Africa, says, "ACI technology is brand new – a first in the market and a product of DEHN exclusively. The new DEHNguard surge arrester with ACI technology allows the user to save space, time and costs. DEHNguard is a pre-wired, complete unit that consists of a base part and plug-in protection modules."

Oelofse says ACI technology presents a technical solution to dimensioning issues, which eliminates the need to select the right backup fuse or conductor cross-section, in turn increasing the safety of the electrical installation and saving space.

"The technology also removes leakage current, preventing ageing of the protective device and saving the time and expense of replacing arresters ahead of schedule. In addition, DEHNguard ACI prevents the accidental tripping of the insulation monitoring, contributing to operational safety."

DEHNguard with ACI technology has recently become available in South Africa through DEHN Africa. It offers a number of benefits.

- ***Safe dimensioning, eliminating mistakes***

With ACI arresters, users can avoid making certain configuration errors that can occur when selecting and dimensioning a suitable backup fuse. This increases the availability of the system. The new switch/spark gap combination is integrated directly into, and ideally adjusted to, the arrester. The user does not need to spend time and effort selecting the correct fuse size and tripping characteristics.

- ***Withstanding temporary over-voltages***

Temporary over-voltages (TOV), caused by loss of neutral, for example, can destroy conventional surge protective devices. The new ACI arresters have a much better capacity to withstand TOV, which increases system availability and prevents wasting time and money on repairs.

- ***Zero leakage current***

The ACI technology eliminates leakage currents. This prevents premature ageing of the arresters and the time and expense of replacing arresters ahead of schedule. ACI arresters also avert the accidental tripping of the insulation monitoring and contribute to operational safety.

- ***Connection cross-section of just 6 mm²***

A conductor cross-section of just 6mm² is sufficient, allowing the installer to save on the time that otherwise needs to be spent dimensioning the cross-section. The size also makes installation easier because the radiuses are smaller and the wing shorter.

"Renewable power generation is creating new grid parameters and isolated grids and storage systems are changing short-circuiting conditions. With DEHN's ACI technology, users can future-proof grid parameter requirements, at the same time adapting to the legacy issues of today," Oelofse says.

For more information contact DEHN Africa. Tel: +27 (0)11 704 1487, or visit: www.dehn-africa.com

Advanced circuit interruption technology in surge arresters advances safety in power supply and offers space-, time and cost-saving benefits.

Portable CO_2 monitoring device

The measurement of carbon dioxide (CO_2) emissions is a critical activity throughout industry. Across many industries, CO_2 leaks in equipment, resulting from inadequate maintenance, mechanical damage or wear and tear, can impact on the wellbeing and safety of employees and on the related manufacturing processes – in the food, beverage and refrigeration industries for example.

Adding to its already extensive range of instrumentation, Greisinger, part of the GHM group of companies, has launched the new G 1910-02 and G 1910-20 mobile, handheld CO_2 measuring devices. The compact CO_2 monitors incorporate integrated sensors and optical and acoustic alarm functions. They also have long-lasting rechargeable batteries and offer easy battery charging and a wide measuring range.

"From breweries, wine presses and dispensaries to heating, ventilation and air-conditioning to energy management in buildings and use in research and education, the newly launched CO_2 measuring device fits perfectly into the hand and can be taken anywhere. It is a conveniently portable and cost-effective device," says Jan Grobler, Managing Director of GHM Messtechnik South Africa.

"Every mining or pulp and paper plant, for example, needs to monitor the operating environment and this device offers a wider measuring range than usual, reaching up to 2 000 ppm in the G 1910-02 version and as much as 19 999 ppm with the G 1910-20 model. Additionally, having a calibration connection enables the customer to recalibrate the device themselves, or we can do it for them. This eliminates the need to for devices to leave the place of operation for recalibration," Grobler adds.

Benefits include the long-lasting rechargeable battery with low power consumption, which enables measurements over a period of 24 hours. Standard AA NiMH batteries can be used and recharged via the micro USB connection with a standard micro USB charging cable, without the need for a special mains adaptor. The device has an easy-to-read display with backlighting.

The monitoring instruments also incorporate alarms useful for various applications: in air quality monitoring, green houses, and for energy management. The CO_2 is measured with a high-quality non-dispersive infrared (NDIR) sensor via an opening at the instrument's head. The display of the time-weighted average (TWA) over eight hours or 15 minutes can be read simultaneously.

Grobler adds, "CO_2 is dangerous at a concentration of more than 3%. These new portable CO_2 monitoring instruments are ideal for warnings of moderate but non-dangerous levels. They offer an impressive price/performance ratio and high durability, as is expected with German precision manufactured instrumentation."

For more information contact Jan Grobler at GHM Messtechnik South Africa. Tel: +27 (0)11 902 0158, or email: info@ghm-sa.co.za

The new Greisinger portable CO_2 metering devices provide efficient warnings on abnormal CO_2 levels in the industrial environment.

The power of remote monitoring

As Eskom's most recent round of load shedding confirmed, South Africa is an increasingly energy-uncertain country. With the national utility facing daunting financial and technical challenges, electricity users can no longer bank on uninterrupted national supply.

For businesses and facilities where uptime is critical, such as data centres, factories, construction companies, mines and telecoms providers, alternative solutions are needed.

Master Power Technologies (MPT) supplies backup power solutions that ensure uptime and good quality power that will not compromise critical equipment. The company's mostly turnkey solutions include uninterruptible power supplies (UPSs), generator sets, fuel systems, battery and energy management processes.

However, even the best backup power solutions are not infallible. In response to this, MPT has developed a comprehensive automated remote monitoring capability.

Rory Reid, Sales and Marketing Director at MPT, says, "The Master Power Universal Controller (UC) is at the heart of our remote monitoring system. Conceived and developed by our in-house R&D team, the UC is a range of application-specific hardware and software that controls and monitors all components of our backup power solutions.

"The UC provides real-time hardware and software monitoring and internal intelligent automatic action to mitigate potentially critical issues that could cripple essential functions. The MPT team of experienced and skilled technical experts monitors customer systems from our 24/7/365 network operating centre, and site assistance is deployed before a situation reaches critical points. For breakdown support or routine maintenance, our response time is excellent. We also have the advantage that we own and operate workshops that keep stock of frequently used spares."

With the UC as a backbone, MPT has developed several product applications to improve and expand its remote monitoring capability.

Triple change-over controls consist of multiple devices or boards which are connected to form a system that controls the source selection of an electrical system, such as power-metering, switching breakers with and without interlocks, reading breaker status and generator management. The main function of the triple change-over is to select and then operate any of the three sources connected to it in order to provide power to the site. It is a standardised control tool for power management in data centres and power-critical sites.

Base transceiver station (BTS) NewLife remote monitoring is a desktop and mobile phone app that remotely monitors sites and generates equipment reports. The sophisticated generator controller's technology actively monitors electrical equipment to ensure it is operating at optimal capacity, and to pre-empt any problems. It also allows the remote starting and stopping of equipment. It is used in high-resilience installations where uptime is critical.

MPT's remote management system monitors all alarms and the condition or status of secure power equipment in critical areas such as data centres. This includes environmental monitoring – humidity, temperature, intrusion detection and CCTV monitoring.

Every UPS is only as reliable as the batteries providing the backup power; hence, companies must ensure that their batteries are functioning optimally at all times. BattSure is a battery manager that provides customers with surety of site performance according to design specifications. The technology protects a site by monitoring the safe and correct operation of its batteries, which is vital for uninterrupted power supply. Designed to monitor the status of UPS batteries continually, BattSure sounds a warning as soon as one or more batteries show signs of a fault, before they can damage other cells in the UPS. BattSure monitors the string current, voltage and temperature of each battery to determine the state of charge, state of health, and alarm conditions according to standard IEC-62060.

When the UC detects an issue – anything from a mains failure to a battery failure in a UPS installation – it raises an alarm. In response, the operators at the remote monitoring centre follow standard operating procedures to deal with the issue. As the UC monitors the situation in real time, a log is kept of the performance of all electronic equipment under observation. This provides customers with a clear understanding of the status and performance of their systems.

In addition to improving availability, reliability and uptime, MPT's remote monitoring capability helps maintain optimal operational costs by reporting on any deviations in the efficiency matrices.

"The high number of clients we monitor via our network operating centre is testimony to the value that the remote monitoring system provides to the overall data centre solutions that we offer," says Reid.

For more information contact Master Power Technologies. Visit www.kva.co.za

BattSure is a battery management system developed to monitor the operation of UPS batteries, to ensure consistent backup power or raise an alarm when battery faults are indicated.

B2Gold's Fekola solar project, Mali

Solar energy has become a keenly competitive energy source. In off-grid energy systems, solar energy combined with conventional energy generation and battery storage can provide secure power through day and night.

B2Gold operates the Fekola gold mine in Mali, West Africa, where Suntrace GmbH in partnership with BayWa r.e. completed a preliminary study earlier this year evaluating the technical and economic viability of adding a solar battery plant to the mine site.

Following from the results of the study, B2Gold approved a US$ 38 million project for implementation in 2019-2020, which will be one of the world's largest off-grid solar battery hybrid systems. Construction will start at the end of 2019 and is scheduled for completion in August 2020.

Suntrace and BayWa r.e. were selected as solar experts to support B2Gold in the implemention of the project, providing all required technical expertise, such as detailed engineering, procurement support and support during construction and commissioning until completion of the project.

Martin Schlecht, COO of Suntrace, said, "This signals B2Gold's strong commitment to build such a significant solar-battery plant as a fuel saver for the Fekola mine. The project is a landmark in terms of battery and PV plant size in an off-grid project. We are proud that B2Gold has entrusted Suntrace and BayWa r.e. as experts to support the implementation of this project."

Tobias Kriete, Regional Manager Africa at BayWa r.e. Solar Projects GmbH, commented further: "This is a great achievement for B2Gold and its move towards sustainable production. The fuel savings will enable repayment on the investment as well as lower energy costs and cut carbon emissions."

Philipp Kunze, Head of BayWa r.e. Solar Projects's Global Hybrid Team added that the realisation of this innovative system highlights the hybrid expertise of Suntrace and BayWa r.e.

The PV-battery system will be integrated with the existing power plant to ensure safe and reliable operation of the hybrid and allow fuel savings of 13.1 million litres of heavy fuel oil (HFO) per year. The solar battery system will cut total energy costs and CO_2 emissions significantly. Electricity for the mining site is currently generated exclusively by HFO and diesel generators. The addition of the 30 MW net capacity solar battery plant will allow the mine to shut-off up to three HFO engines during daylight hours, with the 13.5 MWh battery storage providing the buffer for irradiation fluctuations.

Suntrace and BayWa r.e, will implement the project with B2Gold until it goes into operation and will thus make a significant contribution to sustainable power generation for mines in West Africa.

For more information email: Sabrina.braemer@suntrace.de or: felix.gmelin@baywa-re.com

B2Gold has given the go ahead for construction of a PV solar battery storage system at its Fekola gold mine in Mali.

Nesa Investment Holdings acquires Makro solar sites

Nesa Investment Holdings, a local renewable energy fund that invests in commercial and industrial-scale renewable energy systems, recently acquired the portfolio of Makro's carport solar photovoltaic (PV) systems, located at various Makro stores countrywide.

The solar PV systems generate clean, affordable electricity that is fed directly into the Makro stores, enabling them to reduce their monthly electricity bills. Solar PV also assists in relieving pressure on the national grid.

The Makro sites include stores at Woodmead, Riversands, Carnival, Strubens Valley and Springfield, with construction scheduled to begin soon on the Silver Lakes site in Pretoria. The acquired portfolio has the capacity to generate some 4.4 million kWh and offset 4 700 tonnes of CO_2 emissions per year. The Strubens Valley store alone has a 480 kW peak plant output that is estimated to produce one quarter of the store's annual energy needs.

In the latest transaction, an additional two rooftop solar PV sites were acquired, bringing Nesa Investment Holdings' assets under management to R158 million across 40 sites in South Africa.

Peter Frolich, Director at Nesa Investment Holdings, explains: "Through a 20-year management agreement, we commit to covering the full installation cost of the solar PV systems and maintenance to ensure optimal performance. Our clients benefit from immediate savings in energy costs with zero capital expenditure."

The electricity generated by the systems is sold to Nesa's clients at a discount to their current municipal utility tariffs and prices escalate annually at fixed rates. This model protects clients against abnormal tariff hikes in future.

"More corporates are looking for alternative energy sources, but developing, finding or managing alternative energy does not form part of their core business," says Frolich. "Our organisation can supply and operate the most appropriate solutions for each site. We guarantee a minimum quantity of energy, allowing our clients to focus on their business while saving energy costs."

The latest acquisition positions the fund as a leading independent investor and operator of commercial and industrial-scale renewable energy generation facilities. The fund's current installed generation capacity is 6.6 MWp and is expected to grow to over 11 MWp by the end of 2019, with more than 20 additional solar PV sites currently at various stages of completion across South Africa.

The acquisition was funded from capital raised from Nesa Investment Holdings' shareholders, as well as a debt facility provided by Absa's Retail and Business Bank (RBB SA).

Justin Schmidt, Head of Renewable Energy at RBB SA, says, "With a significant reduction in the cost of solar module prices over the past decade and increases in the cost of electricity, solar PV has become a cost competitive solution. We are committed to the renewable energy sector and funding of commercial and industrial solar PV installations."

For more information visit Nesa Investment Holdings: www.nesacapital.co.za

Data centre backup and recovery solutions

Veritas Technologies, a worldwide leader in enterprise data protection and software-defined storage, was recently again positioned as a Leader in Gartner's 2019 Magic Quadrant for Data Centre Backup and Recovery Solutions. This marks the 14th consecutive time that Veritas has been recognised as a Leader in the report[1].

Deepak Mohan, Executive Vice President, Enterprise Data Protection and Compliance at Veritas says, "Ninety-nine percent of the Fortune 100 trust Veritas to protect their data, simplify how they manage it, and ensure the continuity of their businesses through our data protection and availability solutions. Gartner has recognised us as a Leader in the Magic Quadrant for Data Centre Backup and Recovery Solutions for the 14th time in a row. Considering Veritas protects more data across on premise, virtualised and cloud environments than any other data protection company, we believe the world's leading enterprise companies can be confident we will continue to provide them with innovative availability, protection and insights solutions to ride the technology disruptions in today's and tomorrow's IT environments."

According to Gartner, "Leaders have the highest combined measures of Ability to Execute and Completeness of Vision. They have the most comprehensive and scalable product portfolios. They have a proven track record of established market presence and financial performance. For vision, they are perceived in the industry as thought leaders and have well-articulated plans for enhancing recovery capabilities, improving ease of deployment and administration, and increasing their scalability and product breadth.

"A fundamental change is occurring in the backup and recovery market. For vendors to have long-term success, they must plan to address the legacy requirements of traditional backup and recovery, while looking to expand their integration with and exploitation of emerging applications, hypervisors, snapshot and replication technologies, and public cloud capabilities. A cornerstone for Leaders is the ability to articulate how new requirements will be addressed as part of their vision for recovery management.

"As a group, Leaders can be expected to be considered part of most new-purchase proposals and to have high success rates in winning new business. This does not mean, however, that a large market share alone is a primary indicator of a Leader. Leaders are strategic vendors, well positioned for the future having established success in meeting the needs of upper-midsize and large data centres."

According to the Gartner report, "Veritas NetBackup is a mature product that is proven in the most demanding environments. It is favoured by large organisations with a complex mix of legacy, traditional and modern workloads."

Key NetBackup™ innovations include:

- Scalable data protection – proven scale in demanding environments with several customers deploying multiple petabytes and more than one thousand clients in a single environment. Scalable data protection gives organisations the confidence of recovering large environments in the face of ransomware, data loss or other threats to modern enterprises
- Automated, multi-cloud integration – supports a broad range of operating systems, hypervisors and relational databases, providing organisations unified data protection regardless of where they are on their cloud journey
- Extensive storage options – integrates with a wide range of storage arrays, object storage, public cloud targets and tape device vendors, ensuring seamless integration into heterogeneous environments.

[1] Previous titles include Magic Quadrant for Enterprise Backup Software and Integrated Appliances (2014-2015), Magic Quadrant for Enterprise Backup/Recovery Software (2011-2013), Enterprise Backup and Restore Magic Quadrant (2001, 2003-2005), Enterprise Backup Vendor Magic Quadrant (1999-2000). From 2005-2015, Veritas Technologies was known as Symantec.

Veritas Technologies is a global leader in data protection and availability. Over 50 000 enterprises – including 99% of the Fortune 100 – rely on Veritas to abstract IT complexity and simplify data management. Veritas Enterprise Data Services Platform automates the protection and orchestrates the recovery of data everywhere it lives, ensures 24/7 availability of business-critical applications, and provides enterprises with the insights they need to comply with evolving data regulations. With a reputation for reliability at scale and a deployment model to fit any need, Veritas supports more than 500 data sources and over 150 storage targets, including 60 clouds.

For more information on Veritas Technologies visit: www.veritas.com

Skills for advanced manufacturing and automation

The National Science and Technology Forum (NSTF) recently hosted a Discussion Forum looking at how new technologies in the Fourth Industrial Revolution (4IR) have the potential to transform and advance manufacturing industries in South Africa. The discussion forum explored the current context, a range of initiatives in this environment and what is realistically feasible considering the challenges the country and the manufacturing sector specifically are facing.

The discussion forum was held over three days in Cape Town in September and was coordinated by the NSTF proSET sector (professionals in science, engineering and technology) in parallel with the South African Innovation Summit.

The Intsimbi Future Production Technologies Initiative was highlighted by a number of speakers, including Ilse Karg, Chief Director: Future Industrial Production Technologies, Industrial Development Division (IDD) at the Department of Trade and Industry (the dti), and Johan McEwan, CEO of the Production Technologies Association of South Africa (PtSA).

The initiative is a partnership between government (the dti and the Department of Higher Education and Training), the PtSA and industry. It is a talent-driven innovation model and the pilot is already showing success. McEwan said, to date, some 2 500 students have been trained and 95% of them are employed in the manufacturing sector.

The initiative is run by the National Technologies Implementation Platform (NTIP), a project management company owned by PtSA. At the discussion forum it was covered in more detail by Dirk van Dyk, CEO of the NTIP.

Van Dyk said Intsimbi exists as part of the solution to ensure South Africa actually has manufacturing industries in the future. The programme is seen as one of the systemic solutions to industry's needs for advanced manufacturing skills and it is already in process. It focuses on skills development and training as well as building enterprise competitiveness in the advanced manufacturing sector.

Van Dyk said, with the changes in industrial manufacturing technologies brought about with 4IR, traditional manufacturing skills are no longer adequate and we need to look at future skills required for production systems. The disruptive environment is placing jobs at risk and the manufacturing skills gap is widening globally.

Van Dyck said the manufacturing sector in South Africa is tackling the problem directly to stop the sector's decline. We need to learn from Germany, China, Korea and the USA where manufacturing sectors are growing, he said.

The future will entail cooperation between people and technology and hybrid systems. From a manufacturing perspective, van Dyck said, the human element cannot be de-coupled completely from the process because of the human capacity for innovation. Consciousness and creativity are not inherent in machines. It is important to understand the partnership between people and technology to move forward from present training curricula, which restrict students' employability.

Industry associations including the PtSA, the Manufacturing Circle, SAIMC and smaller organisations such as the Welding Association, agreed to support an industry-led programme. This led to the formal partnership between industry and the dti and the foundation of the Intsimbi Future Production Technologies Initiative.

The programme bridges skills, enterprise development and funding, and is systemic rather than curriculum-based. It is a sustainable solutions-based approach to developing the competitiveness of industry, encouraging the creation of new businesses, facilitating the deployment of talent and skills and creating innovation capacity in the sector.

It starts with identifying talent. The skills development and training process is based on a proprietary ICT platform that comprises nine components in a blockchain-controlled environment. Based on global industry standards, it moves to learning frameworks and then student networks leading to modular knowledge and competency. The process then moves to practical learning, the factories network, localisation and possible creation of incubator businesses and new business development. Customised training programmes, based on industry needs, are compiled from existing modules developed internationally.

Learning pathways can be adapted to the individual and their talent profile. It's about packaging curriculum content into frameworks that develop competencies to meet industry needs.

The NSTF provides neutral collaborative platforms where different sectors meet on different issues.

- One of the NSTF's functions is to hold discussion forums, bringing together the private and public sectors to address important issues and engage with government policy.
- Feedback from these discussion forums is given to stakeholders.
- Recommendations are put forward to government as part of the SET community's lobbying efforts.

Intsimbi is using existing international standards rather than "taking years to develop a South African standard," van Dyk said.

Students work on modules – on the platform – and the modular components on the system are made available free of charge. Technology companies and manufacturing businesses have put their training material on the platform and provided equipment for the practical learning labs/factories. The exchange is clear, van Dyck said. If companies want students to understand their systems, they must supply the material. Industry provides the curriculum content and the methodologies. The flexible, modular system accommodates this and allows for content to be upgraded quickly.

Students can select a company to work with, book time and train on high-end machinery. As well as covering theory and practical sessions in advanced laboratories, the guided programmes include a minimum of 40% time on the factory floor in on-the-job training – all to be completed within a year, whether the student is an engineer or a machine operator.

A key aspect of the Intsimbi approach is that it enables the individual student to take their education into their own hands. AI built into the system tracks each student and suggests what is needed to assist with skills development and in building confidence levels. Support is also built in, van Dyck said. For example, teachers can be booked as facilitators and remedial help is available, as is extra content for difficult areas.

The programme is looking to engineers and highly skilled and experienced people to assist with theory and on the practical side of the programme. Social workers assist with personal skills and are available to help students deal with life challenges they may face.

It's a creative environment where students are allowed to test and stress, van Dyck said. This is where innovation and learning happen.

Another important aspect of the programme is that with each student's information on the system, companies can assess potential employees' competency levels. Where entrepreneurial skills are noted, these can be developed through the company incubation track or supplier development programme.

The Intsimbi programme is being piloted in South Africa and has a national footprint with well-equipped training facilities for basic training, advanced training and advanced manufacturing training. Trade tests have been included in the facilities provided. It already has a nine-year track record and has proven successful.

Van Dyk highlighted that the current student retention rate is 80%, with an average 86% permanent placement rate. In the time a student is in the programme, they reach the competency level needed. Students do not go home without some skills that will get them a job, he said.

Each student is employable after a short period of time and then keeps building on their employability. They can migrate in and out of the system. It's completely modular, flexible and self-regulating.

It is a solution supported by industry. "We see this as key to overcoming unemployment and halting the decline in the manufacturing sector. We have demonstrated that the model works. We now need to see it incorporated into the mainstream – in terms of policy and public education and training institutions, colleges and universities," van Dyk said.

SA's new energy plan

Following cabinet's approval of the long awaited Integrated Resource Plan (IRP2019), Minister of Mineral Resources and Energy, Gwede Mantashe said at a media briefing on 18 October 2019, "The IRP 2019 brings much-needed certainty to this critical area of the economy and, hopefully, puts to rest the often polemical debate which has consumed many analysts and commentators regarding the country's future energy mix."

The IRP2019 – which provides a blueprint for South Africa's envisaged generation capacity up to 2030 – supports a diversified energy mix including coal, nuclear, renewable energy, gas and hydro. (The previous Integrated Resource Plan 2010 – IRP 2010 – was promulgated in March 2011.)

Acknowledging that energy infrastructure provides a critical underpinning for economic activity and growth across the country, Mantashe also noted that the energy sector contributes close to 80% of the country's total greenhouse gas emissions, of which 50% is from electricity generation and liquid fuel production.

In terms of the IRP 2019, Mantashe said coal will continue to play a significant role in electricity generation as the country has the resource in abundance. "New investments," the minister said, "will be directed towards more efficient coal technologies (high efficiency, low emissions), underground coal gasification and the development of carbon capture and storage to enable us to continue using our coal resources in an environmentally responsible way."

He also said government will work with Eskom to ensure the power utility complies with the minimum emissions standard over time and he emphasised the need for a just transition to low carbon technologies.

The energy mix

Since the promulgation of IRP 2010, new generation capacity totalling some 18 000 MW has been committed: 9 564 MW of coal power at Medupi and Kusile power stations; 1 333 MW of hydro pumped storage at Ingula; 6 422 MW of renewable energy via independent power producers (IPPs); and 1 055 MW in open cycle gas turbine (OCGT) peaking plants (currently using diesel) at Avon and Dedisa.

The IRP 2019 proposes additional generation capacity, up to 2030, across various energy resources: 1 500 MW from coal; 2 500 MW from hydro; 6 000 MW from solar photovoltaic; 14 400 MW from wind; 2 088 MW from storage; and 3 000 MW from gas.

Mantashe noted that while coal's installed capacity will be lower than the current installed base (with provision for decommissioning of older coal-fired power plants), it will remain the dominant energy supply source contributing 59% of the energy volumes required to meet demand. Nuclear will contribute about 5%, hydro 8%, solar photovoltaic 6%, wind 18%, gas and storage 2%.

Nuclear

Mantashe said nuclear power is seen globally as a clean source of energy that can reduce emissions. He highlighted a move towards development of small, modular reactors that are considered more manageable investments than a large fleet. However, the IRP 2019 also provides for a 20-year extension of the design life of Koeberg in the Western Cape, the country's sole nuclear plant. New nuclear power will be commissioned at a pace, scale and cost that the country can afford and taking into account capacity that will be decommissioned.

Renewables

Turning to renewables, Mantashe said renewable energy combined with energy storage presents an opportunity to produce distributed power closer to where demand is and to provide off-grid electricity to remote areas in South Africa.

The minister also pointed out that in addition to the sun and wind, the country has some of the world's largest high-grade resources in at least six key commodities that play a critical role in the global energy storage sector. Vanadium, platinum, palladium, nickel, manganese, rare earths, copper and cobalt have the potential to create new industries and localisation across the value chain.

Gas to power technologies will provide the flexibility required to complement intermittent renewable energy and meet demand during peaking hours. The short-term opportunity is to pursue gas import options, and for the longer term, local and regional gas resources are being considered.

The minister highlighted changing electricity supply and consumption patterns – influenced by technological advances, shifts in costs and tariffs, and the power supply difficulties that Eskom is experiencing – all of which affect infrastructure planning. To the extent possible, the IRP 2019 takes such changes into account. Key changes to the assumptions include, among others, a revision of the energy availability factor (EAF) projections submitted by Eskom.

DIARY DATES

MESA Africa Conference

14-15 November 2019,
Zulu Nyala Country Manor, Chartwell, Sandton
Manufacturing Enterprise Solutions Association (MESA) Africa will hold its 11th annual conference this year, themed: 2020 Vision and focusing on The digital enterprise: people, productivity & profitability.
Enquiries: visit http://www.mesa-africa.org/ or email marketing@mesa-africa.org

SAEEC 2019 Conference

14-15 November 2019, Farm Inn, Silver Lakes, Pretoria
The 14th annual conference of the SAEEC (South African Energy Efficiency Confederation) will focus on five key themes: Strategies for environmental change, Energy nexus links, Sustainable generation and distribution, 4IR and energy, and the business of energy.
Enquiries: Franki McKechnie, Tel. +27 (0)63 235 8031, or email: admin@saee.org.za

17th ICUE Conference

25-27 November 2019,
UCT Graduate School Conference Centre, Cape Town
The African and International Use of Energy Conference will look at the productive use of energy as a strategic resource by an ever- expanding market in the industrial and business sectors and explore energy solutions for the cities of the 4th Industrial Revolution.
Enquiries: Tel. +27 (0)21 959 4330, or email: icue@aiue.co.za or ICUE@cput.ac.za

SPS – Smart Production Solutions 2019

26-28 November 2019, Nuremberg, Germany
SPS covers the full spectrum of digital automation and smart manufacturing from simple sensors to intelligent solutions, from what is feasible today to the possibilities of a fully digitalised industrial world tomorrow. It is the meeting place for leading players in automation, control and smart industry solutions in Europe and internationally.
Enquiries: visit https://sps.mesago.com/events

1st SAIEE National Conference

27-29 November 2019,
Sandton Convention Centre, Johannesburg
The 1st SAIEE (South African Institute of Electrical Engineers) national conference, themed Engineering an Africa for the Future, will focus on Connectivity and Communication in Africa. It encompasses six tracks: Build; Power Up; Automate; Connect; Empower; Change.
Enquiries: visit http://saiee-conference.co.za

Investing in African Mining Indaba 2020

3-6 February 2020, Cape Town ICC
The next edition of the African Mining Indaba will look at key issues facing the African mining industry in 2020 and beyond: addressing mining's impacts on the environment, opportunities to alleviate South Africa's heavy unemployment levels, and the potential for automation and digitalisation in mining operations, among others.
Enquiries: visit https://www.miningindaba.com

Beckhoff Product Training 2019

TwinCAT 3 and TwinCAT 2 training courses, monthly, to November 2019
Beckhoff Automation offers training for its system components such as TwinCAT 2, TwinCAT 3, IPCs, Embedded PCs, I/O and Motion products. The 3-day training courses are run at Beckhoff Training Centres in Johannesburg, Cape Town, Port Elizabeth and Durban.
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