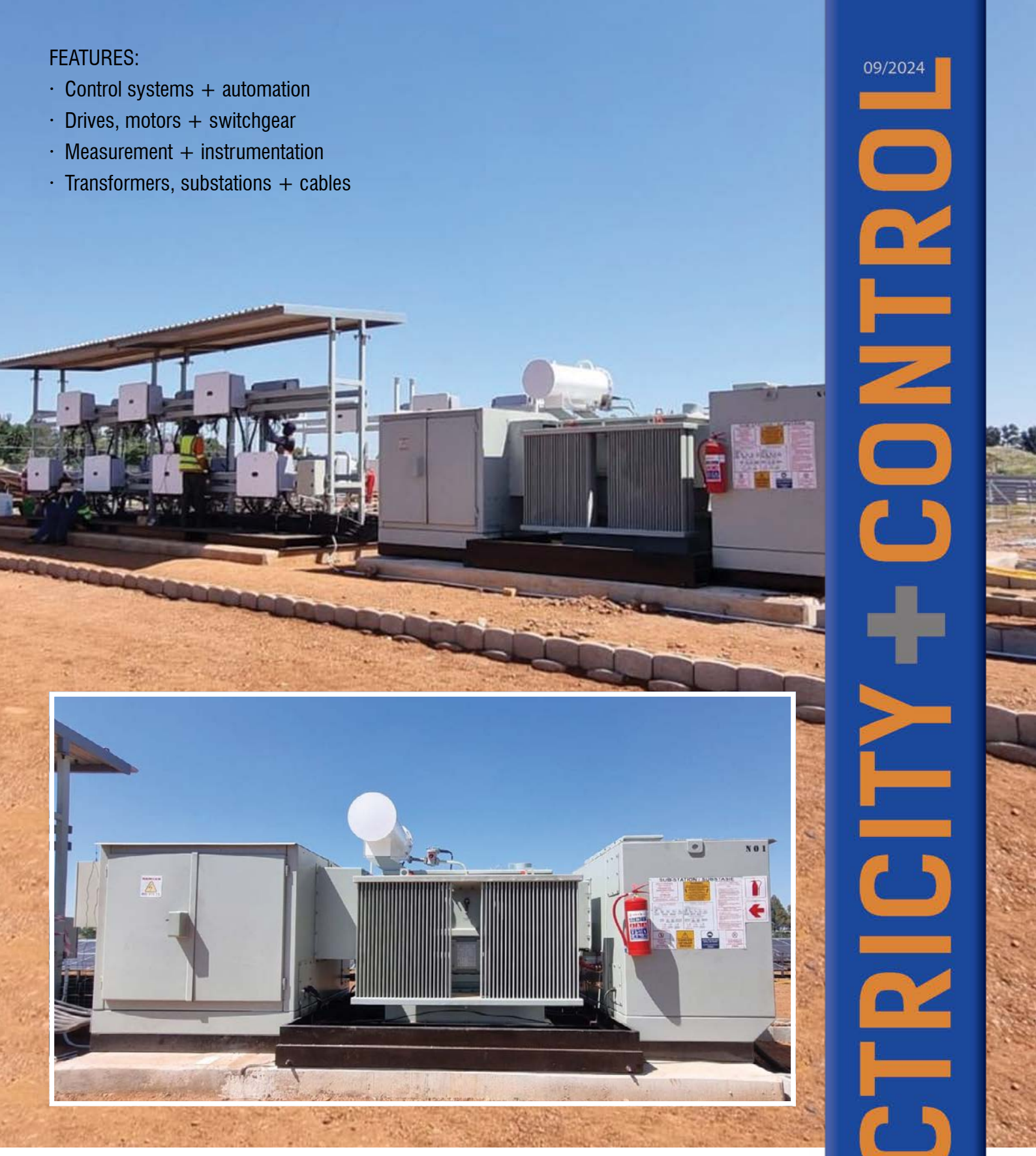
09/2024

ELECTRICITY+CONTROL

FEATURES:

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



Explore the Precision and Reliability of ArmCoil Afrika's Medium Voltage PV Substations

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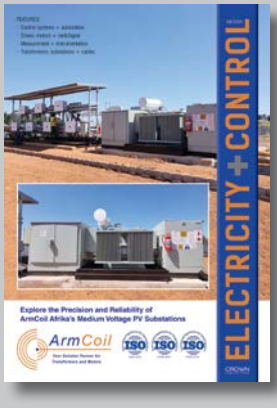

As demand for renewable energy grows, medium voltage PV substations play a central role in integrating this new energy and ensuring reliable, efficient, and sustainable power distribution systems.
(Read more on page 3.)

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Catching the wave

Welcome to another packed edition of *Electricity + Control*. The only troubling concern to observe is how rapidly this year has moved along.

This month we feature: Control systems + automation, Drives, motors + switchgear, Measurement + instrumentation, Transformers, substations + cables.

Each of these topics can be considered in light of the developments we see around us – inviting us to decide how and when we invest further in our plant.

Could we be seeing the start of a new and more positive time ahead? It cannot be overstated that the absence of substantive load shedding has certainly buoyed the spirits of many in industry. When I last looked, it was over 140 days. Intriguingly, some are behaving as if those dark days are over.

They are not – but certainly, the road ahead is now a lot more predictable, isn't it? Although it is not for this comment to unpack what has led to this improvement, we can all agree that the changes are palpable.

I am reminded of the role played by that new sheriff in town …

We also see growing indications for a decreasing inflation rate and a decline in fuel prices.

They say that one swallow does not a summer make – but somehow the bird-watching seems to be getting better.

While the noise levels remain high, some clarity and energy seem to be emerging from the state for the first time in a long while. And I have the sense that it is this new energy in some ministries that may well be driving sentiment and behaviour.

This is great.

It also poses the question: can we catch up with our on-site investments to ensure that, should this turn in the tide be sustainable, we are able to compete in the wider world?

There are formidable competitors out there but reflect for a moment on this: we argue that maintenance of so much of our infrastructure has fallen way behind schedule – in many respects we argue that it has been neglected.

Be assured that in much of the developed world a lot of infrastructure is at its end of life.

This is a wicked challenge: the more developed and substantial, for instance, your road and bridge infrastructure is, the more costly it is going to be to upgrade, repair and replace it. My sense is, however, that much of the world has infrastructure that is simply 'working, so why break it', and this is a situation that will catch us all out quite suddenly.

We have heard stories that bridge infrastructure in South Africa's wealthiest province needs some attention; so, imagine what that must look like in the most populated area of the USA?

The sub-text of all of this is that, if we continue to turn this ship, surely we can be competitive in the true sense of the word.

But there is work to do: our state logistics infrastructure is still dysfunctional, and that can be a massive impediment. It is clear the country's water infrastructure needs extensive maintenance and development work, as does the power network. I have previously made the observation that opportunity arrives in waves – and unless you have your surfboard ready, and your sunscreen on, you will miss it.

Let's not allow that to happen again!

Ian Jandrell

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

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REGULARS

Medium voltage PV substations in modern power distribution

As the world pivots towards renewable energy, the importance of efficient and reliable power distribution systems cannot be overstated. At the heart of this transition lies the critical infrastructure that ensures the seamless integration of renewable sources like solar power into the existing grid. Here, the medium voltage PV substation stands out as a cornerstone of modern solar energy projects.

Solar power integration

Medium voltage photovoltaic substations are specially designed to handle the unique demands of solar power generation. As solar panels capture sunlight and convert it into electrical energy, this energy must be efficiently distributed to where it's needed most. Medium voltage PV substations play a pivotal role in this process, managing the conversion of the direct current (dc) produced by solar panels into alternating current (ac) suitable for distribution through the medium voltage grid.

Beyond simple energy conversion, the substations are designed to optimise the performance of solar power systems, ensuring energy is delivered reliably and efficiently to the grid. In a world increasingly reliant on renewable energy, the role of medium voltage PV substations in maintaining grid stability and reliability is more crucial than ever.

Designed for performance and reliability

ArmCoil's medium voltage PV substations are engineered with a focus on reliability, efficiency, protection monitoring and adaptability. Each substation is meticulously designed to meet the specific requirements of the project, whether it's a large-scale solar farm or a smaller, localised solar energy system. This customisation ensures every substation operates at peak efficiency, minimising energy loss and maximising the output of the solar power system.

One of the key advantages of ArmCoil's medium voltage PV substations is their durability. Built to withstand harsh environmental conditions, the substations are equipped to handle the challenges of remote and rugged installations. In the scorching heat of a desert or the unpredictable conditions of a coastal area, ArmCoil's substations are designed to perform consistently and reliably, safeguarding the investment in solar infrastructure.

Advanced monitoring and control

In today's energy landscape, the ability to monitor and control power distribution systems in real time is essential. ArmCoil's medium voltage PV substations are equipped with state-of-the-art monitoring and control systems, allowing operators to track performance, identify potential issues, and make adjustments 'on the fly'. This real-time capability ensures continuous, efficient operation and contributes to the stability of the power grid.

The integration of advanced monitoring systems also facilitates predictive maintenance, reducing the likelihood of unexpected outages and extending the lifespan of the equipment. By providing operators with detailed insights into the condition and performance of the substation, these systems help to ensure solar power installations remain operational and efficient, even in the most challenging conditions.

A commitment to sustainability

ArmCoil's dedication to sustainability is evident in every aspect of its medium voltage PV substations. The substations are designed to optimise the performance of solar power systems and to do so with minimal environmental impact. By maximising energy efficiency and reducing losses, ArmCoil's substations contribute to the overall sustainability of solar power projects, making them an ideal choice for environmentally conscious energy providers.

The use of high-quality materials and components in the construction of the substations ensures they have a long operational lifespan and this commitment to sustainability includes the entire lifecycle of the substations, from manufacturing to eventual decommissioning and recycling.

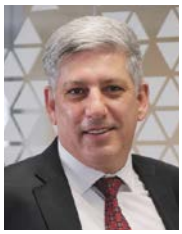
The future of solar energy distribution

As the demand for renewable energy continues to grow, the importance of reliable, efficient, and sustainable power distribution systems will only increase. Medium voltage PV substations will play a central role in meeting this demand, providing the critical infrastructure needed to integrate solar power into the grid on a large scale.

ArmCoil is at the forefront of this effort. □

ArmCoil's Medium Voltage PV Substations are designed to deliver reliability, efficiency, and durability.

For more information contact ArmCoil.
Tel: +27 (0)11 763 2351
Email: sales@armcoil.co.za
Visit: www.armcoil.co.za



Adrian van Wyk, MD, Referro Systems.

When is the best time to upgrade systems and processes?

In the manufacturing and mining environments, where downtime is best avoided, or at least minimised, how does one determine the best time to upgrade systems and processes and ensure productivity targets can still be reached? With the rapid pace of new developments in technology, this is a question that faces operations, production, factory managers and C-suite executives. Adrian van Wyk, Managing Director at Referro Systems, highlights some important factors to consider when reviewing operational efficiencies to achieve production targets.

Van Wyk says the answer to the question is easier, and not as expensive, as many may think. Effective upgrades can be achieved through careful planning, but more importantly, by working with a supplier that has the in-depth expertise and a track record of dealing with complex, technologically advanced systems and processes. The risks and associated costs of not acting to upgrade systems in good time can be significant, with unplanned downtime caused by breakdowns of old and obsolete equipment and no or limited access to spare parts forcing plant operators to implement expensive 'quick fixes' just to get production up and running.

When facing the dilemma of deciding the optimal time to upgrade your systems and processes there are a number of factors that need to be taken into account.

Engineering solutions

Incorporating new technology into existing systems can be done cost-effectively when companies partner with an experienced service provider who can advise them on the optimal solution, which entails the planned evolution of hardware and software.

It is important that the service provider has a track record and proven expertise to undertake the kind of work involved. That requires advanced engineering expertise across various disciplines, including process, automation and systems engineering, as well as the knowledge of, and access to the latest software and hardware available globally. They can advise on timing – when existing hardware or software is reaching end of life and will no longer be supported, and putting plans in place for a systematic upgrade of equipment and processes, mitigating the associated risks in doing so. Projects of this nature can be implemented in stages, allowing for capex availability and production requirements.

Referro Systems is a sales and distribution company for some of the world's leading electrical, automation and software and hardware brands for industrial sectors.

Choosing the best network

As systems and processes develop, so too does the technology to support these processes and the need to migrate to new technologies in order to benefit from network advances being made. New networks can enhance operations. Outdated networks, such DeviceNet or ControlNet, are now being replaced by Ethernet IP, which is significantly more cost-effective and easier to install, providing faster processing speeds and richer, more in-depth data that offers real-time diagnostic information. A further advantage is that Ethernet IP operates on the control layer as well as on a device and management layer, providing a single transparent network. With these advantages, Ethernet IP is today the preferred network for both control and information.

Replace hardware in good time

It is equally important to replace hardware before it becomes obsolete and in good time to gain the benefits of technological advances. As technology develops, manufacturers stop repairing and providing product support for hardware that is becoming obsolete. Spares become difficult to find and prices for the outdated technology start to soar.

Companies need to ask: 'Can we afford the cost of downtime and lost production that comes with outdated hardware breaking down?'

It is critical to work with an engineering solutions provider to plan the replacement or upgrading of aging hardware, taking into account the optimal time for replacement, balancing maximum product life versus the increasing cost of maintaining outdated hardware.

The adoption of new technology comes with many benefits, including optimised spares holdings, with economies of scale providing cost savings; improved control, monitoring and reporting; and increased production capability, if it is undertaken in a planned and systematic way. This is essential in the implementation of new technology: a planned and systematic approach will ensure that operations can continue to deliver the production required to maintain and

build the company's competitiveness, locally and globally.

A final word of caution – do not leave the implementation of new technology to the point that it becomes disruptive to the business model, risking the profitability of operations as well as relationships with your customers.

The case of a system upgrade for an iron ore mine

Core to every mine or manufacturing plant are the motor control centre and the control systems.

In the case of a large iron ore mine, where Referro Systems implemented a seamless upgrade of existing infrastructure, the equipment and technology that needed to be replaced had been installed in 2006, and at the time was new and considered 'state-of-the-art' but had now reached its end of life. The project entailed the replacement of 87 high-power variable speed drives (VSDs) and their corresponding control networks that were reaching obsolescence. Key engineering solutions were required to incorporate new technology into the existing motor control centre infrastructure so that the mine did not have to replace the entire system, and simultaneously to ensure as little disruption to production as possible.

The project involved the replacement of legacy Powerflex 700H and Powerflex 700S Series VSDs including the replacement of their inter-drive fibre network connections, with the new Powerflex 750 Series using Ethernet IP to connect the VSDs seamlessly in load-sharing configurations as well as to the control platform.

The new VSDs have also reduced the spares inventory from 14 units to just three units, due to their modular design and common control elements shared across the PowerFlex 750 Series platform. The modular nature of the roll-in power cores shared across the series platform means any power core can be swapped out on-site by maintenance personnel in minutes, instead of requiring hours of troubleshooting. It ensures optimisation without complexity or compromise.

This successful upgrade project was carried out by implementing innovative engineering solutions in partnership with the manufacturer of the VSDs to ensure the least disruption to operations at the mine. □

For more information visit: https://referro.co.za/

A successful automation upgrade

In 2021, Clover Industries, a leading South African food and beverage group, embarked on a digital transformation and automation upgrade journey to meet essential system technology requirements and evolving demands in its operations. The company set out to redefine its automation roadmap to support its business strategy and objectives. This was motivated by large-scale consolidation projects which were planned at that time and required an overhaul of its existing technology platforms. The journey was complicated by the challenges presented by the pandemic, but a successful solution was achieved and it is proving its capabilities.

Working with Element 8 and several system integrator partners, Clover Industries adopted Ignition® by Inductive Automation to tackle its automation requirements. The approach involved establishing new standards and templates across multiple sites to ensure uniformity and efficiency. Ignition was chosen for its flexibility, scalability, and cost-effectiveness, enabling Clover to develop reusable templates, provide high-performance user interfaces, and ensure seamless integration with existing systems. The implementation also allowed Clover to run systems on various client devices, improving accessibility and efficiency.

The transition began with smaller-scale projects, enabling the company to understand what the Ignition Platform could do and to see how it performed. Bigger projects were then implemented progressively, and quite quickly, to full implementation.

The transition to Ignition streamlined Clover's operations significantly, introducing standardised and simpler systems that are easier to manage and scale. Clover also won substantial cost savings and gained enhanced system reliability and improved user experience. The new SCADA platform enables quick response times and reduces the complexity of updates and maintenance, empowering plant operators and integrating real-time data for better informed decision-making.

Clover Industries chose Ignition to achieve effective enterprise control across multiple sites.

This transformation has set a solid foundation for Clover's future growth, enabling an efficient rollout to upgrade or replace legacy systems and creating an environment ripe for further technological innovation.

Element8, founded in 2020, is a distributor of Ignition SCADA and IIoT Platform, Sepasoft MES, Canary Historian and Flow Analytics Hub. It works with manufacturers and utilities aiming to ensure a flourishing, data-driven future. □

John van Hooijdonk, Omron.

Embracing change for flexible manufacturing

John van Hooijdonk of Omron recently shared an article outlining how Omron's approach of breaking down the process enables flexible manufacturing. Focusing on the fast-moving consumer goods sector, he highlights that the sector is experiencing a transformative shift, driven by factors such as consumer empowerment, customisation demands, health-conscious preferences, veganism, ethical concerns, and sustainability.

"We expect that it will undergo more changes in the next decade than it has in the previous 50 years," van Hooijdonk says. This necessitates the adaptation of production and supply chains to meet emerging trends. The future of fast-moving consumer goods factories will likely involve smaller, smarter facilities with autonomous movement of goods and interconnected systems.

Machines, whether standalone or interconnected, need to be more flexible than before to ensure the timely supply of appropriate materials and packaging. Production needs to be more agile, increasingly producing retail-ready items with a high mix-low volume approach with zero recalls. The question is: how to realise this at minimal cost and with a fast return on investment?

Workflow in three levels

To achieve an optimal solution with maximum flexibility, it is important to consider various factors. A practical approach, like the one employed by Omron, focuses on optimising processes to minimise disruptions. This involves breaking down the workflow into three functional levels.

Level 1 - For the machine - intralogistics
Before reaching the production line and machine level, the emphasis needs to be on enabling flexibility in the production line, based on just-in-time delivery of consumables, optimising the transport of goods, boxes, and pallets, as well as managing half-products, waste, and unused consumables. The goal is to avoid storing consumables and half-products on the shop floor.

Level 2 - At the machine - machine feeding
At the machine level, the focus shifts to automating material verification and feeding processes, replacing manual feeding activities with automated feeding, conducting quality assurance on packaging materials, and ensuring package integrity after packaging.

Level 3 - In the machine - machine setup
In the machine itself, all functions such as machine control, motion, robotics, sensing, vision, and safety need to be automatically aligned. This ensures that tasks like filling, capping, tray loading, seaming, sealing, and labelling are executed as quickly as possible, enhancing overall efficiency.

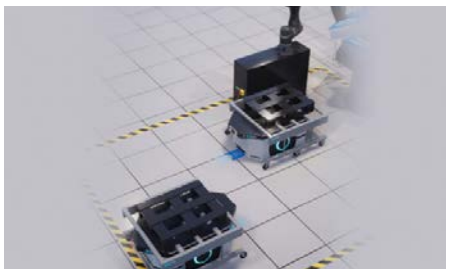
The benefits

The automation of production processes for flexible manufacturing offers a number of benefits. For instance:

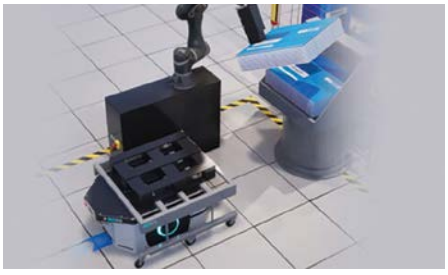
- Faster product changeover capabilities enable quick adjustments and modifications to production lines, reducing changeover time and optimising performance
- Improved tracking and analysis provide valuable insights for continuous improvement and workflow optimisation
- A focus on value-adding tasks and more strategic and creative work increases employees' job satisfaction.

By leveraging the benefits of automated flexibility, companies can achieve greater operational efficiency, employee safety, cost savings, product innovation, and improved competitiveness. □

For more information visit:
https://industrial.omron.co.za/en/solutions/



Before reaching the machine level, the emphasis needs to be on enabling flexibility in the production line.



At the machine level, the focus shifts to automating material verification and feeding processes.

In the machine, all functions, such as control, motion, sensing, vision, and safety, need to be automatically aligned.

Advancing digital technologies in process industries

As a global leader in advanced industrial technologies, ABB is campaigning for process industries to realise the performance benefits enabled by digital transformation.

Working from its long experience across pulp and paper, mining, metals, cement, and other process industries, ABB has assembled an expert team to support these sectors with advanced industry-specific solutions, implementing digitalisation progressively and enabling them to accelerate digital adoption in a shorter timeframe. It highlights the opportunities to build on successes in energy management, process safety, skills retention and process performance.

Although these industries will continue be enhanced through technology development, including generative artificial intelligence, data analytics, machine learning, cloud and edge computing, they also present challenges due to factors such as the volumes of production, location of operations, energy and heat chemistry, and others. Notably, pulp and paper, mining, metals and cement are seen as 'hard to abate' industries in terms of the high emissions they generate. The World Economic Forum[1] reported in 2022 that digital solutions can accelerate the achievement of net zero in high-emission industries, delivering up to 20% of the total reduction required by 2050, in terms of the International Energy Agency's calculated forecasts. ABB is leveraging its expertise, its recent record in industrial software development, and its 140 years of heritage across multiple industries, to guide customers on their digitalisation journeys.

The company has worked with customers across the process industries for decades, supporting them with the deployment of digital solutions such as advanced process control (APC), energy management systems (EMS), and manufacturing execution systems (MES). These have evolved from original packages to become variations used for specific industries, with their own tools and libraries, and remain the foundation for continuing progress in advancing technology. Customers recognise that they are at different stages of the digitalisation journey – often, ABB encounters 'starters' (those embedding digital for the first time), 'stallers' (those piloting a new advanced solution, often with a start-up), or 'scalers' (those moving to the next level, perhaps with a technology company). ABB is currently working across this spectrum to design and develop new solutions collaboratively with customers and other industry players, to meet current and future needs.

"The adoption of advanced digital technologies is still slower than one might expect in the process industries," said Sanjit Shewale, Global Business Line Manager for Digital, ABB Process Industries. "Customers are facing new challenges in proving and scaling up solutions that will drive real, transformative change. However, there are opportunities for all parties to use technologies to retain knowledge of processes in their business, as people retire or move on in shorter timeframes than was typical in the past. Through co-creation, there is also the opportunity to show more and do more for positive investment decisions that quickly result in improved levels of energy management, efficiency, sustainability, safety and service."

ABB is supporting faster adoption of progressive digitalisation in the process industries.

ABB is working with fellow global technology companies to integrate new capabilities like generative AI into the ABB Ability™ suite of industrial software, supporting industrial companies to improve data collection, unlock insights hidden in operational data, and enable significant gains in efficiency and productivity. It is also working through various partnerships to accelerate the adoption of digital solutions to help industries meet their goals on net-zero emissions. One example is in real-time data transmission using cloud-based software integrated with ABB systems.

ABB's team works with a focus on five key pillars – operational excellence, process performance, asset performance, sustainability, connected workforce, all with embedded cybersecurity. The company uses this framework when advising industries looking to keep pace with rapid innovation, to optimise efficiency and, in turn, minimise waste and reduce costs.

References:

[1] Digital technologies can cut global emissions by 20%. Here's how | World Economic Forum (weforum.org)

For more information visit: go.abb/processautomation

Managing a resilient MRO supply chain

In today's fast-changing and unpredictable world, maintaining a resilient supply chain for maintenance, repair, and operations (MRO) is essential for businesses across various sectors. Managing Director of RS South Africa, Brian Andrew, says the goal is not just to withstand disruptions but to adapt and thrive amid them. Here he shares his top five tips on how to approach and manage MRO supply chains to ensure resilience against future shocks.

Supply chain resilience depends on the knowledge of suppliers, their reliability, and the quality of supplies.

Focus on trusted suppliers

Rather than diversifying the MRO supplier base widely, businesses should rely on a core group of trusted suppliers that can guarantee delivery certainty. Building strong relationships with these suppliers will ensure stability and reliability in the supply chain.

Develop a flexible supply chain

When faced with pressure, it is essential to act quickly while considering the long-term consequences. A flexible supply chain and suppliers that can adapt to changing circumstances is key. This flexibility includes being prepared for potential increases in spending or the need to switch suppliers without significant disruptions.

Leverage technology and data

Use eProcurement and vendor managed inventory (VMI) solutions from a trusted and stable procurement partner. Effective planning requires visibility into what is being consumed, especially for companies with multiple plants. High-quality data is essential to maintain adequate inventory levels and ensure supply chain resilience.

Choose sustainable and ethical procurement

Cost reduction is important, but sustainable and ethical procurement practices are equally so. It's important to work with partners that share common goals and include sustainability programmes in procurement processes. As well as benefitting the environment, for businesses that value sustainability this approach will align with the values of company management, shareholders, and customers.

Plan for continuity

Continuity planning requires a comprehensive action plan that includes compliance with policies, processes, and corporate governance. Ethical sourcing of raw materials should be a priority, and procurement departments should challenge the status quo, if need be, to follow ethical sourcing principles.

Supply chain resilience depends on the quality, reliability, and knowledge of suppliers. Working with the right MRO supplier, leveraging technology, and focusing on sustainable practices, businesses can be better prepared for future disruptions and maintain a robust supply chain.

For more information visit: https://za.rs-online.com

DeltaV AgileOps is used every day across industries and around the world to drive operational excellence.

Excellence in operations management

With the recent introduction of the DeltaV™ Automation Platform, Emerson's successful AgileOps software will now be known as DeltaV AgileOps.

Users across industries and around the world use DeltaV AgileOps every day to drive operational excellence across facilities and enterprises in a way that suits the organisation and process.

DeltaV AgileOps is another step towards improving operations management. It facilitates the streamlining and integration of different systems and technologies to make operations management easier. Specifically, it provides for:

- Monitoring alarm and event metrics across the unit, site, or enterprise – in and beyond Emerson product lines
- Rationalisation and updating of runtime alarm configuration based on the operating state of the facility, to eliminate alarm overload
- Reducing nuisance alarms with advanced alarm shelving
- Monitoring and reporting on safety instrumented function (SIF) health and usage
- Tracking and reporting metrics on key operational values.

The branding change simply reflects Emerson's commitment to innovation and to empowering its customers with improved automation capabilities, flexibility, and efficiency. □

Control cabinet-free automation

As a replacement for the conventional control cabinet, the MX-System from Beckhoff offers some significant efficiency advantages. It also provides optimisation potential with regard to the growing shortage of skilled workers and the expanding presence of dc supply networks across industry. Thus it supports streamlined continuity in industrial production, with benefits for machine and system engineering companies as well as end users.

The MX-System is a uniform modular automation system where function modules can be used to replace traditional control cabinets completely in many applications. The system is waterproof and dustproof and can be mounted directly on the machine. It comprises a robust aluminium baseplate with integrated module slots, featuring EtherCAT for data communication and integrated distribution for different voltages. The extensive portfolio of function modules includes the mains connection, drives, power supplies, industrial PCs, and I/Os. With these features and more, the MX system covers the full range of functions of conventional control cabinets.

The function modules can be easily attached to the baseplate and simply screwed into place. This eliminates the need for any mechanical assembly of the control cabinet and its mounting plate, and there is no need for time-consuming manual wiring. These straightforward steps are directly reflected in the time required to set up the MX-System: including the necessary tests and checks, an MX-System can be set up in just one hour, in contrast to at least 24 hours for a comparable control cabinet. In this way, the MX-System also assists in overcoming the shortage of skilled workers, as individual employees are not tied to a single task for too long and can move on to the next project quickly.

A further advantage is the straightforward pluggability of the function modules, which means they do not need to be connected by specialised electricians. This is a real benefit for companies that do not have such expertise in this area.

The latest window profile processing machine from Schirmer Maschinen GmbH showcases the benefits of the MX-System.

A notable application scenario involves the use of a higher-level dc power supply. The dc supply for complete production halls is based on the strategy of providing electricity from renewable energies (photovoltaics, for example) in combination with storage technologies for machines and systems as a mains voltage of 600 V dc. The MX-System is designed to be dc-ready in that it can distribute dc voltages and can also be used directly for protective extra-low voltage power supply lines or modules, controlling synchronous and asynchronous motors. By facilitating the continuous use of dc voltage, the MX-System offers the major advantage of buffering the braking energy of the motors in the storage units of the dc networks, rather than losing it through braking resistors. This possible use of the MX-System is already being implemented in a trial project.

For more information visit: www.beckhoff.com

First industrial control cabinets made from green steel

Siemens subsidiary Alpha Verteilertechnik in Cham, Germany, has introduced the green SIVACON 8MF1 control cabinet series. This is the latest addition to Siemens Smart Infrastructure's line of sustainable electrical products. Now, besides conventional control cabinets, customers globally can purchase the SIVACON 8MF1 industrial control cabinet series. The green steel enclosures are made with 100% scrap metal, sourced from reputable suppliers in Europe, and manufactured using wind power. The move supports Siemens' sustainability goals in the areas of decarbonisation and resource efficiency, as outlined in its DEGREE framework, through which the company is pursuing a 1.5°C science-based decarbonisation target.

The production process for the steel in the SIVACON 8MF1 control cabinets cuts CO_2 emissions by 70% compared to that for conventional steel, which is typically produced in a blast furnace using iron ore and coal. The 70% reduction translates into savings of 308 kg of CO_2 emissions per enclosure unit. Currently, steel production is reportedly responsible for eight percent of emissions globally. As demand for steel continues to rise, it is important to decarbonise the production process.

The SIVACON 8MF1 industrial control cabinet series is made with 100% scrap metal, sourced from reputable suppliers, and manufactured using wind power.

The new green steel enclosures offer the same technical properties and functionality as cabinets produced with conventional steel. They enable larger industrial customers to reduce their CO_2 emissions and get closer to achieving their sustainability goals.

For more information visit: www.siemens.com.

Six automated wire tyers for Sappi Saiccor mill

Valmet, a leading global developer and supplier of process technologies, automation and services, primarily for the pulp, paper and energy industries, as well as other process industries, is to deliver six wire tyers to Sappi's Saiccor dissolving pulp mill in South Africa. Valmet Wire Tyer is a fully automated tying machine that applies high-tensile steel wire around pulp bales at pre-selected positions.

Valmet received the order in the second quarter of this year. The wire tyers will be delivered in the second quarter of 2025 and installed on the baling lines C3 and C5 during the mill's annual maintenance shutdown.

Leolin Pillay, Mechanical Technician at the Sappi Saiccor Mill says, "Our current wire tyer units are starting to near the end of their lifecycle, causing an excessive amount of unplanned downtime for the baling lines. The new wire tyers will improve the overall performance and the reliability of the tyer units and play an important role in the planned speed increase of the baling lines."

Kevin McQueen, Sales Manager, South Africa, EMEA Area at Valmet, says, "We are thankful for being selected to supply six wire tyer units to Sappi's Saiccor Mill. We have worked well with the customer to date and believe our relationship will be strengthened further with this project."

The delivery will include six wire tyers, fully automatic tying machines consisting of the tying unit, related conveying units, and a specially developed wire cage for the customer's two baling lines. In addition, the delivery will include two remote tyer test stations, a spare parts package, and on-site support during the installation.

[Photo source: Sappi Saiccor]

The Sappi Saiccor mill at Umkomaas, south of Durban, KwaZulu-Natal.

Sappi is a global provider of raw materials, such as dissolving pulp, wood pulp, and biomaterials, as well as end-use products, such as packaging papers, specialty papers, graphic papers, casting and release papers, and forestry products. In South Africa, Sappi operates five mills. The Saiccor mill produces about 890 000 tonnes of elemental chlorine-free dissolving pulp, mostly for manufacturers of viscose staple fibre (VSF) used in clothing and textiles. □

Advancing industrial automation with new PLCs

Taking another stride to advance industrial automation, Veichi Electric Company has introduced its latest line of PLCs. For plant operators, this new product range is set to improve efficiency, flexibility, and ease of use in managing and interacting with automation systems. It promises greater reliability and improved cost-effectiveness.

The new VC Series PLCs feature cutting-edge technology designed to meet the growing demands of modern industrial environments. Equipped with a powerful processor and increased memory capacity, the VC Series PLCs offer high performance and fast processing speeds, essential for complex automation tasks. The new PLCs support a wide range of I/O expansion modules and communication protocols, making them adaptable to various industrial applications, from manufacturing and energy management to transportation and more.

One of the standout features of the VC Series is its scalability. The PLCs can be configured to suit small-scale operations or expanded to manage large, multi-layered systems. This flexibility ensures automation solutions to suit specific needs, optimising cost and performance. Additionally, the VC Series PLCs incorporate advanced diagnostics and predictive maintenance capabilities, providing for proactive system management and reduced downtime.

The new line-up of Veichi PLCs advances efficiency, flexibility, ease of use and scalability in industrial automation.

Veichi's commitment to innovation is reflected in the software suites that accompany the VC Series PLCs. The Auto Studio PLC programming software provides an easy platform for programming and configuration. With its intuitive drag-and-drop interface and extensive library of pre-configured functions, the software simplifies the development process. It accelerates project timelines and is easy to learn for any programmer with basic experience. The software also includes advanced simulation tools that allow users to test and refine their automation systems before deployment.

Industry experts have noted Veichi's latest line-up for its robustness and versatility, recognising the PLCs and HMIs as a significant advance in industrial automation technology. The combination of high performance, flexibility, and user-centric design is seen to address many of the challenges faced by modern industries.

As the new Veichi PLCs are rolled out, the company aims to empower businesses to achieve greater operational efficiency and agility. The VC Series PLCs and VI-HMI panels are now available through authorised distributors – like Conical Technologies in South Africa – and are expected to set new benchmarks in the field of industrial automation. □

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15 years sees growing demand in West Africa

Set up in 2009, initially to provide parts support to the growing installed base in West Africa at the time, WEG Africa's Ghana operation has become a fully-fledged branch providing electrical and electronic equipment and services to customers across the region. Through an expanded network of Value Added Resellers (VARs), the branch has built its capacity to deliver tailored and responsive solutions to a diverse customer base in West Africa.

Throughout its 15 years in operation, WEG Africa's Ghana branch has placed customer success at the centre of its work, providing customised solutions to meet customers' needs and specific market requirements.

Foster Yeboah Owusu, Regional Manager – West Africa – Sales at WEG Africa, says VARs play a pivotal role in ensuring customer satisfaction. The branch has eight VARs in key markets: Nigeria (two), Ghana, *Côte d'Ivoire*, Burkina Faso, Mali, Senegal and Mauritania.

As a commercial office for WEG Africa, the Ghana entity can offer a complete range of WEG solutions across the different product families – industrial electric and electronic equipment, power generation and transmission and commercial and appliance motors. Currently, its main focus is on industrial electric and electronic equipment, meeting the needs of oil and gas, and mining markets.

This focus spans electric motors, variable speed drives and controls, softstarters, switchgear, geared motors, distribution boards and customised E-houses, among many other products. It is complemented by a selected range of power generation and transmission products such as oil-cooled and dry-type transformers as well as mobile substations.

Owusu emphasises the importance, in a culturally diverse region of 16 countries, of understanding the unique infrastructural challenges and regulatory requirements in each market in order to develop suitable solutions. For example, he says, several countries in West Africa have varying levels of grid power infrastructure and different voltage compatibility requirements, which makes product customisation and adaptation especially important to meet particular market needs.

WEG medium voltage variable speed drives operating in a mine.

With the WEG product offering, which is globally recognised, and a strong support regime that entails technical support, training and high spare parts availability, WEG Africa's West African business has seen substantial growth in recent years. Owusu says this has been driven largely by a thriving West African mining sector.

Some of the team from WEG Africa's branch in Ghana, with Regional Manager, Foster Yeboah Owusu, at centre.

"We have executed some flagship projects in the region," he says. "For example, between 2019 and 2020, we supplied and commissioned major electrical equipment for a large oil and gas project. This comprised six WEG electric motors – four 9.5 MW and two 7 MW units. And that project was successfully executed during the Covid-19 pandemic."

Commenting on emerging trends in the market, Owusu highlights the accelerated move towards energy-efficient solutions. In Ghana, for example, the government has introduced Minimum Energy Performance Standards (MEPS) for about 20 different electrical products, including transformers, electric motors and air conditioners, among others.

As a key industry stakeholder, WEG Africa was part of the electro-mechanical technical committee that prepared the standards on which the MEPS for electrical motors are based. Through this process, the government of Ghana has set MEPS for electric motors at IE2, up from IE1. The industry, however, is already moving to IE3 and IE4 efficiency standards. Given that electric motors reportedly consume around 50% of global energy, Owusu says the adoption of higher MEPS is a welcome development. Making electric motors more efficient not only reduces power consumption, but also minimises carbon emissions and supports sustainability.

"Governments in West Africa have a big focus on sustainability and environmental management. On the back of rapid industrialisation, there is a growing renewable energy sector in the region. To serve this market, we intend to expand our offering with other existing WEG solutions such as solar systems, hydro and wind turbines," Owusu says.

In addition, he highlights a lot of interest in increasing partnerships and collaboration. "The plan is to have local service partners in every country in the region, to ensure faster parts and service turnaround times for our customers," he says.

For more information visit: www.weg.net

Key contracts for electrical equipment in East Africa

Kelvin Ageng'o Oriwo, General Manager, ACTOM Kenya.

Since opening its low voltage (LV) manufacturing facility in Kenya in July last year, electrical equipment and services supplier ACTOM has identified several growth opportunities in the region.

Kelvin Ageng'o Oriwo, General Manager of ACTOM Kenya, says although the factory has been focused on the LV space, it recently built its first medium voltage (MV) protection panel.

"We are the only manufacturer in East Africa that builds MV protection panels, and we expect this to be a key area of growth for us across the East Africa region, specifically in the Kenyan, Ugandan and Tanzanian markets," says Oriwo.

He adds that ACTOM Kenya has recently secured various "mission-critical" contracts, among them the supply of LV Panel BlokSets for customers in Uganda, Kenya, and Rwanda.

"The orders from Kenya and Rwanda are for customers in the pharmaceuticals sector, which is a quality- and specification-sensitive space. The orders therefore recognise our strengths in terms of product quality and guarantees, as well as our capacity to service clients specifically concerned with assurance and quality," Oriwo says.

"The Uganda contract is a sensitive project with a major brand client and reflects the growing trust that companies producing leading brands in the East Africa region are placing in ACTOM Kenya. This contract for the client in Uganda also complements our efforts to ramp up our regional output."

Global trends

Oriwo says ACTOM's decision to establish a manufacturing hub in Kenya was largely influenced by the global trend of multinational companies increasingly coming into East Africa, with their entry point most often being Kenya.

"Additionally, the technical capacity in Kenya is generally much higher than in many countries in the sub-Saharan region. This makes it easy for an original equipment manufacturer like ACTOM to establish itself in this country."

Oriwo highlights too, "ACTOM has performed well in South Africa over many years, but if we compare South Africa's Gross Domestic Product with the combined GDPs of Kenya, Tanzania and Ethiopia, this East Africa region presents a bigger market than South Africa."

To achieve its goal of becoming the company that powers Africa, it makes sense for the ACTOM group to

Continued on page 14

Advancing productivity in agriculture

SEW-EURODRIVE is participating for the first time this year at NAMPO Cape in Bredasdorp, to present its specialised geared motors and other solutions that support productivity and efficiency in the agricultural sector. The show takes place from 11 to 14 September.

With an established footprint in agricultural packhouses and bottling facilities countrywide, SEW-EURODRIVE is extending its solutions onto the lands, in its gear units for centre pivots in irrigation equipment, for example.

Jonathan McKey, National Sales and Marketing Manager at SEW-EURODRIVE, says this is part of the company's continuing innovation to offer farmers more energy-efficient solutions for streamlined and automated operations.

"Our classic 7 Series geared motors have for many years served the farming industry in various packhouse applications, including conveyors, sorters and box packaging lines," says McKey. "These solutions have been fitted with premium efficiency IE3 motors – which are also available as non-integral units – delivering considerable savings in energy costs."

Variable speed drive (VSD) technology allows for further efficiency and the finetuning of production lines to suit the pace of demand.

"In the modernising of packhouse facilities, VSDs allow solutions to be tailored to a changing production pattern," he says. "Our ECDriveS® drive system for roller conveyors in light duty materials handling offers another opportunity for greater efficiency."

McKey highlights the work SEW-EURODRIVE has done in 'closing the loop' to meet more of the drive requirements in farming. The company now supplies, installs and services the centre drive and wheel drives for pivot irrigation systems – as well as the drive technology to power them.

"These solutions have been popular on farms in Brazil since the 1980s," he explains. "Similarities with South African conditions show that this offering will add value locally too."

Aligning to the shaft sizes and flange connections on existing centre pivot irrigation equipment, SEW-EURODIVE provides a 'plug and play' solution of gearing, casing and motor. The concept is more cost effective and sustainable, as the company can then service and repair the drive systems when necessary, rather than replacing them.

SEW-EURODRIVE's variable speed drives and related equipment enable modernisation of packhouse facilities and production lines.

Meeting the performance customers demand, SEW-EURODRIVE's product quality and support mean the systems achieve high levels of uptime. The company's extensive national service footprint and decentralised stocking policy ensures that servicing and parts are quickly available to customers, within hours.

"We serve every key agricultural region through our comprehensively stocked facilities in Cape Town, Nelspruit and Gqeberha, providing current products as well as the pivot solution," he says. "We appreciate that agricultural products are sensitive to time delays, so we help ensure minimal downtime."

McKey says SEW-EURODRIVE also recognises the importance of sustainability principles in agriculture and it builds sustainability into its designs. The high performance ECO2 geared motor, for example, is made from uncoated aluminium, which forms a thin protective layer in contact with oxygen. With no coating or solvent on the surface, the result is more cost-effective, environmentally friendly and easier to recycle.

The company has also developed its own premium lubricants, based on its decades of field experience. These boost operational performance by reducing friction between gear wheels, and extend the life of sealing rings. These innovations are ideal for applications in the food and beverages industry as well.

"We look forward to talking to visitors at NAMPO Cape about their aims to modernise their facilities, as we can walk this journey with them," says McKey.

For more information visit: www.sew-eurodrive.co.za

Continued from page 13

extend its geographical diversification into East Africa.

He points out that the electricity uptake per capita in the East African region is generally lower than in South Africa, indicating that the region has a lot of growth potential in the energy space, and ACTOM recognises the opportunity this offers.

Fully localised

ACTOM Kenya's manufacturing facility is now 100% localised and employs 66 people directly and a further six indirectly. Oriwo says this fosters a sense of pride and confidence within the local business community as people from the community operate and manage a large factory.

"Although ACTOM Kenya is currently a smaller representation of the ACTOM group, which produces a wide range of electrical equipment, the company aims over time to bring the full spectrum of ACTOM's products into the region, not only what we manufacture in Kenya," Oriwo adds.

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

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Ensuring security in measurement systems

Cybersecurity has not generally been a priority in process industry operations. This may be because at the operations level it is assumed to be the IT department's responsibility, or because it's not seen as an operational threat. However, instrumentation specialist VEGA cautions that these perspectives ignore the reality that security should always be a shared responsibility involving IT and OT.

Digital networking is fast advancing in the process industry, and developments such as NOA (NAMUR Open Architecture), MTP (Modular Type Package), and Ethernet-APL (Advanced Physical Layer) are increasingly being used. This creates new pathways into the previously isolated operations automation level, opening potentially easy entry points for cyberattacks.

The risks of digital networking

The use of modern, integrated automation solutions is simplifying processes and making them more flexible and efficient, but as a consequence of this flexibility, process automation engineers are placing more emphasis on security. For example, according to the industry association Bitkom e.V., the German economy experiences a yearly loss of about 203 billion euros due to the theft of IT equipment, and proprietary data, as well as from espionage and sabotage. Cyber adversaries can come from various backgrounds, they may be individual 'script kiddies', or criminals or, in some cases, nation states. Although cyberattacks are still relatively infrequent in the process industry, operators of power plants, fuel tanks, or equipment in the water industry have recently become more vigilant. It is important to recognise too that any IT attacks can quickly impact OT systems.

Wireless communication in measurement systems

The development of wireless communication has brought with it many benefits for users in industry. Sensors, including level sensors, play a key role in providing essential data across various industrial sectors. This allows process data to be accessible globally and, among other things, Vendor Managed Inventory. VEGA sensors have been supplying critical data for many years, such as level data from reservoir water levels – to inventory stockpiles at coal power stations.

The VEGAPULS 6X radar sensor, using an 80 GHz signal frequency, enables contactless level measurement in challenging applications.

The emergence of Bluetooth technology expanded the use of level sensors in such applications. Bluetooth simplifies the adjustment and commissioning of sensors and controllers, often helping to prevent accidents. Irrespective of the source of the level data, whether it's from large silos, remote measuring points, potentially hazardous environments, or intricate processing plants, VEGA sensors make the data available where it is needed. Wireless data transmission is also used to retrieve status information from the sensors, reporting maintenance needs, for example, or requesting updates, in order to reduce downtime.

With regard to cybersecurity, challenges arise. Data is increasingly integrated into production and maintenance systems for further processing in offices or control rooms, and this creates a gap between operational and security functions.

Holistic security for VEGAPULS 6X

VEGA invested significantly in obtaining certification following IEC 62443-4-2 when it was developing the VEGAPULS 6X. This international set of standards defines security requirements for hardware and software, and the whole development process of the VEGAPULS 6X was aligned with it. The work was overseen by TÜV Nord and every measure was rigorously tested.

Safety is prioritised in the VEGAPULS 6X, with its internal electronics safeguarded against tampering. A layered security approach, termed Defence-in-Depth, is used. This comprises various IT security layers such as production equipment security, network security, and security measures for different system components. This security strategy provides protection against threats like data manipulation, Denial of Service (DoS) attacks, and espionage.

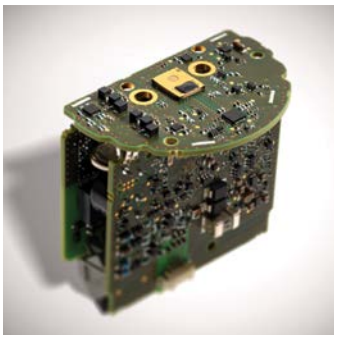
The VEGAPULS 6X incorporates extra security features which include user authentication. Each device is assigned a unique device code and a Bluetooth access code. The Bluetooth connections are encrypted using standardised cryptographic methods and can be disabled after configuration. The instrument logs all locking and unlocking

actions in its event memory, capturing all successful and unsuccessful attempts. Firmware integrity checks ensure the software update package is encrypted and signed, preventing unauthorised software from being loaded into the VEGAPULS 6X. Additionally, the instrument allows data backup for recovery through the DTM, with the option to save parameters using HART-enabled control systems.

Handling a worst-case scenario

When defending against a cyberattack, time is of the essence. Companies need to be prepared and this includes developing a clearly defined emergency plan to ensure that time is not wasted in case of an attack. It is also essential to plan how to rebuild a secure system in case significant damage is done. The PSIRT (Product Security Incident Response Team) at VEGA is always ready to help. This team of experts continuously searches for vulnerabilities in measurement systems, assists with updates and patches, addresses customer inquiries, and will take immediate action in critical situations, such as when a user discovers a vulnerability. VEGA also collaborates closely with CERT@ VDE, an IT security platform for industrial companies, to report and investigate vulnerabilities.

VEGA level sensors have been used for monitoring industrial processes for many years. The VEGAPULS 6X sensor is designed to be easy to set up, whatever the application area, technology, or sensor version. The company also focuses on simplifying aspects related to cybersecurity, acknowledging that ensuring cybersecurity is an ongoing, dynamic process that requires continuous attention. VEGA works with plant operators to support security systems on the shop floor and encourages operators to implement the security measures outlined in its guidelines. The guidelines also offer suggestions for enhancing the security of production systems. □



Above: Safety is prioritised in the VEGAPULS 6X, with its internal electronics safeguarded against tampering.

Left: The VEGAPULS 6X offers an easy-to-install continuous measurement solution as required in many processes.

For more information visit: www.vega.com/en-za

Elemental analysis in lithium-ion battery recycling

SPECTRO Analytical Instruments has published a report detailing a new method for the elemental analysis of black mass from recycled lithium-ion batteries. This method uses the SPECTRO ARCOS MultiView ICP-OES with dual side-on plasma observation (DSOI) mode, enhancing sensitivity and accuracy in determining the composition of valuable elements like lithium, manganese, cobalt, and nickel.

The SPECTRO ARCOS system features CMOS detectors (complementary metal-oxide-semiconductor technology used in imaging sensors) and a high resolution Paschen-Runge spectrometer mount with Optimised Rowland Circle Alignment (ORCA) technique, ensuring high sensitivity and minimal interference for accurate measurements.

It provides enhanced sensitivity with the dual side-on plasma observation mode which offers up to twice the sensitivity of traditional single radial plasma observation, yet maintains the benefits of the radial method, making it efficient for analysing major as well as trace elements in battery black mass.

The report compares two sample preparation methods: peroxide fusion and aqua regia extraction. Both methods showed excellent recoveries for major elements, with aqua regia extraction recommended for its efficiency and cost-effectiveness.

The SPECTRO ARCOS MultiView ICP-OES is used in analysing black mass from recycled lithium-ion batteries.

The accurate analysis of black mass is essential for the lithium-ion battery recycling industry. This new method supports better resource management by enabling the recovery of critical elements, aligning with the sustainability goals of the electromobility and energy storage sectors.

The full application report can be accessed from the SPECTRO website. □

Flow metering without disruption

The SU Puresonic flow meter works with ultrasound and does away with moving parts, minimising maintenance needs and simplifying flow measurement.

Flow meters that involve moving parts are prone to errors and usually require a lot of maintenance. The SU Puresonic flow meter from ifm has no moving parts inside the measuring tube and hence offers several advantages.

In applications where conventional flow meters are affected by components in the measuring pipe, the SU Puresonic is an ideal solution. A typical problem with flow meters that involve moving parts such as a paddle wheel, is that the wheels can become porous and break (a risk that increases over the service life) or a blockage can occur due to foreign bodies in the medium. Furthermore, components can be damaged during cleaning and cause the meters to malfunction.

In contrast, the SU Puresonic flow meter works with ultrasonic technology. The ultrasonic transmitter and receiver are placed on the outside of the pipe wall in such a way that the reflection occurs on the opposite inner side of the pipe. This means there is no need for potentially interfering structures inside the measuring pipe, which is made entirely of stainless steel.

Another advantage is that the sensor does not require any seals and ensures permanent tightness. The SU Puresonic is equipped with an operating status LED that can signal different status messages such as a deterioration of the signal quality due to air bubbles, particles or deposits, a failure of the electronics, or a short circuit. In addition to green and red, the LED can show a blue light, in line with NAMUR NE107, to indicate a change in the process.

As the SU Puresonic flow meter consists of a stainless steel pipe with no components built in or protruding into it, it makes the customer's choice simple. It obviates the need for a time-consuming selection of the appropriate meter, considering for example, the wetted parts or the sealing materials depending on the process parameters. The SU Puresonic flow meter is available in two sizes with process connections of 1" and 2"; the measuring ranges of the two models are 1...240 l/min and 5...1 000 l/min respectively. The measuring accuracy, which is guaranteed over the entire temperature range, is ±1% of the measured value / ± 0.5% of the VMR.

The SU Puresonic flow meter can be used to monitor ultra-pure water, water or water-based media containing additives of up to 10%. The flow meter is therefore used mainly in applications with very pure water, typically based on reverse osmosis in which salts are also removed from the water. The output is so-called demineralised water, which is also used in various water treatment processes.

For more information visit: www.ifm.com

German technology company celebrates 60 years

The GEMÜ Group, which develops and manufactures valves, measurement and control systems for liquids, vapours and gases, is celebrating its 60th anniversary this year. Marking this milestone, it has moved into its new company headquarters in the Hohenlohe business park in Kupferzell Germany.

Construction of the new headquarters building began in 2021, marked by the ceremonial signing of the contract by Managing Partner of the GEMÜ Group, Gert Müller and Managing Director of the GEMÜ Group, Stephan Müller. It is built over an area of about 14 000 m^2 providing workstations for about 300 staff as well as corporate facilities.

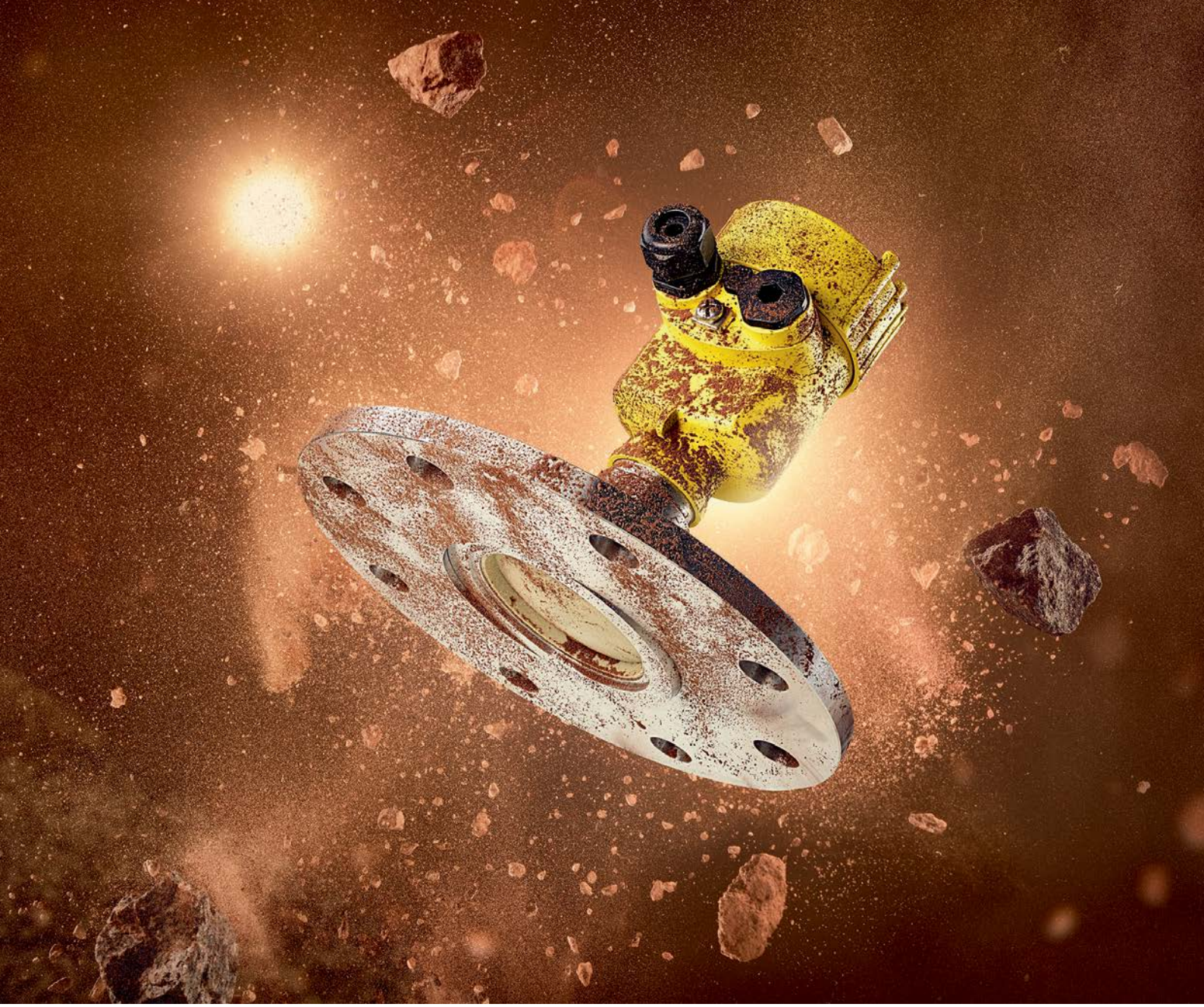
Marking its 60th anniversary, the Ingelfingen-based technology company GEMÜ opened its new headquarters in June.

This is GEMÜ's third building in the Hohenlohe business park, after the European Production and Logistics Centre (PLZ) and the Surface Technology Centre (OTZ). "With this move into our new headquarters in our 60th anniversary year, we're opening a promising new chapter in GEMÜ's company history," says Gert Müller.

Since its foundation in 1964, the company has grown into a leading world-wide manufacturer of valves, measurement and control systems. GEMÜ is also a global market leader in providing solutions for sterile applications.

"The 60th anniversary is an opportunity to thank our employees, customers and business partners for their loyalty and support," says Gert Müller.

Over the course of the year, GEMÜ is organising various activities to celebrate its 60th anniversary. □



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Segomoco Scheppers, Interim CEO of the NTCSA.

Progressing implementation of the TDP

The National Transmission Company of South Africa – NTCSA – formerly the Transmission Division of Eskom, is making progress on several fronts in implementing the rollout of infrastructure development as set out in the Transmission Development Plan.

In late June Eskom announced it had appointed a panel of five selected transformer suppliers to tender for upcoming transformer contracts which, as part of the Transmission Development Plan (TDP), will enable grid connection for significant new generation capacity and support access to reliable electricity transmission across the country.

More recently, *Engineering News* has reported (5 August 2024) that following the completion of an internal due diligence process, Eskom released the names of the companies selected; they are confirmed as Hitachi Energy South Africa, Hyosung South Africa, Siemens Energy South Africa, the SPECO & Changzhou Toshiba Joint Venture, and WEG Electric in South Africa. Most of the suppliers are local with an international footprint.

The Transmission Development Plan indicates that over the next 10 years, 101 large-scale and various other sizes of transformers will be required for the rollout of infrastructure build.

A tender for the first 26 power transformers was issued in April and this first batch of large-scale transformers, with a total contract value of some R7 billion, is to be delivered to the NTCSA over the next four years, between 12 and 36 months from the placement of orders. They will help to meet the urgent need to increase transmission capacity for customers as well as independent power producers and, in turn, contribute to the country's economic growth.

Segomoco Scheppers, formerly Managing Director for Transmission at Eskom and now the Interim CEO of the newly established National Transmission Company of South Africa, (NTCSA) has said: "The aim is to connect 53 GW of new generation capacity over the next ten years. To achieve this, innovative project delivery models and partnerships are being explored and implemented to drive accelerated delivery of the TDP, including a priority programme for strategic projects."

New transmission infrastructure will add substantial grid connection capacity and extend power lines by 2033.

Localisation strategy

The NTCSA has designed a framework agreement to procure the full scope of 101 transformers from the selected suppliers, initially addressing the demand up to the end of the 2028 financial year. The contracting strategy is designed to allow for efficient procurement processes, to maintain and strengthen governance, promote localisation and reduce lead times, in order to deliver on the TDP requirements. The 26 power transformers that make up the first priority project will enable the delivery of some 28 GW of electrical energy.

Eskom has indicated that going forward it will call for higher levels of local content as the supply chain becomes more established in South Africa. However, Scheppers has noted a lack of local capacity for the supply of 400/132 kV transformers, and it is hoped that the original equipment manufacturers selected as suppliers will look to develop this capacity over time.

The NTCSA has overall accredited 22 factories, locally and internationally, for various classes of transformers to meet the requirements of the TDP as it is implemented.

Scheppers has also flagged as a concern South Africa's current steel fabrication capacity, in view of the need for steel towers that will be required for the rollout of 14 000 km of new powerlines as indicated in the TDP. This will need additional capacity.

TDP priority programmes

The overall transformer contract includes a list of 34 transformers that form part of two priority programmes to accelerate the delivery of the transmission infrastructure. The first 25 projects at existing substations will provide additional transformers to unlock 13 000 MW of new generation capacity. Secondly, 22 expedited transmission projects will unlock 24 000 MW of grid connection capacity. In summary, the NTCSA is developing 47 projects that have the potential to unlock 37 GW of grid connection capacity between 2025 and 2033. The projects are at different stages of implementation in terms of design, procurement, and construction.

They form part of the major infrastructure rollout which is being undertaken by the NTCSA as set out in the TDP

to 2032. This sees a commitment to deliver 170 transformers to bring on board 105 865 MVA of transformer capacity and 14 218 km of new transmission lines by 2032.

Securing operational and investment revenues

Established as a separate entity and a subsidiary of Eskom Holdings with effect from 1 July 2024, the NTCSA has its own board of directors and some 3 400 Eskom staff members have been transferred from the former Eskom Transmission Division to the NTCSA. It also operates its own finances, which have been separated from those of Eskom.

Noting that the former Transmission Division had not received an adequate share of funding within Eskom to maintain and extend the transmission network over the past several years, Scheppers has highlighted that the NTCSA will need to secure revenues for its ongoing operations as well as the rollout of the TDP. Although it is recognised that the TDP (2022) needs to be updated, for now it continues to represent the current grid investment roadmap. The question of electricity tariffs generally, and the transmission tariff on its own, are increasingly raising concerns. Scheppers has said that the NTCSA will need to address how it secures operational and development revenues going forward and attracts the necessary investments, Opportunities are being explored within the public sector as well as with private sector organisations and financing institutions.

Besides securing dedicated revenue for the rollout of the TDP, Scheppers has said the NTCSA's strategy includes:

- Protecting existing grid assets through ongoing maintenance and renewal
- Leveraging the existing assets to integrate additional renewable energy generation through mechanisms such as curtailment
- Accelerating the development of new transmission corridors
- Implementing measures to ensure grid stability as variable renewable energy penetration increases
- Expediting the two priority grid capacity programmes (as outlined above).

Further progress

Moving ahead in extending its infrastructure, the NTCSA on 20 August 2024 announced that long-term agreements have been signed with 19 local companies in the various categories of overhead line construction, that is, in Engineering, Procurement and Construction (EPC), Procurement and Construction (PC) and Construction. Five companies have been signed on for EPC, nine for PC, and a total of seventeen companies for Construction.

This marks a pivotal moment in the country's commitment to improving its transmission grid capacity. It follows the issuing of an open tender enquiry in May 2023 by the then Eskom Transmission Division.

Furthermore, the process to be appointed to the EPC panels will be opened to the market annually on the anniversary date, which is around July each year, to enable other companies to participate. The suppliers will compete for various tenders over the coming years, and the contracts are expected to be worth in the region of R32 billion over eight years.

Scheppers commented: "The NTCSA's strategic move to accelerate the development of the transmission infrastructure through partnerships is a significant step towards enhancing South Africa's power network and underscores the importance of strategic planning and efficient execution. It demonstrates the collaboration between the public and private sectors and is expected to support economic growth by creating sustainable and skilled job opportunities," he said.

The scope for line construction has been divided into three different transmission lines panels:

- Engineering, Procurement and Construction (EPC)
- Procurement and Construction (PC)
- Construction.

This approach is to allow for a specialised focus on each aspect of the infrastructure development, in order to optimise the overall process. Working with three panels of suppliers provides flexibility in the procurement strategy and supports inclusivity of all contractor capabilities. The services to be provided will encompass engineering, detailed designs, procurement, construction, testing, commissioning, and handover of assets to the NTCSA.

The process adopted demonstrates a commitment to continuity and stability in the energy sector, providing companies with a platform to compete for various tenders. This competitive context is intended to drive innovation and efficiency and so benefit the rollout of the NTCSA's infrastructure development plan.

The NTCSA has said it will provide regular updates on the TDP projects and related initiatives as they progress. □

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

The practicalities of digitalising power distribution networks

Continuing his exploration of the impact of IEC 61850 on protection and control in the field of power distribution networks, Joe Stevenson of Doble Engineering Company recently shared his latest blog post – as below – highlighting issues raised at a seminar, including concerns regarding cybersecurity.

Protecting protection and control

Utilities fight back hundreds of thousands of cyberattacks every month. Cyber defences are not cheap (and in North America, NERC CIP penalties[1] are not either) on top of recovery expenses if something gets missed. Consequently, substation automation gets the attention of industry regulators and owner-operators as it involves networks of computer equipment serving to protect and control power systems. Obviously, these networks must be protected for the sake of system reliability. Industry players have a clear and real incentive to prioritise cybersecurity throughout substation networks anyway, but especially those at facilities operating at voltage levels that support bulk electric power delivery.

Many eggs in one basket

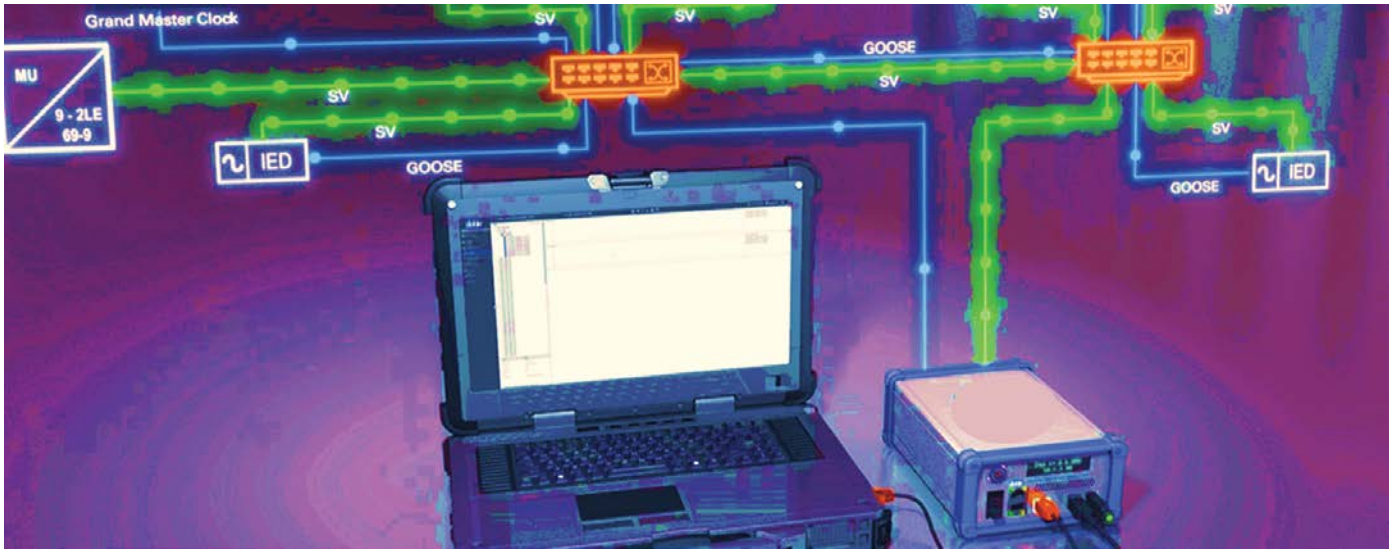
Substation automation involves coordinated integration – multiple discrete functions happening as integrated processes. In the context of protection and control (P&C), microprocessor-based (MP) relays enable automation. As programmable electronic devices, MP relays use an algorithmic paradigm for tripping built on logical (if, and, or) expressions that give protection engineers many possible ways to design advanced schemes. In due course, the intricacies of their schemes become settings in the programming of the relays. Tripping parameters of protection elements become set like so many other functions – monitoring, alarming, event capture, self-checking – all coordinated and governed by logic.

MP relays receive wired inputs from instrument transformers and use wired inputs and outputs to control circuit breaker operations in their given protection schemes. Other connections (for Ethernet over copper/Ethernet over fibre) join them to networks of equipment in communication schemes that coordinate relays device-to-device using protocols that invoke redundancy among segments of the power system if local protection fails. Device-level communication schemes, such as those for P&C, contribute essential information to SCADA (supervisory control and data acquisition) aggregations at the station level.

Automation rests on the capabilities of multi-function MP relays, but one significant problem complicates the whole matter: the marketplace. Manufacturers of MP relays compete on features at least as much as prices and support offerings. Customer by customer, features required within bid specifications extend what manufacturers produce, resulting in extensive capabilities being amassed along with multiple setup choices. Such expansive feature sets increase the complexity of engineering, commissioning, and maintenance, especially with relays from different manufacturers that have their own ins-and-outs regarding settings, logic, and communications.

Interoperabilty via IEC 61850

IEC 61850 and its associated standards define protocols



[Source: Doble]

Implementing IEC 61850 in digital substation infrastructures and maintaining automation through IEDs changes the game for engineers and technicians – stretching their functional areas into the domain of network specialists and vice versa.

that manufacturers can implement to overcome proprietary differences which generally impede device-to-device communications between commercially diverse relays. Interoperability is great, but the catch is automation schemes based on IEC 61850 exist digitally in substation LAN/WAN topologies … gone are the wires (replaced by Ethernet cables) but not the complexity. MP relays that can support Ethernet-based digital schemes like those based on IEC 61850, are considered intelligent electronic devices, so called IEDs.

IEC 61850-based P&C invokes a whole different set of concepts – SV/GOOSE/MMS[2], publishing/subscribing, test/simulate modes, mapping logic to digital I/O of IEDs, for example – and this changes the game for engineers and technicians. Their functional areas enter the domain of network specialists and vice versa when it comes to implementing IEC 61850 in digital substation infrastructures and maintaining automation through IEDs.

As they protect and control power distribution networks, substation automation systems need to be protected against cyber threats.

Cybersecurity is paramount

Considering infrastructure, critical infrastructure – like high voltage electric systems – is significantly consequential to society, which makes it the target of cyberattacks. Bad actors are becoming more sophisticated, honing their techniques from ceaseless attempts to disrupt large-scale electric systems by compromising their cyber defences.

The power industry has responded with numerous countermeasures – access controls, hardened laptops, multi-factor authentications, password management, segmentation and firewalls, encrypted data in transit, secure communication protocols, regular patching and updates – in defence of its assets and interests. One particular standards series, IEC 62351 for security of control centres and communication networks, lays out methodologies that entities have been adopting for years on this front.

Does IEC 61850 increase security risks?

Protection, communication, and control inter-dependencies carry the same criticality whether we're talking about systems that are Ethernet-based and digital or point-to-point and hardwired. Cybersecurity is essentially as stringent for one as the other. As far as the industry is concerned, the attack surface calls for a robust cybersecurity posture either way. □

For more information visit: www.doble.com

Notes:

[1] Critical Infrastructure Protection penalties charged by the North American Electric Reliability Corporation.

[2] In the realm of substation automation and digital communication protocols, Generic Object Oriented Substation Events (GOOSE) and Sampled Values (SV) stand out as two key technologies. Both are integral components of the IEC 61850 standard, designed to enhance the efficiency and reliability of power grid operations.

Multimedia Messaging Service (MMS) is a standard way to send messages that include multimedia content to and from a mobile phone over a cellular network. MMS provides the structured framework for exchanging information and configuring devices.

SV, GOOSE and MMS ensure real-time event exchange, secure information sharing, and accurate measurement transmission.

Consider total cost of ownership when specifying transformers

As with a vehicle, the total cost of running and maintaining a transformer over its lifespan will be considerably higher than its purchase price. These other cost factors therefore deserve close consideration before any purchasing decision is made.

David Claassen, Managing Director of Trafo Power Solutions says, "The rated power of a transformer is usually among the key determinants of its capital cost, but there are various design differences which will also come into play."

To help the buyer assess the capital cost effectively, transformer manufacturers need to provide a detailed data sheet indicating specific parameters such as losses, windings material, environmental conditions and others.

Transformer manufacturers need to provide buyers with a detailed data sheet to help them assess the capital cost effectively.

Operational costs

Claassen notes that the next main area of costs is operational – the running and maintenance costs.

"The running cost is essentially the cost of electricity, measured in kWh. These costs are affected by the efficiency of the transformer. All transformers have both no-load losses and load losses. The monthly cost of electricity for low loss transformers is lower than that for those with higher losses. However, the capital cost of a low loss transformer will be higher due to the design requirements to meet lower losses."

Regarding maintenance costs, he points out that these vary considerably between oil cooled transformers and dry-type transformers, which are cooled by air. With oil cooled transformers, oil samples need to be collected and analysed regularly in order to gain the insights such analyses offer into the condition of the unit and any possible areas of underperformance.

"The analysis allows the owner to foresee the steps needed to keep the transformer in optimal condition," he says. "In dry-type transformers, where oil is not used as a coolant, the cost of maintenance is significantly reduced."

Other important maintenance tasks include testing of a transformer's instrumentation such as temperature and pressure gauges, as well as relays. Dry-type transformers will tend to have less instrumentation, with a focus on monitoring temperature variation and providing surge protection. On all types of transformers, it is essential to test, regularly, that the probes are measuring the unit's temperature accurately. Another basic check is the torque measurement on the termination points.

Installation costs

"The next big cost factor to consider is the installation cost of the transformer," Claassen says. "There are regulations that govern where and how transformers are installed, depending on their characteristics – such as their fire hazard level and their potential danger to the environment."

Oil cooled transformers are, generally, classified as hazardous in terms of the fire risk they present, and they must therefore be located at a safe distance from human activity. Systems need to be in place to detect and suppress a fire in the transformer, should this occur. There is also a requirement for containment of oil, in case of a leak or rupture – to avoid environmental damage.

The inherent safety of dry-type transformers means they can be installed indoors without this added infrastructure. Rated as Class F1 for fire safety, dry-type transformers can also be safely installed in confined spaces. Where an outdoor location is required, a concrete plinth is usually sufficient as a base.

"When considering the total cost of ownership – the capital cost plus operational and maintenance costs plus installation cost – there is a strong case favouring dry-type transformers, particularly for applications of 5 MVA and below, up to a voltage level of 33 kV," Claassen says. "The case becomes stronger with the number of transformers required on a single site."

On a large mining or industrial site, which may have dozens if not hundreds of transformers, low maintenance dry-type units reduce the cost and workload substantially. As these operations look to become safer and more efficient, there are great opportunities offered by dry-type transformers, he says.

Claassen notes too that as the price of electricity continues to rise, there is a growing focus on reducing the energy losses incurred by transformers. This highlights why transformer suppliers must be able to quantify the predicted losses over time.

"Considering the specification of a lower-loss design, a purchaser can calculate whether or not it is worth spending more upfront on the capital cost, in order to save on losses over the 20- to 30-year lifespan of the transformer," he says.

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

Distribution transformer monitor with new capabilities

Comtest, the local representative of Franklin Electric – Grid Solutions, has announced that the INCON® Distribution Transformer Monitor (DTM) has been updated to include new functionality for transformer life prediction, enabling forecasting for services and maintenance. This enhancement leverages predictive algorithms to estimate the remaining lifespan of transformers and so helps streamline operations.

Additionally, the DTM now supports Ethernet connectivity with compatibility for DNP3 (Distributed Network Protocol 3) and Modbus, offering flexible and efficient network integration. It provides continuous, meter-grade precision performance monitoring of high-value, mission-critical, low-voltage pad mount and conventional pole mount transformers.

With the ability to monitor and trend transformer output voltage, loading (current) by phase, temperature, and power factor for an entire network of transformers, utilities gain the information they need regarding power distribution and equipment maintenance.

Key advantages

Transformer state of health: continuously monitoring the key indicators of a transformer's performance, including temperature and load, the DTM provides remote access to real-time data on transformer health and automated threshold alarms for condition-based maintenance planning

Transformer life prediction: the DTM tracks a transformer's 'loss of life' and employs advanced predictive algorithms to forecast the estimated remaining run time. It provides a near-constant assessment of the transformer's health, considering real-time conditions, updating at two-second intervals, and applying a calculated dynamic acceleration factor to predict the cumulative loss of life.

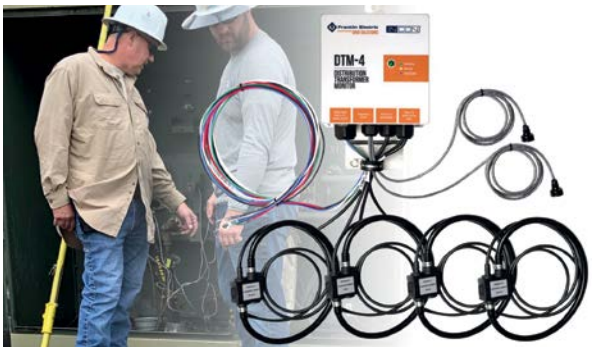
Power factor monitoring: the monitor tracks a transformer's power factor, which reflects the trend of useful power delivery. Power factor helps utilities to determine the most efficient distribution of power during peak times and to ensure the delivery of high-quality outbound power when customers need it most.

High-performance hardware: a powerful industrial IOT-grade processor and sophisticated polyphase energy measurement integrated circuit provide advanced onboard computation capability and power quality monitor-level fidelity.

Deploy anywhere at scale: a built-in Cat M1/NB2 cellular modem allows the DTM to communicate via a cellular network, enabling utilities to deploy DTMs almost anywhere and at scale (that is, one unit to thousands of units).

Alarms and notifications

With the CONVERGE™ web interface, utilities can manage installations by exception, with customised threshold alarms and notifications, such as Voltage signal Delta, Current signal Delta, Fault current, Voltage sag and swell, K-factor harmonics, Top/Bottom tank temperature, Temperature Delta, Winding hot spot load ratio, Winding load, and Winding hot spot temperature.



The INCON® Distribution Transformer Monitor provides continuous, precise, performance monitoring of low voltage pad mount and conventional pole mount transformers.

Asset management database

A secure MQTT communication protocol allows the DTM to communicate safely with the web-based UNITE™ asset management database. UNITE™ provides user-friendly access to all distribution transformer performance data – voltage, temperature, current, power factor, and more – for convenient centralised analysis and reporting. It is a sophisticated IoT database with advanced data visualisation tools for Franklin Electric monitoring systems like the DTM. It provides service and maintenance personnel with a consolidated view of the health and performance data of an entire network of distribution transformers.

Easy installation

The DTM can be applied to any type of distribution transformer with a secondary output of 480 Volts or less, phase to neutral. This includes single-phase, split-phase, or three-phase transformers. Installation has been kept simple, with only a few connections required for the secondary transformer.

Four split-core Rogowski Coils measure load current. Five voltage leads measure Phase A, B, and C, as well as neutral and ground. Two magnetically mounted RTD sensors measure the top and bottom of the transformer temperature.

For magnetic mounting, four powerful magnets integrated into the mounting plate allow for the DTM to be installed vertically or horizontally, without drilling or adhesives.

Setup and configuration are also simple. All user interface communication, including alarm and setting configuration, data viewing, and alarm resetting, is made via the CONVERGE™ web interface. Configuration can be done locally via Wi-Fi using a web browser, or remotely through the cellular connection.

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

Nishandra Baijnath, Power Systems, Schneider Electric.

Power and control platform for complex applications

Schneider Electric has recently released the PowerLogic P7 digital power and control platform – the latest device in its PowerLogic range of products.

The PowerLogic P7 is designed to offer the best performance in complex and high-demand applications and is based on a visualisation-ready, next-generation platform, powered by a single configuration tool, the PowerLogic engineering suite.

Nishandra Baijnath, Systems Architect, Power Systems at Schneider Electric, says the PowerLogic P7 is now available to the South African and the Anglophone Africa region and will replace the company's legacy protection relays.

"This is a high-end, multi-functional protection and control platform that combines all the features and functionalities of our legacy MiCOM range of protection relays, including the MiCOM P30, C264 and P40, as well as the SEPAM 60 and 80," Baijnath says.

"It is the rejuvenation and platforming of our high-end legacy protection relay that brings five product ranges and more than 50 products to a single platform to support all applications."

He explains that the PowerLogic P7 is designed for more complex, demanding and advanced industrial applications to help maximise operational efficiency, power availability and electricity security.

"It provides an improved digital experience that helps to reduce complexity at various stages of the product lifecycle. Performance and flexibility have been increased to deliver a more modular, cyber secure platform," he says.

The PowerLogic P7 can be deployed to multiple applications and is specifically designed to protect critical installation in distribution networks, on the supply and demand side. On the supply side, the platform can be used by electricity utilities in HV/HV (high voltage) substations, HV/MV (medium voltage) substations and MV/MV switching.

On the demand side, it is suitable for use in electro-intensive applications in industries such as petrochemicals, mining, minerals and metals and metallurgy, and can also be used in environments with electro-sensitive and critical infrastructure such as data centres and military bases.

Efficiency, security and network reliability

Baijnath highlights the PowerLogic P7 platform's ability to maximise user efficiency, security and network reliability. It offers a sound investment, delivering operational efficiency through flexible hardware and firmware concepts with application packages, an intuitive digital experience for various engineering devices and enhanced lead time with pre-configured devices on stock and delivery tracking.

Furthermore, it can reduce operational expenditure through efficient engineering, operation and maintenance, as well as modular hardware that limits out-of-service time and spare parts handling, among other concerns.

"Another key aspect of PowerLogic P7 is that it was designed with reliability and sustainability in mind, based on Schneider Electric's more than 100 years of experience in protection relays. PowerLogic P7 is supplied with a 10-year warranty," says Baijnath.

"Importantly, the PowerLogic P7 can use wireless Internet of Things-based sensors that provide real-time information about temperature, environment and humidity that affect switchgear and transformers. This means organisations can start adopting more cost-effective predictive maintenance practices rather than relying on routine scheduled maintenance for their equipment," he adds. □

New power quality solution to strengthen the grid

Hitachi Energy recently won an order from SP Energy Networks to design and deliver a first-of-its-kind power quality solution to balance the grid and boost the flow of renewable energy across the UK. SP Energy Networks is the electricity network operator for some regions of the UK and the solution will enable it to add more renewables into the grid and facilitate the phase-out of fossil fuels.

The project, located at SP Energy Networks' substation at Eccles, consists of two sets of an SVC Light® STATCOM and a synchronous condenser controlled centrally by the MACH™ control system, connected at a common electrical node. This unique combination of technologies will maximise the future power system's potential and provide greater system resilience, thus supporting the increasing integration of renewables into the electricity grid.

Each STATCOM installation – a static synchronous compensator that continuously provides variable reactive power in response to voltage variations, supporting the stability of the grid – uses Hitachi Energy's advanced power electronics and technology-leading MACH control and protection solution to provide system strength, instantaneous voltage control and enable maximum power flow. The MACH Control System acts as the intelligent control centre of SVC Light, using state-of-the-art computers, microcontrollers and digital signal processors. This technology, which entrusts a STATCOM to control a local synchronous condenser, is market leading. It builds on an earlier collaboration between SP Energy Networks and Hitachi Energy on the network innovation competition project Phoenix, which was supported by Ofgem, the energy regulator for the UK.

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E-houses installed to power Mozambique gas project

Now in the final stages of installation and commissioning, an important substation E-house facility at Sasol's Upstream Production Sharing Agreement (PSA) Project in Mozambique called for WEG Africa's depth of experience, locally based technical infrastructure and specialised skills sets.

The E-house facility, with transformers and generator set, procured by EPCM contractor Wood, was designed and manufactured in South Africa by WEG Africa and supplied in partnership with local engineering firm Proconics.

"The project is a successful demonstration of our product quality and technological capacity, delivered to the highest global standards," says Lukas Barnard, WEG Africa's Sector Specialist Oil and Gas – Business Development. "Our scope of supply was essentially the 'electrical heart' of the project – with the electrical supply and control for the entire PSA plant coming through the E-houses."

The PSA Project includes the construction of facilities to produce 23 million gigajoules of gas per year, which will power the Temane Thermal Power Plant to generate 450 MW of electricity and provide excess gas for export. It will also include a Liquefied Petroleum Gas (LPG) facility which will produce 30 000 tonnes per year, meeting 75% of Mozambique's cooking gas demand, as well as light oil for export.

The substation package measures 45 m by 22 m and includes medium voltage (MV) and low voltage (LV) switchgear, a battery room, a local equipment room and an HVAC system.

Barnard highlights how the E-house option overcomes the various challenges of building conventional electrical facilities on site in countries with limited infrastructure. WEG Africa could manufacture and pre-assemble the E-houses under controlled workshop conditions at its advanced facility in Heidelberg, Gauteng. The design

Rigging the first WEG E-house pod into position on the project site.

responds to the harsh environmental conditions and takes account of other risks on the site.

"The site is in a region which has experienced hurricanes in the past," Barnard says. "WEG Africa also considered the elevation and weather conditions of the environment to ensure the E-house solution will withstand the harsh conditions."

Special treatment of the steel was necessary to ensure the high level of corrosion protection required by the client. All related work was conducted in accordance with SANS 12944 for C5M – that is, highly corrosive – environments. Outer walls are constructed from 3CR12 stainless steel, with galvanised steel for outside staircases and walkways. Another design element built into the structure is its ability to resist seismic events with ground acceleration of up to 0.20 g – the measure of g-force or ground acceleration.

The advanced Heidelberg workshop – and ready access to the required expertise – enabled strict adherence to WEG Africa's manufacturing quality standards, which are aligned to ISO 9001. Barnard notes that this also allowed for greater manufacturing efficiency as well as reducing the number of people needed on site, improving safety levels and minimising the risk of construction-related incidents.

"The whole package, with all the related equipment, could be transported to site. Although the logistics were challenging, the process of constructing the E-house locally reduced the complexity and timeline, as all the equipment is already installed and tested before being transported."

Barnard notes that the project combines the manufacturing capabilities of WEG Africa and the project management and design capabilities of Proconics. It demonstrates that the partnership the two companies have built can provide full turnkey solutions to the oil and gas industry.

"Working closely with the contractor, WEG Africa and Proconics ensured all the client's expectations were met, and the highest quality of workmanship delivered," he says. "The success of a project like this also confirms to the market that the expertise and industrial capabilities needed for projects of this nature are available here in South Africa."

For more information visit: www.weg.net

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Billy Moore, Senior Project Manager at SP Energy Networks said, "This innovative power quality solution will increase the transfer capacity across the UK by up to 280 MW by improving the transmission network's strength as more renewable generation is connected in Scotland. Technology like this will become increasingly important as we reduce the usage of fossil fuels."

Marco Berardi, Head of Grid & Power Quality Solutions and Service business at Hitachi Energy. "This pioneering innovation is another addition to our evolving portfolio of power quality solutions that help grid operators overcome the immediate and long-term challenges of the energy transition."

In this project, the SVC Light STATCOM and synchronous condenser with combined control generates or absorbs reactive power to adjust the grid voltage and maintain system resilience. □

Empowering the workforce - shaping SA's energy future

Xolile Msimanga, Secretary General SANEA

Xolile Msimanga, SANEA.

South Africa's energy sector has faced numerous challenges for over a decade. In the power sector, national power utility Eskom, has struggled with an ageing coal fleet, governance issues, and financial difficulties, which led the country into a prolonged period of loadshedding. Although loadshedding has recently diminished significantly, as a result of collaborative efforts between Eskom and broader stakeholders, it remains a concern. There has also been a marked growth in renewable energy in power generation, increasing to 8.8% in 2023 (CRSES, 2024), supported by regulatory amendments that have enabled increased private participation. In the Oil & Gas sector, energy security has been compromised by the shutdown of three of the six refineries, increasing the country's dependence on fuel imports. Natural gas supply is also a concern, with the Pande/Temane source from Mozambique forecast to decline from 2025 and to be depleted by 2029/2030 (Competition Commission, 2023). Moreover, the gas source for the PetroSA refinery is already exhausted, and TotalEnergies recently announced its official exit from the West Coast's Brulpadda and Luiperd gas finds. Securing new sources of gas is critical to ensuring energy security into the future. The energy sector is also on a decarbonisation pathway within the context of the country's just energy transition, as it is the largest source of greenhouse gas emissions (GHG) in South Africa.

The upcoming SANEA Leadership Conference, which will focus on, among other things, transformative leadership for a sustainable future, will serve as a platform for these discussions and guide the implementation of strategies going forward. As engagements increase on improving the energy sector and getting things back on track, empowering the workforce is a key lever in addressing the challenges. Strong leadership can inspire, guide, and mobilise an empowered workforce, driving the sector towards a sustainable and efficient future.

Leadership challenges in the energy sector

Some of the leadership challenges the energy sector is facing are outlined below.

Leadership instability: Frequent changes in leadership at Eskom, which has had 12 CEOs and Acting CEOs over the past decade (Eskom, 2024), as well as in other key institutions, raises challenges to organisational stability and the organisation's long-term strategic vision. This is detrimental to a sector that requires long-term stability to implement projects (Msimanga, 2023) and it undermines confidence among investors, employees, and the general public.

Corruption and mismanagement: Corruption and state capture allegations have also severely impacted Eskom. They have eroded trust and [until more recently – Ed] diverted resources away from critical infrastructure and maintenance. In addition, they have contributed to Eskom's debt burden. Addressing these issues requires firm, transparent, and accountable leadership.

Resistance to change: Due to the energy sector's long-term perspective, there has been some inertia in bringing about changes [again, until more recently], and this has hampered efforts to modernise and innovate. Resistance to change, within energy organisations and among external stakeholders, including government, has slowed progress. Leaders need to navigate new and unfamiliar areas, promoting a culture of adaptability and openness to new ideas.

Empowering the workforce

According to an article in *Harvard Business Review (HBR)*, research has regularly shown that when employees feel empowered by their employers, this can lead to more robust job performance, job satisfaction, and organisational commitment (HBR, 2018). Research by EY's Transformation Leadership: Humans@Center and Oxford Saïd Business School, empowering people is one of the six key drivers for transformational success (EY, 2023).

Empowering the workforce in energy organisations should follow a strategic approach. Some considerations are outlined below.

Building skills and motivation: Organisations need to invest in the training and development of their employees, as this ensures employees are equipped with the skills they need to adapt to new technologies and practices. This is particularly important in the context of the JET, where skills have been identified as a critical cross-cutting requirement in the Just Energy Transition Implementation Plan (JET-IP) (The Presidency, 2023). Furthermore, a motivated workforce is more productive, innovative, and committed to the organisation's goals.

Promoting a culture of accountability and excellence: It is common knowledge that an organisation's culture dictates how it performs. Organisations that foster a culture which empowers employees by setting clear expectations, providing the necessary tools and resources, and holding everyone accountable for their performance achieve better outcomes (Gouldsberry, 2023). Leaders who promote a culture of excellence inspire their teams to achieve higher standards and take ownership of their work. Employees take pride in their work outcomes and the willingness to work with others to maximise impact grows.

Encouraging innovation and problem-solving: Employees who feel empowered and trusted by their leaders are more likely to contribute innovative solutions and improvements. In sectors like the energy sector, which relies heavily on the workforce for operations, the employees can provide insights into challenges that leaders may need to be aware of and develop potential solutions. For this to happen, the leaders need to be open to receiving input from their employees and work hand in hand in implementing

solutions that can impact the business positively. Encouraging a bottom-up approach to problem-solving leverages the insights and expertise of those on the front line.

Increasing retention and job satisfaction: Employees who feel empowered by their organisations tend to stay with them longer because they feel valued and respected. There is a lower turnover rate and higher job satisfaction because employees feel they have some control and ownership over their work and can contribute meaningfully to the organisation's broader goals (Gouldsberry, 2023). Research indicates that organisations with higher employee engagement see 23% greater profitability (Gallup, 2024).

Further empowering steps should include the following.

Providing resources and support: Ensure employees have access to the necessary tools, resources and support to perform their roles well.

Professional development and learning: Contribute to the development of employees by implementing programmes aimed at developing leadership skills at all levels, ensuring a pipeline of capable leaders who can drive change and innovation. Foster a culture of learning and provide mentoring and coaching.

Inclusive decision-making: Create mechanisms for employees to participate in decision-making, ensuring their voices are heard and valued. When employees feel included in the decisions impacting their roles, there is increased buy-in and a higher chance of successful implementation. Furthermore, diversity can result in better decision-making (Phillips, 2014). According to research by Salesforce (2019), employees who feel their voices are heard are 4.6 times more likely to feel empowered to perform at their best.

Performance-based Incentives: Introduce performance-based incentives that reward excellence, innovation, and commitment to organisational goals.

Transparency and communication: Develop a culture of transparency where communication flows freely between leadership and employees. Regular updates, feedback sessions, and open forums can help build trust and align everyone with the organisation's vision. At the most recent SANEA Annual General Meeting, Dan Marokane, Eskom CEO, highlighted that he was regularly engaging with his staff to bring about the utility's turnaround.

Citizenship in a republic

At this time in our nation, the newly established Government of National Unity (GNU) is sure to have an impact on the future of the energy sector and its workforce. These wise words below, an excerpt from a speech entitled 'Citizenship in a Republic', by Theodore Roosevelt, the 26th President of the United States, in 1910, seem particularly relevant.

"... in the long run, success or failure will be conditioned upon the way in which the average man, the average woman, does his or her duty, first in the ordinary, everyday affairs of life, and next in those great occasional crises which call for the heroic virtues. The average citizen must be a good citizen if our republics are to succeed. The stream will not permanently rise higher than the main source; and the main source of national power and national greatness is found in the average citizenship of the nation. Therefore, it behoves us to do our best to see that the standard of the average citizen is kept high; and the average cannot be kept high unless the standard of the leaders is very much higher." (UC Santa Barbara, 2024)

South Africa's energy sector faces significant leadership challenges. However, workforce empowerment can transform some of these challenges into opportunities. Empowering employees enhances performance and builds a sense of ownership and commitment to overcoming the sector's challenges, in turn benefiting the nation. I urge all South Africa's energy sector stakeholders to prioritise leadership stability and workforce empowerment. Together, we can drive the energy sector towards a more sustainable and prosperous future.

SANEA will host its Inaugural Leadership Conference 2024: TRANSFORM – Energising Progress: Transformative Leadership for a Sustainable Future, on 6 and 7 November 2024 at the Gallagher Convention Centre. We will continue the conversation on the role of leadership in revitalising and restoring the energy sector in South Africa.

For more information visit: www.sanea.org.za

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Superconducting transmission lines: more power, same footprint

Zach Winn at the MIT News Office reports that VEIR, an energy start-up founded by MIT alumnus Tim Heidel, has developed technology that can move more power over long distances with the same footprint as traditional lines.

Last year in Woburn, Massachusetts, a power line was deployed across a 100-foot stretch of land. Passersby wouldn't have found much interesting about the installation: the line was supported by standard utility poles, like those most of us have driven by millions of times. The familiarity of the sight is a key part of the technology's promise.

The lines are designed to transport five to 10 times the amount of power of conventional transmission lines, using essentially the same footprint and voltage level. That will be key to helping them overcome the regulatory hurdles and community opposition that has made increasing transmission capacity nearly impossible across some swaths of the globe, particularly in America and Europe, where new power distribution systems are essential to support the shift to renewable energy and the resilience of the grid.

The lines are the product of years of work by VEIR, which was co-founded by Tim Heidel (Master of Science 2005, 2006, and 2009, PhD 2010). They make use of superconducting cables and a proprietary cooling system that will enable initial transmission capacity up to 400 megawatts and, in future versions, up to several gigawatts.

"We can deploy much higher power levels at much lower voltage, so we can deploy the same high power but with a footprint and visual impact that is far less intrusive, and thus can overcome a lot of the public opposition as well as siting and permitting barriers," Heidel says.

VEIR's solution comes at a time when more than 10 000 renewable energy projects at various stages of development are seeking permission to connect to US grids. The White House has said the US must more than double existing regional transmission capacity in order to reach 2035 decarbonisation goals.

This comes as electricity demand is soaring with the increasing use of data centres and AI, and the electrification of everything from passenger vehicles to home heating systems.

Despite those trends, building high-power transmission lines remains stubbornly difficult.

"Building high-power transmission infrastructure can take a decade or more, and there have been some projects that folks have had to abandon because they realise there's just so much opposition, or there's too much complexity to pull it off cost-effectively," Heidel says. "We can drop down in voltage but carry the same amount of power because we can build systems that operate at much higher current levels. That's how our lines can melt into the background and avoid the same opposition."

Heidel says VEIR has built a pipeline of interested customers, including utilities, data centre operators, industrial companies, and renewable energy developers. The company is aiming to complete its first commercial-scale pilot carrying high power in 2026.

A career in energy

Over more than a decade at MIT, Heidel went from learning about the fundamentals of electrical engineering to studying the electric grid and the power sector more broadly. That journey included earning a bachelor's, master's, and PhD from MIT's Department of Electrical Engineering and Computer Science as well as a master's in MIT's Technology and Policy Program, which he earned while working toward his PhD.

"I got the energy bug and started to focus exclusively on energy and climate in graduate school," Heidel says.

Following his PhD, he was named research director of MIT's Future of the Electric Grid study, which was completed in 2011.

"That was a fantastic opportunity at the outset of my career to survey the entire landscape and understand the challenges facing the power grid and the power sector more broadly," he says. "It gave me a good foundation for understanding the grid, how it works, who's involved, how decisions get made, how expansion works, and it looked out over the next 30 years."

"We can deploy much higher power levels at much lower voltage," Tim Heidel says.

The core innovation at VEIR is the cooling system, which is passively cooled with nitrogen.

After leaving MIT, Heidel worked at the Department of Energy's Advanced Research Projects Agency-Energy (ARPA-E) and then at Bill Gates' Breakthrough Energy Ventures (BEV) investment firm, where he continued studying transmission.

"Almost every decarbonisation scenario and study that's been published in the past two decades concludes that to achieve aggressive greenhouse gas emissions reductions, we're going to have to double or triple the scale of power grids around the world," Heidel says. "But when we looked at the data on how fast grids were being expanded, the ease with which transmission lines could be built, the cost of building new transmission, almost every indicator was heading in the wrong direction. Transmission is getting more expensive over time and taking longer to build. We need to find a new solution."

Unlike traditional transmission lines made from steel and aluminium, VEIR's transmission lines leverage decades of progress in the development of high-temperature superconducting tapes and other materials. Some of that progress has been driven by the nuclear fusion industry, which incorporates superconducting materials into some of its nuclear reactor designs.

But the core innovation at VEIR is the cooling system. VEIR co-founder and advisor Steve Ashworth developed the rough idea for the cooling system more than 15 years ago at Los Alamos National Laboratory as part of a larger Department of Energy-funded research project. When the project was shut down, the idea was largely forgotten. Heidel and others at Breakthrough Energy Ventures became aware of the innovation in 2019 while researching transmission. Today VEIR's system is passively cooled with nitrogen, which runs through a vacuum-insulated pipe that surrounds a superconducting cable. Heat exchange units are also used on some transmission towers.

Heidel says transmission lines designed to carry that much power are typically far bigger than VEIR's design, and other attempts at shrinking the footprint of high-power lines were limited to short distances underground.

"High power requires high voltage, and high voltage requires tall towers and wide rights of way. Those tall towers and wide rights of way are deeply unpopular," Heidel says. "That is a universal truth around much of the world."

Moving power around the world

VEIR's first alternating current (ac) overhead product line can provide transmission capacities up to 400 MW and voltages of up to 69 kV, and the company plans to scale to higher voltage and higher-power products in the future, including direct current (dc) lines.

VEIR will sell its equipment to the companies installing transmission lines, with a primary focus on the US market. Looking ahead, Heidel believes VEIR's technology is needed as soon as possible to meet rising electricity demand and new renewable energy projects around the globe.

For more information visit:
https://news.mit.edu/mit-news-office

Mareli Botha, Zutari.

Industrial ecology: a model for deep sustainability

Mareli Botha, Technical Director, Zutari

Engineers have long drawn inspiration from nature. Examples of such biomimicry include passive ventilation systems modelled after termite mounds and wind turbine blades with scalloped edges, inspired by the flippers of the humpback whale, which dramatically reduce drag.

Now, an emerging field is inspiring engineers to model industrial systems on nature's elegantly designed cycles and systems. As with biomimicry, engineers and nature want the same outcome – to create efficient, resilient, and sustainable systems. Nature, however, is far better at this than we are.

Consider nitrogen, for example. The nitrogen cycle tirelessly extracts this essential element from the atmosphere and transforms it into usable forms through complex interactions among microorganisms, fungi, and plants. Remarkably, this cycle is circular and waste-free; nitrogen is re-extracted from waste products through further interactions and returned to the atmosphere for long-term storage.

When we examine the deep, long-term sustainability of natural systems like these, we notice key points: they encourage abundant life and growth, they are largely mutualistic, and they are highly resilient. Industrial ecology aims to replicate this deep sustainability by supporting economic growth, benefitting all stakeholders, and providing the resilience needed to face threats like climate change.

In approaching this goal, industrial ecology offers several core practices. These include material and energy flow analysis, which examines how resources move through industrial systems and seeks to identify opportunities to reduce inefficiencies and waste. Lifecycle assessment evaluates the environmental impacts of products and processes from cradle to grave, considering sustainability at every stage. Ecodesign integrates environmental considerations into product development, aiming to create products that are sustainable throughout their lifecycle. The concept of a circular economy emphasises the creation of closed-loop systems where resources are continuously reused and recycled, eliminating waste and reducing the need for virgin materials.

Remarkable and exciting work is being done in this field. For instance, the Kalundborg Eco-Industrial Park in Denmark exemplifies industrial symbiosis where multiple industries collaborate to use each other's waste as resources. Companies like Interface Inc. are pioneering eco-design and circular economy principles by recycling old carpet tiles into new products. Germany's *Energiewende* policy is leading a national shift towards renewable energy and smart grid technologies, and London's Circular Economy Route Map promotes sustainability and resilience at a systemic level.

Industrial ecology is particularly appropriate in a resource-constrained context. It teaches us to do more, better, with less. By working in smarter, leaner, more connected ways, we can overcome constraints and maximise the positive impact of infrastructure development.

In Africa, ageing infrastructure presents unique challenges and opportunities. Implementing sustainable processes in old plants is complex; creating a digital twin for optimisation is often impractical due to a lack of existing plans or data. Industrial ecology can help identify effective levers for impactful change.

Small adaptations can sometimes lead to significant improvements, though pinpointing these within complex systems requires expertise. Infrastructure owners, investors, and managers can benefit from consulting partners who bring broader technical, social and legal perspectives, and additional capacity, to identify and activate those levers that are most likely to enhance environmental, social, and economic sustainability.

One example of the broader approach to sustainability inherent in industrial ecology is the SANRAL N2 Legacy Programme, which is led by Zutari's Social Development Team. Zutari was appointed by SANRAL to design and oversee parts of the N2 Wild Coast Road development, a multibillion-rand project. While construction will create significant employment opportunities, the jobs will not fully address the high level of unemployment in surrounding communities, and this [together with environmental concerns - Ed] is one of the major drivers of opposition to infrastructure projects along the Wild Coast, posing a risk to the project's smooth execution.

In response, SANRAL worked with Zutari to develop a Legacy Programme aimed at maximising long-term impact and addressing unemployment. This programme empowers 14 rural villages to create and sustain businesses, promoting social, economic, and environmental sustainability. It moves beyond temporary job creation to build a growing circular economy that capitalises on the opportunities the new road introduces. By linking livelihoods to natural resource conservation, it incentivises environmental protection. The programme also achieved broad community support for the road project, mitigating the risk of project delays due to community opposition.

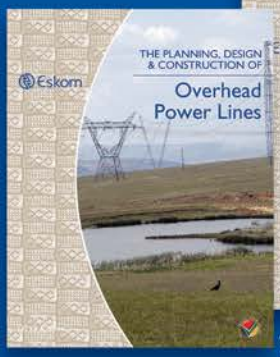
In addressing the complex challenges of our time, we need to guard against a narrow view of sustainability. When sustainability becomes a check-box exercise, we miss out on tremendous opportunities to create win-win systems. We also create real risks. There have been cases where industries have inadvertently increased their output of harmful chemicals – more harmful than carbon – in their efforts to reduce carbon emissions and gain market share.

Social, economic, and environmental sustainability are more than a triple bottom line, they are parts of a complex, and inseparably integrated system. Let us connect differently, across traditional boundaries, to explore our shared challenges more deeply. Let us draw inspiration from nature's intricate designs and elegant solutions to create deeper sustainability, together.

For more information visit: https://www.zutari.com

Eskom

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



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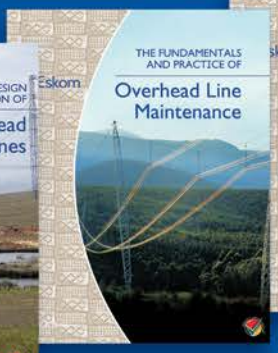

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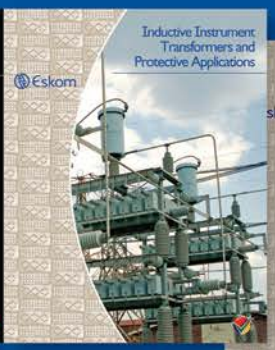

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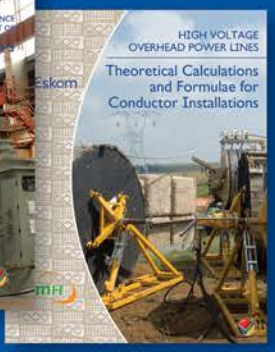

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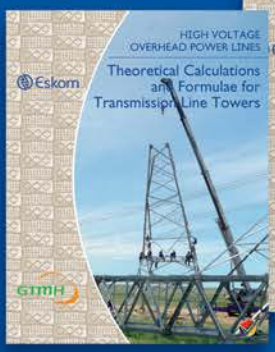

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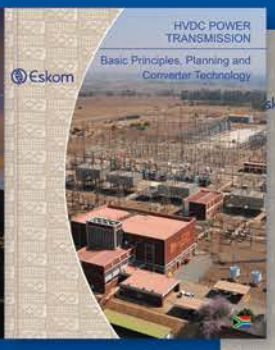

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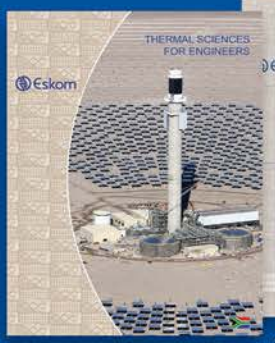

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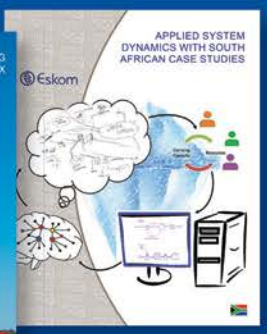

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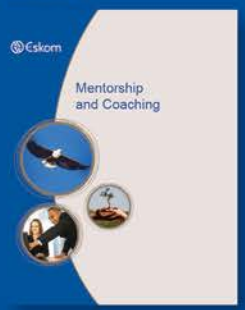
The Eskom Leadership & Management Series was introduced by Eskom at the request of readers and stakeholders of the Power Series who felt that the series should be expanded to include non-technical topics. These topics are often not well understood by technical practitioners and can pose a risk to the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



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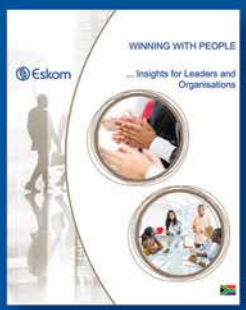

Volume 2: Winning with People ... Insights for Leaders and Organisations

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

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

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