06/2022

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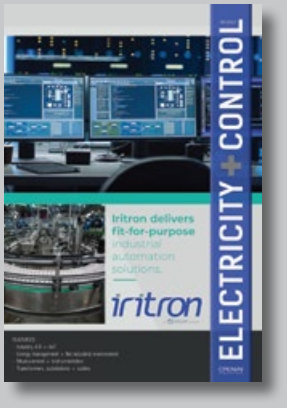

Globally, the industrial automation market continues to experience rapid growth as organisations look to improve operational efficiency, increase productivity and improve their return on investment.
(Read more on page 3.)

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Alternative energy

Alternative energy sources are without doubt critical in the energy mix going forward. The challenge, of course, relates to finding suitable storage mechanisms if we are not to be overly bound by 'making hay while the sun shines', as it were.

Previously, I have floated the idea of rethinking working times – to consider possibly running operations when the energy is available – and not work on the assumption (which we can see is tenuous in any case...) that energy will always be there when we need it.

This is clearly inconvenient and some of the feedback I received was in relation to simply rethinking the entire national option – and carrying on very much more as we have in the past.

Part of the feedback I received was a remarkably important observation: if we aim to use solar PV, wind (and possibly battery storage), we need to aim not for 100% coverage – but 400% coverage. This then allows one to minimise chemical storage and to cover unfavourable weather conditions.

This coverage, it seems, is also likely to be the most cost-efficient.

But consider the kind of things we need to do on a national basis: we need to be sure we know where optimal alternative energy is available (for instance wind, hydro and solar) – and we need to think carefully about storage options.

An obvious option would be to consider pumped storage systems in support of batteries – providing of course that the water to do this is available. However, the concern is a really good 'battery' – or at least a good energy storage option.

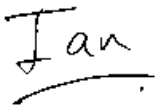
Similarly, there are solar technologies that include the storage of heat (for instance, in various molten materials which retain heat well), which allows that energy, stored as heat, to be used when the solar source is not available (for instance, to produce steam and drive a turbine).

What emerges quite rapidly is that if we are to rely on our own local alternative energy source, we are bound by the favourability (or otherwise) of the source. But if we are able to consider the option of interconnecting various sources all over the country (using a national grid) then we could move the energy about – from the active sources and active storage entities to the loads needing the energy at any time.

This highlights the need for a really well thought out and robust national grid – and quite possibly the need for a grid interconnecting various countries too. Immediately one begins to look (again, as we have done for decades) at the possibility of hydro power from equatorial regions, solar energy from 'desert' areas, and potentially current (ocean) or tidal energy from various coastal regions.

This is a new paradigm; and it also must look to the other option noted previously – and that is to consider seriously the possibility of running the business when the energy is there – of course within limits.

Imagine a world where we combine these solutions.



Ian Jandrell

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

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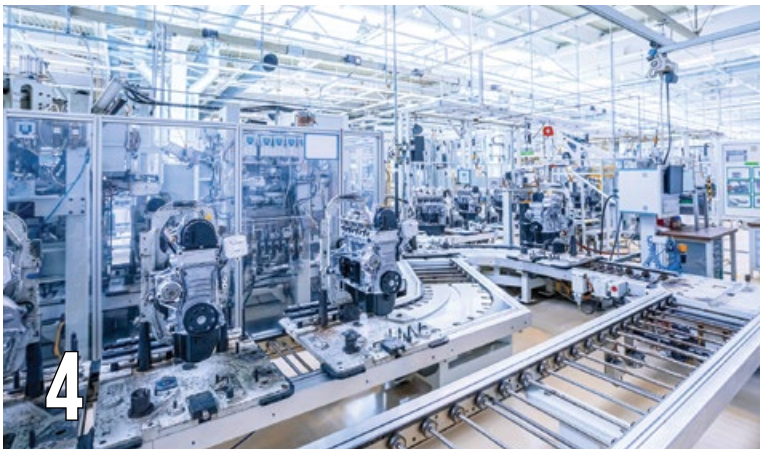
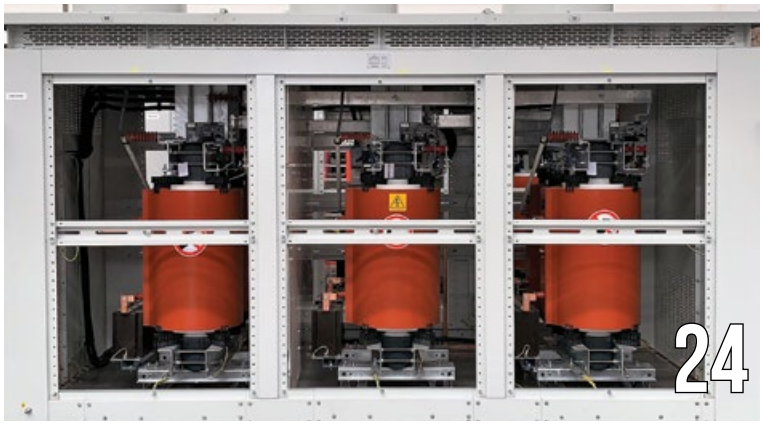
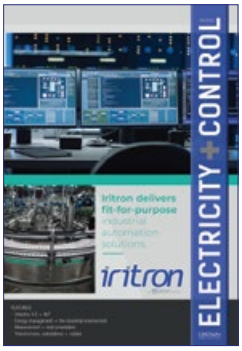




Global demand for industrial automation – Iritron makes its mark!



Alwyn Rautenbach, CEO, Iritron.

Globally, the industrial automation market continues to experience rapid growth as the demand for operational efficiency, technology advancement, system integration and advancement in communications technology is being driven by the continuous pressure on organisations as they seek to improve profitability. Organisations are continuously looking to invest in solutions that will help them increase their productivity, reliability and efficiency, thereby improving return on investment (ROI).

With this in mind, industrial automation company, Iritron continues to make its mark on the industry with its well defined, fit-for-purpose solutions that enable customers to achieve sustainable operational excellence and a measurable ROI. As a Level 2 B-BBEE empowered engineering, integration and manufacturing company, Iritron has a proven track record of over 20 years in providing electrical and instrumentation engineering, decision support systems, control systems engineering, manufacturing as well as construction services. The company assists customers to optimise operations through the effective implementation of the latest technology and software developments.

With an in-depth understanding of the exacting requirements of its impressive list of customers across the industrial spectrum, Iritron has both a national and an international footprint with a strong presence in sub-Saharan Africa. In addition to projects within the African region, the company has undertaken projects in Europe, North and South America, India and Australia.

It executes projects across a wide range of service delivery models, including turnkey, EPCM and single-phase project segments and has proven its ability to manage projects efficiently and with high quality results. Process simulation is used, enabling rapid implementation and a faster return on investment.

Expertise in control systems engineering and development

Providing customers with control systems engineering and development, Iritron supplies DCS, PLC and SCADA systems, advanced process control, process simulation, and digitisation. Software development projects are engineered in accordance with the V-model and in compliance with ISA 88 for batching processes, ISA 95 for enterprise and control systems, and ISA 106 for continuous processes.

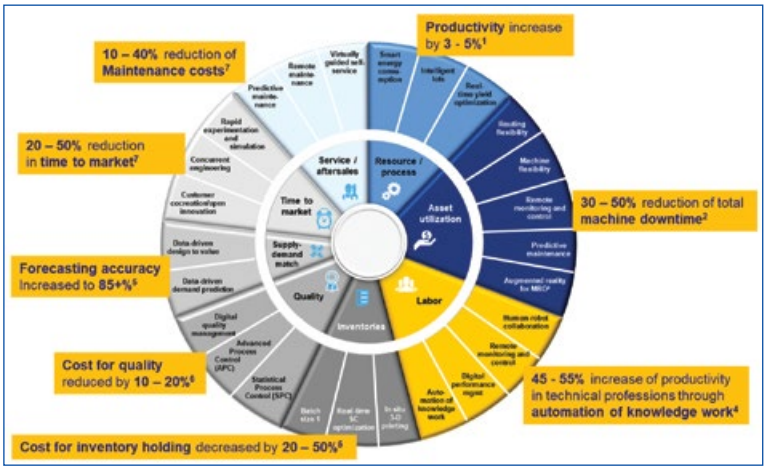
Decision support system solutions

Iritron's expertise in decision support systems includes MES and MOM systems, EMI and MIS systems, finite capacity scheduling, machine learning (APR and AI), as well as systems integration.

The company conducts Plant Automation Audits to ensure a plant is operating optimally, and provides a full report with recommendations on how to optimise operations to improve production capability. In addition it provides Service Level Agreements, including on-site and remote support.

Iritron provides technology implementation that is scalable to anticipate future needs, and flexible to change when business requirements change, providing a base and framework for business growth.

With a track record of completing projects on time, within budget and to specification by virtue of technical excellence and first-class resources, Iritron uses proven methodologies to design, implement and support solutions in brown- and green-field environments. In this way it reduces overall project implementation risk and provides peace of mind for customers in a globally competitive market. □



Industrial automation systems enable operational improvements across a range of measures.

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Optimising complex manufacturing systems

This letter was received from Dr Michael D Grant, Chief Technology Officer at Cape Town-based DataProphet, in response to the article titled: **What can sport teach us about MRO Procurement?** ***written by Brian Andrew, Managing Director Sub-Sahara Africa at RS Components South Africa, and published in the May 2022 edition of*** **Electricity + Control.**

I am always thrilled when I see a fellow MAMIL take the continual improvement lessons from triathlon and apply them to business. Triathlon as a sport is data-rich and is one of the few sports that seems to be raced entirely based on compliance to various physiological performance envelopes. Not dissimilar, if you would, to Statistical Process Control (SPC). Every professional triathlete I've met can talk to their Functional Threshold Power (FTP), Critical Swim Speed (CSS), or Lactate Threshold (LT) and how they race with respect to fractions of these quantities.

In his enjoyable article, Brian Andrew speaks to quick-expensive versus slow-deliberate fixes: it is a beautiful analogy where the author proposes buying a new bicycle over weight loss. The fun, of course, is that the correct answer is *always* to buy a new bicycle. The sober and more complicated reality is that the solution is neither to buy a new bicycle nor lose weight, and it is for this reason I am writing to you.

The complexity lies in the interdependencies between things we'd really prefer to be independent. Triathlon is a great example of this: where athletes haul themselves through a swim, followed by a bike, finishing through a run. The state athletes experienced in each prior discipline profoundly affects performance in the next leg, as the phrase "the race is never won in the swim, but it's always lost there" foretells. As to the trick to a faster bike split? Well… the trick is to swim more.

The complexity in modern consumer goods is easily appreciated: from richer features to better performance criteria. To support this increasing complexity, manufacturing systems have become more complex themselves, either through more production steps or through more complex material transformations.

In the case of system complexity, engineers work fervently to decouple production steps within the system by specifying input parameters and output requirements and then aligning these two between subsequent steps. Here are two examples to illustrate this: in triathlon, the

To support increasing complexity in products, manufacturing systems too have become more complex, involving more production steps or more complex material transformations.

energy consumed in the swim is energy that is not available during the bike, so pacing in the swim is crucial; and in the production of industrial diamonds, the initial sintering pressure sets up crystal planes that can cleave around carbon impurities.

This attempt at decoupling is great and can help process (not system) owners manage their various sections. What was not immediately obvious to me when thinking about this at a systems level, is that this decoupling is really just risk-transferral. If the incoming material does not comply with the property specification, the risk is realised in the current production phase, but was actually caused in the preceding phase. However, the consequences of non-quality increase with each successive production step (each production phase incurs direct and indirect costs). The greatest cost of non-quality is realised at the final inspection step because at this point, all the labour, energy, and material has been expended to produce a defective item.

There is a kicker though, which is that inter-process decoupling is never complete nor perfect. So the likelihood of non-quality (and hence risk transferral) is also increasing: even though one may be complying fully with the material property specification of any single process step, the aggregate effect of successive steps is never captured. This is called tolerance stack up and it is a very hard problem to solve. Back to my previous two examples: in triathlon, even if the swim is paced correctly the effect of swimming at the faster end of the pace envelope and biking at the faster end of the speed envelope could lead to a case where there is insufficient energy to finish the run; and in manufacturing, where carbon purity may be correct and initial sintering pressure is at the high-end of the SPC envelope, this could result in failure at the final phase of the industrial diamond production.

In such cases folks often believe that SPC can come to the rescue: narrower tolerances can prevent these stack-up events. However, this comes at the cost of control. Finer control is possible, but it is expensive to implement and systems become fragile on achieving very narrow envelope compliance. This may mean swimming to within ±1 sec/100 m or controlling carbon mass to within ±1 µPa. These are expensive to achieve in terms of technology, measurements, and control, and the gains may be too marginal to justify the investments.

There is a modern approach to this problem: antifragile production. Rather than generating a narrow set of incoming properties that material/components should comply with and incurring expensive control system costs, it is possible to adjust individual process set-points to accommodate the aggregate set of variances experienced upstream. This is a very wordy statement, so let me unpack the concept a bit: rather than trying to constrain an upstream process to a specific and very tight performance envelope, one can modulate the current process to accommodate a broader range of input variances and maximise the likelihood of success in the next downstream process.

In this approach, risk is no longer transferred to subsequent steps. Rather, each step is seeking to optimise the output with respect to success at the next step, by making a series of process changes to stop the risk transference and maximise the total performance of the complex, now adaptive, system. Expanding on the previous two examples: in triathlon this means starting the bike a bit slower to allow the anaerobic energy stores to be replenished sufficiently to bike even quicker; and in diamond production, reducing the final pressures and increasing the temperatures to avoid shattering of the newly formed diamond.

This is an exciting new paradigm, and my deep learning system is having a huge impact on a wide range of production systems. For each production step, the system generates a set of prescriptions that minimises the risk transfer, and maximises overall efficiency. In feed processing, to grey iron foundry processes, and even my own racing.

I can't wait to wave at Brian as he comes storming past me in the next race and I loved his article that was speaking to one of my passions. I hope my perspective on the complex modern production system helps your readers appreciate some of the new paradigms available to production teams. □

Dr Michael D Grant
Chief Technology Officer, DataProphet

For more information visit: https://dataprophet.com

Tackling sustainability in a tech hungry world

Nick Durrant, CEO, Bluegrass Digital

Nick Durrant, CEO, Bluegrass Digital.

The digital world is a major contributor to greenhouse gas emissions. But technologies also hold the key to solving the world's climate crisis. Hence these innovations play a dual role in the drive towards sustainability.

If you're reading this article right now, you're quite likely using some sort of electronic device connected to the Internet. Earlier in the day, you may have replied to a few emails, watched a YouTube clip or liked several posts on social media.

While these activities may seem harmless enough from an environmental impact perspective, our browsing, posting and streaming habits, and our extensive use of digital services/platforms and apps, is not anywhere near as green as many of us think it is.

Although the carbon cost of many of the activities we perform online is minimal, when we consider how widespread digital technology is, and how much time we spend using these tools and solutions, our carbon impact adds up. Fast.

Estimates indicate that the collective digital world contributes around 4% of all greenhouse gas emissions. In context, this is similar to the GHG emissions produced by the global airline industry [by some estimates]. And the state of play is expected to worsen – with emissions set to double by 2025.

Our data hungry activities have driven brands like Meta (Facebook) to put together a proposal to build the largest data centre in the Netherlands. This data centre, the size of 1 300 Olympic swimming pools, will consume around 1 380 gigawatt hours of electricity, which is equivalent to 10% of the country's wind energy production.

However, technology companies can also help the business world deal with environmental problems. When we understand what sustainability is about. A recent survey by Capgemini showed that very few CIOs and tech executives had any real idea of the state of their carbon footprint. About one-third noted that sustainable IT was on the board-level agenda, but only 6% of companies had a sustainability policy in place to limit their environmental impact, and fewer than one in five (18%) firms surveyed had a comprehensive sustainable IT strategy, with clear goals and targets.

The growing use of digital technology in business and industry contributes to increasing carbon emissions.

Smart tech for sustainability

Although technology is a big part of the problem, it also plays a critical role in the solution. Consider all the technologies being used – across a broad range of industries – to improve efficiency and streamline processes so businesses can minimise their use of natural resources, reduce their energy consumption and decrease their carbon footprint.

By leveraging emerging technology solutions like artificial intelligence (AI), it is possible to deliver improvements in, for example, logistics efficiencies and more streamlined manufacturing operations. One can even map rain forests to combat deforestation.

In action, these smart sustainability solutions can significantly reduce the environmental impact of, for example, massive building and infrastructure construction projects. Building information modelling (BIM) enables construction firms to see their projects before they are built, which makes it possible to reduce time, material use, fuel, as well as overall energy consumption on site. [Similarly in industry, digital twin technology allows for design simulation before plants are built – and for continuing iterations of plant modifications and maintenance over time. This allows for substantial efficiencies to be achieved in design and ongoing operations.]

In agriculture, too, technology can be used to reduce the amount of water and chemicals needed to run modern farms. This results in a reduced impact on natural ecosystems. More advanced solutions like robots, drones and various sensors can also help agricultural businesses become more environmentally friendly.

Sustainability needs to be front of mind

As a solutions business, Bluegrass Digital works with customers across different business sectors to help them streamline business processes and promote automation in B2B and B2C operations. It provides IT solutions for business, simplifying technology and helping its clients build digital products and services that enable them to succeed in a digital world.

In industrial applications as much as in business processes, it is important to remember – and manage – the huge energy demand generated by data processing and the widespread use of digital technologies. □

For more information visit: www.bluegrassdigital.com

Growing demand for software as a service

Siemens Digital Industries Software recently announced that it is seeing increasing momentum in its transition to a software as a service (SaaS) led business. It highlighted how a range of companies – from global industry leaders to start-ups – are using Siemens' software, particularly leveraging its digital twin software, to transform digitally and to address global challenges. In addition, the company has expanded Xcelerator as a Service, with the addition of NX™ X, cloud-based computer aided design (CAD).

Tony Hemmelgarn, CEO and President, Siemens Digital Industries Software said: "Last year we announced our transition to a SaaS-led business and introduced Xcelerator as a Service. Customers are responding enthusiastically – ready to embrace the cloud to accelerate their digital transformation. Siemens is transforming its own business, making our portfolio easier to access, more open, and integrated, so we can help our customers transform their industries."

Xcelerator is Siemens' comprehensive, integrated portfolio of software, services and an application development platform, designed to help companies create and leverage digital twins that provide them with new insights, opportunities and levels of automation to drive innovation. Xcelerator as a Service (XaaS) makes the Xcelerator portfolio more accessible, scalable and flexible. With a subscription offering that takes advantage of cloud computing to provide powerful new capabilities across the Xcelerator portfolio, it is designed to help speed digital transformation for Siemens' customers.

Around the world, companies are adopting solutions from the Xcelerator portfolio to solve business challenges and drive competitive advantage. At its 2022 Media and Analysts Conference, Siemens highlighted how Italian start-up Nemo's Garden and autonomous ocean data collection specialists, Salidrone, are taking advantage of the accessibility of Xcelerator as a Service to advance their developments and innovate more quickly. Global automotive OEMS such as Hyundai Motor Company, Kia Corporation and Daimler Truck have chosen Siemens' Xcelerator as a platform to explore carbon-neutral futures.

Siemens' NX X combines the capabilities of Siemens' NX™ software, centralised storage capacity and collaboration via industry-leading hosting partners.

Luca Gamberini, Co-Founder of Nemo's Garden said: "When I first saw Siemens' digital twin technology, I was mesmerised. Nemo's Garden is a one-of-a-kind (underwater agriculture) system and we need to adapt to each environment where it is to be installed. If you can model that environment virtually before you start, you can foresee the challenges and address them in the best way."

Siemens is adding industry-leading design and engineering software to Xcelerator as a Service with the new NX X. This is a packaged solution that combines capabilities of Siemens' NX™ software, centralised storage capacity and native collaboration delivered via industry-leading hosting partners. With NX X, software upgrades, backup and hardware requirements are handled by Siemens and its hosting partners, making sure software is up to date and running on leading-edge hardware.

For more information contact Siemens Digital Industries Software.
Visit: www.siemens.com/software

The key to IoT

The integration of sensors into the Internet of Things (IoT) is important for many applications: in the monitoring of machines, for example. Where remote machine parts are not connected to the company network, the io-key from ifm electronic can be the ideal link to the IoT.

The io-key allows quick and easy transmission of sensor data directly to the cloud, even without a controller and connection to a network. Up to two sensors can be connected to the compact device via IO-Link. The measured values are then uploaded to the cloud via the mobile network and saved there. All that is needed besides the io-key are a power supply and sufficient GSM coverage.

The user can visualise and analyse the data transmitted to the cloud via a web-based dashboard. With a few more clicks, different configurations can be set there. It is possible, for example, to send notifications automatically by e-mail or SMS when limit values are exceeded or not reached. A summarising representation of the measured values can also be generated in the form of reports, and they can be easily exported.

Whenever the measured values of the sensors are not needed in real-time and a direct connection is not easily possible, transmission to the cloud via the io-key offers an optimum solution. This allows monitoring of remote machine parts. Typical applications include tank monitoring with KQ10 type level sensors, fan monitoring with VVB type vibration sensors, or valve monitoring with the MVQ valve sensor.

The io-key transmits the measured values of connected sensors with IO-Link interface directly to the cloud via the mobile network.

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Email: info.za@ifm.com, visit: www.ifm.com

George Senzere, Schneider Electric.

The edge and AI – working together for smarter computing

George Senzere, Solutions Architect: Secure Power at Schneider Electric, says the advent of Artificial Intelligence (AI) and its continued proliferation have seen the technology changing the functionality of computing, making it smarter and increasingly adaptable to meet everyday requirements.

Senzere cites a recent article in *Scientific American* that presents examples of where AI can deliver solutions to issues such as the world's current nickel shortage. The article suggests that through AI, four alternative materials that could replace nickel were identified – a helpful discovery.

However, for the world to harness the full potential of AI, ensuring its outcomes remain relevant, data and the computation and transmission of data are crucial. Decision makers in organisations need to mitigate data complexity, minimise data silos, and ensure the right tools or platforms are in place before deploying AI.

Edge computing enables AI to do more

A fundamental element of using AI fully is the space where data processing occurs. Findings from IBM's *Global AI Adoption Index 2021* indicated that almost 90% of IT professionals believe data location is critical to the success of AI projects.

This is where edge computing's importance becomes evident. AI requires a robust edge data centre which focuses on keeping data on location for faster processing, higher security, and more efficient performance.

Edge computing offers speed for organisations that can be burdened with large volumes of raw data from AI. Processing is done on-site and the system's speed allows for timely output of analysis. Latency is reduced significantly, allowing for near real-time decision making.

In an industrial or large-scale edge computing setting, real-time decision making can save money, effort and mitigate the risk of unplanned downtime. Accurate data also gives industrial players the insights to predict machine failures and therefore to implement predictive maintenance without disrupting production capabilities – a major plus.

Combined with the edge, AI can unlock new possibilities, enabling businesses to interact with their customers on an ongoing basis and accurately. Together they enable:

- Faster computing and insights
- Improved data security
- More efficient control over operations.

The future is fused

AI, already optimised by edge functionalities, will receive a further boost with the ongoing global rollout of 5G networks and quantum computing technologies – a rapidly emerging technology that harnesses the laws of quantum mechanics to solve problems too complex for classical computers.

This fusing of technologies points to ultra-high speed, superconducting quantum processors, large bandwidth, and enhanced connectivity with the accessibility, scalability, and intelligence of edge computing and the accuracy and predictability offered by AI.

And in real-life applications, organisations will have greater ability to respond to customers' needs with actionable insights and to focus on value creation.

For more information visit: www.se.com

EtherCAT block I/O with eight IO-Link masters

Turck Banner has added the TBEC-LL-8IOL EtherCAT IO-Link master in IP67/69K to its IO-Link portfolio, so it can also be used for EtherCAT-based applications. The block I/O module in the robust TBEN-L housing offers eight IO-Link master ports, with four Class A and four Class B ports, enabling flexible configurations. Full galvanic insulation between the power supplies makes it possible to implement safe disconnections. Actuators such as IO-Link valve blocks, robot grippers or motors can be powered with up to 4 amperes. The power supply is implemented with M12-L coded connectors.

The EtherCAT block I/O module offers eight IO-Link master ports, enabling flexible configurations.

The TBEC-LL-8IOLs are also provided with FLC logic (Field Logic Controller). This enables devices to take over simple controller tasks, pre-process data selectively and exchange it with higher-level controllers. It allows users to operate small applications without the need for an additional PLC. In larger applications, the FLC technology relieves the load on the higher-level controller.

Configuration and programming are carried out via Turck Banner's ARGEE web-based programming platform, which enables the user to program conditions and actions easily without the need for any additional software to be installed – even with mobile terminals in the field. The seamless communication of diagnostics and process data ensures data transparency for Industry 4.0 applications such as condition monitoring or predictive maintenance, increased machine availability as well as lower maintenance costs.

For more information contact Turck Banner.
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Secure disposal of old IT equipment

Dell Technologies has expanded its Asset Recovery Services with new availability in South Africa. The service covers any brand of laptop, desktop, server, peripheral or accessory, helping customers receive value from existing IT assets and implement sustainable recycling and recovery services at scale.

Since 2008, Dell has recovered more than 2.5 billion electronics[1] through its takeback programmes, supporting businesses in sustainably retiring IT assets. Asset Recovery Services provides a modern, simplified and standardised offer to help customers scale their recycling efforts. The offer includes a new, online self-service portal that simplifies asset disposition further – providing businesses with real-time value estimates, comprehensive resources and streamlined takeback of devices.

Doug Woolley, Managing Director of Dell Technologies South Africa says, "Every year, the world produces millions of metric tonnes of electronic and electrical equipment waste, which is damaging to our planet when not disposed of properly. Asset Recovery Services plays a critical role in helping customers to retire equipment responsibly and reduce their overall environmental footprint. As a global company we take our commitment to divert e-waste from landfills seriously. By scaling our services for recycling electronics and IT equipment securely, we are working towards our ambitious goal to recycle or reuse one device for each one sold by 2030."

Dell Technologies simplifies the experience for customers with no unit minimums for businesses of any size, whether managing a central or remote workforce. The services offer the flexibility and control to oversee and track the entire process online via the self-service portal.

When customers turn in their devices, data is removed in line with data sanitisation standards[2] to minimise customer exposure to data security breaches. Asset Recovery Services now offers extra options for added protection:

- On-site data sanitisation – Data is cleared from devices on-site before the equipment leaves a customer's facility
- On-site hard-drive shred – Hard drives with data are disposed of through physical destruction and recycled according to local guidelines.

The availability of Dell Asset Recovery Services will make it easier for South African organisations to dispose of their electronic equipment correctly. The Department of Forestry, Fisheries and the Environment has said that e-waste makes up 5% to 8% of municipal solid waste and is growing three times faster than any other form of waste[3].

Asset Recovery Services is available through Dell Technologies and its channel partners.

Doug Woolley, Managing Director of Dell Technologies South Africa.

References

[1] Dell Technologies FY21 Progress Made Real ESG report
[2] These Dell services adhere to NIST SP 800-88 Revision 1 data sanitisation standards.
[3] https://www.golegal.co.za/e-waste-treatment-facilities/

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

Cobots assist in automated palletising

Collaborative robots (cobots) are being used in various applications. A recent example is seen in the automated palletising solution developed by FlexLink and OMRON working in partnership.

FlexLink offers flexible, modular conveyors and industrial automation equipment, including palletising solutions, to customers around the world. FlexLink solutions are in operation on the production lines of well-known brands in food manufacturing and personal care. Following a request from a major manufacturer, FlexLink joined forces with Omron to create a collaborative palletiser, using OMRON cobots.

Stéphane Chevalard, FlexLink's Engineering Supervisor outlines the benefits of the solution. "Palletisation using cobots has a number of benefits. It's very flexible. The system can be easily moved from one area of production to another – and it can be swapped between lines because it is self-supporting and easy to move. It also allows for collaboration with operators, who can work in safe proximity to the cobot without fencing or laser scanners being needed. The active security we have added enabled us to obtain CE certification."

OMRON and FlexLink worked together on the initial design for the project and the solution is continually evolving as feedback is received from users. The system was developed over several months, to ensure it would be flexible and easy to configure. It incorporates accessories which enable it to process both US and EU standard pallets, up to a height of two metres.

The cobot has a capacity of up to eight boxes or parts per minute (ppm), or 14 ppm with a dual-pick vacuum gripper. The new palletising systems can handle boxes of 10 kg or 12 kg, as two different types of cobots can be used – the OMRON TM12 or the TM14.

Gary Hinault, FlexLink's Controls Engineer, comments: "This solution meets the need for automated palletisation, which relieves operators from this repetitive task so they can focus on tasks with more added value and that are more interesting."

The cobots can be delivered on a fairly short lead time and installation takes only one or two days. The automated palletising system helps operators to avoid the health risks that can arise from repetitive tasks and injuries caused by lifting heavy loads. The manufacturer who originally requested the cobot has calculated the return on investment for the new system to be about one and a half to two years.

For more information visit:
www.industrial.omron.co.za

Renewable energy is supporting the national grid

Asante Phiri, Enel Green Power South Africa.

As the debate about South Africa's power supply rolls on, renewable energy is already providing support to the national grid. Eskom Transmission's load forecast data over the past two years indicates the country's daily peak load is around 34 GW. The challenge remains to maintain grid stability and provide for the country's energy needs. Asante Phiri, Head of Operations and Maintenance: Southern Africa, at Enel Green Power South Africa (EGP RSA), outlines how renewable energy works with the national grid and is being used to help meet the current energy demand.

As of late January this year, the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) had connected 5 901 MW of renewable energy to the grid. Most of this, about 3 163 MW, is wind power, followed by solar, at 2 212 MW, and the balance of some 500 MW comes from concentrated solar power (CSP). These figures are expected to increase with upcoming commercial and industrial projects.

The new commercial and industrial projects are driven partly by President Ramaphosa's announcement – and the subsequent gazetting of amended regulations – which allow that projects under 100 MW do not require a generation licence from the National Electricity Regulator (NERSA). This opens the way for companies to take on projects of this nature without having to go through the process of applying for a generation licence, although they are required to register such projects with the regulator.

Supporting the national grid

Providing support to the national grid is not a simple operation. The fundamental difference between renewable and non-renewable energy is the manner in which electricity is generated. In a traditional thermal plant, coal is burned to create steam. Steam drives a turbine, which drives the generator.

With renewable energy, a different, renewable, source is used to drive the generator: wind, for example. Solar panels work slightly differently, but also produce electricity, and the electrons flow throughout the grid and become indistinguishable from each other.

In providing power, renewable energy faces the challenge presented by the natural resources it relies on: the sun and the wind cannot be controlled and are not always available. Consequently, there is some variability in the power supply from renewables.

This makes it challenging for the personnel controlling the national grid, because they need a certain level of stability to maintain the integrity of the grid. However, if battery technology is integrated into the system, surplus energy generated from renewables can be stored and used when needed, that is, at times of low wind or solar resources.

To control the overall dynamics of the grid, the traditional assets in the system need to work hand in hand with the renewable energy sources. When the sun is shining and the wind is blowing, Eskom can lower the output of its generators to allow the renewable energy plants to supply

EGP RSA is one of South Africa's primary independent power producers. Among its already operational projects are the Pulida solar energy plant in the Free State and Oyster Bay wind farm in the Eastern Cape.

Some of the other completed projects in the EGP RSA portfolio are the Adams solar energy plant in the Northern Cape and Gibson Bay wind farm, Eastern Cape.

the grid, and when renewable energy production is low, Eskom generators need to fill the gap.

Managing the grid in this way is a highly technical process and is run by highly skilled personnel, because Eskom needs to maintain the integrity of the grid at all times. If imbalances arise in the grid, these can cascade to a point where a blackout occurs in a region or in the country, and if this happens, it is a difficult process to get the grid running again.

Global warming and renewable energy

Sectors that consume the most energy are, generally, mining, material beneficiation and materials manufacturing. Due to global warming, many countries and the companies in those countries have made a commitment to reduce their carbon footprint, and countries have signed the international treaty on climate change, the Paris Agreement.

Additionally, many investors these days want to know the environmental, social and governance (ESG) standing of the projects or companies in which they invest – and how these companies are tackling issues such as climate change. Renewable energy, supplying clean and sustainable energy, plays a role here because it enables companies and countries to rise to the challenge of meeting their commitments in terms of the Paris Agreement – and the requirements of investors in terms of ESG principles.

Can SA be powered solely by renewables?

With advances in technology and the resources we have in the country, it is envisaged that renewable energy can make a high contribution to the country's energy needs. However, the Integrated Resource Plan (IRP) does make provision for other forms of power generation and different technologies.

For countries that have good water resources and established hydro dams, it is easier to achieve a fully renewable power system. If there is storage in the system too, with a significant number of batteries built into it, for example, the prospect of powering the country solely with renewables becomes theoretically possible. Battery technology is developing fast, but South Africa has a way to go before it could be powered solely by renewable energy.

Renewables capacity

Many of the renewable energy plants already connected to the grid in South Africa have installed capacity that is slightly higher than the amount of energy they are contracted to produce. This is to cater for the technical capabilities the plants need to have in order to meet the requirements for keeping the grid stable – it is governed by the requirements for grid code compliance.

This means most IPPs are currently providing the maximum that they can technically and legally provide to the national grid. Some generate extra power at their plants, which they cannot currently supply to Eskom, in order to stay in line with grid code compliance.

The supply of energy is a dynamic and technically complex process, especially in a country like South Africa where the circumstances are quite unique. However, with advances in technology and more support from renewable energy suppliers such as EGP RSA, the prospect of a national grid with higher levels of renewable energy penetration could be a near-term goal. □

For more information visit: www.enel.com
Or: www.enelgreenpower.com/countries/africa/south-africa

Mitigating harmful harmonics

The rise of non-linear loads in industrial environments over the past two decades has resulted in the growing problem of harmonic currents and utility-level voltage distortion. Facing a lack of awareness, the industry has struggled to implement effective mitigation measures. Here, Global Sales & Marketing Director of UK-based CP Automation, John Mitchell, outlines useful tips to mitigate harmonics.

Voltage distortion, caused by current harmonics, can wreak havoc in a plant, damaging equipment and the mains power supply. Damage can be serious and varied with the most common symptoms including voltage notching, motor vibration, arcing on bearings, nuisance tripping, electromagnetic interference (EMI/RFI) and overheating.

To mitigate harmful harmonics, the place to start is to ensure you comply with regulations. International harmonic control requirement, IEEE-519, limits "the maximum frequency voltage harmonic to 3 per cent of the fundamental and the voltage total harmonic distortion (THD) to 5 per cent for systems with a major parallel resonance at one of the injected frequencies." Some form of filtering is subsequently recommended.

The UK is fortunate to have a stiff power grid, but this is not the case everywhere. Countries with weak grids, an unreliable supply and inadequate infrastructure are common around the world. The power ratings on products are often based on calculations performed in ideal conditions. Buyers would be wise to note that these products may perform adversely in weak grids and may not perform to IEEE-519 standards in such conditions.

Plant operators need to stay on their toes. Industry has seen a rise in the use of non-linear loads such as transistor-based variable speed drives (VSDs) and line commutated dc drive systems. The processes of high frequency switching and pulse width modulation (PWM) introduce unwanted multiples of the fundamental 50 Hz frequency in the form of harmonics. Knowing what options are available, can assist the overall efficiency of the harmonic mitigation process.

Passive and active harmonic solutions can be installed in series and parallel (shunt) configurations within a system. Series solutions operate in line with the load, meaning units must be sized for the full current load. Shunt units can be sized for only the harmonic disturbance. There is a clear decision to be made between series-passive, shunt-passive, series-active and shunt-active solutions.

Passive and active harmonic solutions can be installed in series and parallel (shunt) configurations within a system.

Series-passive

The most straightforward series-passive solution can be achieved using a line reactor. This is a low cost way to reduce current harmonics, while adding a level of protection to the rectifier.

Shunt-passive

Shunt-passive solutions are about power factor correction, often using fixed capacitor banks, tuned and detuned contactor based units, thyristor capacitor banks and fine-tuned passive filters. These methods were developed principally to resolve reactive power and not specifically for harmonic mitigation. Today, plant operators should not be installing capacitor banks themselves and, at the very least, using detuned ones – with an inductor, for example.

Series-active

Series-active solutions take the form of an Active-Front-End (AFE) VSD. This replaces the rectifier diodes in a regular VSD with an IGBT-controlled rectifier to eliminate switching based signal noise.

AFEs are effective in significantly lowering THD and maintaining good power factor. However, AFEs have some serious drawbacks. In order to maintain a small form factor, lower switching frequencies are used, which result in high switch ripples on the voltage waveform. This can cause other sensitive equipment like PLCs and telemetry and communications networks to nuisance trip and malfunction.

Further, although this unit may at first seem to eliminate harmonics, it must be noted that with the AFE in addition to the VSD, there are now two drives in the circuit producing twice the heat. With a 200 kW AFE it soon adds up. For the panel builder or system integrator, bigger cooling systems are needed to cope with the excessive heat.

Shunt-active

Active filters provide the most efficient harmonic compensation in a compact unit that has little loss, is insensitive to grid conditions, cannot be overloaded and is easy to retrofit. All of this comes at a slightly higher cost, which is offset by the better return on investment over the longer term.

Understanding the often subtle differences between various harmonic filtering technologies can yield better cost savings, reduce complexity and prolong equipment life. It is helpful for plant operators and maintenance engineers to understand what options are available – and worth it over the long run. □

For more information visit: www.cpaltd.net

The benefits of wheeling – a new energy market for SA

A new private power supply model in South Africa is set to transform the country's power market from one dominated by a single entity to an open market with multiple suppliers. It presents potentially substantial energy cost savings for large-scale industrial users. David McDonald, CEO of solar energy provider SolarAfrica, unpacks the benefits of wheeling energy through the national grid.

Representing a step-change in an energy market long dominated by power utility Eskom, the decision to allow third-party access to the grid, or wheeling, marks a seismic shift in support of the development of a competitive domestic electricity market.

Wheeling is a financial mechanism that allows an independent generator of electricity – primarily using wind or solar photovoltaics (PV) – to provide power to independent commercial and industrial users of energy through Eskom's existing transmission and distribution system.

This enables a power producer to develop an energy plant in a high-performing solar area, for example, and sell that energy back into the grid for use by an end-user based in another location.

Greening commercial energy assets

With South Africa's wheeling market in its infancy, large-scale industrial power users – from mines, data centres and property companies with extensive portfolios, to industrial operations and automotive manufacturers – are currently best positioned to benefit from wheeling agreements.

Key advantages of this energy model include:

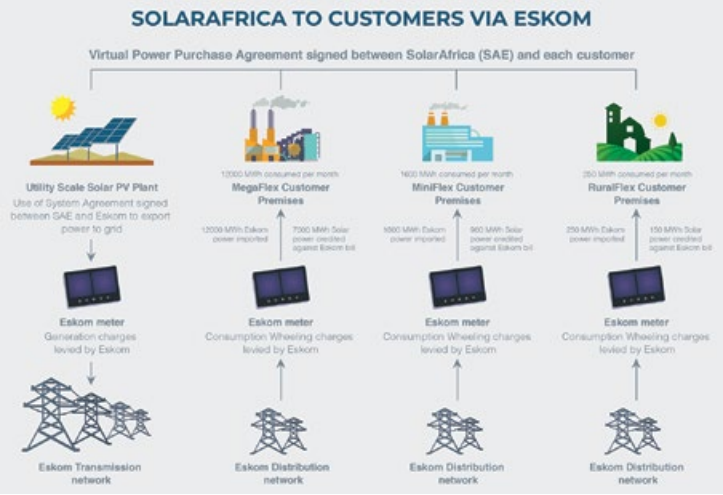
- Up to 50% cheaper tariffs than traditional grid prices for direct Eskom clients
- A reduction in carbon emissions and carbon tax through the use of clean energy such as wind and solar PV
- Higher penetration of green energy due to a Time of Use credits system
- No capital required.

The two primary advantages of wheeling are considerable financial savings on the cost of energy, and the use of green energy.

While Eskom levies a wheeling tariff for the use of its transmission infrastructure, the utility asserts that these are not additional charges. It states that: "All customers buying from Eskom or through bilateral trade will pay the same standard Nersa-approved unbundled network-related tariff charges for the use of the network."

Eskom unbundling a key trigger

As power utility Eskom progresses the unbundling of its generation, transmission and distribution business units, legislative changes aimed at creating a more competitive domestic energy market have acted as a critical accelerator of power wheeling.



The SolarAfrica wheeling model covers energy supply at different scales to serve different market sectors.

The Department of Public Enterprises issued the Roadmap for Eskom in a Reformed Electricity Supply Industry in October 2019, which sets out the transition from a single buyer model to an open market model.

Eskom Power Systems Economist, Keith Bowen, explained during a South Africa Independent Power Producers Association webinar in July 2021 that the roadmap provides for a transmission entity which will effectively act as a central buyer, buying electricity from the Eskom generation entity and independent power producers (IPPs) and selling to the Eskom distribution entity, municipalities and large power users[1].

"Competition in the SA energy market is very real, and the single buyer model doesn't really function anymore. In future, it's almost certain that domestic energy supply will be dominated by renewable power such as wind and solar PV, because it's the cheapest power on the grid," Bowen remarked.

The August 2021 amendment to the Electricity Regulation Act, 2006, exempts developers of embedded electricity generation projects of between 1 MW and 100 MW from the previous requirement of applying for a generation licence, requiring them only to register the project with the National Energy Regulator of South Africa.

These legislative changes have been a key trigger for the injection of large-scale IPP-generated power into the grid and the scaling up of power wheeling in South Africa.

Eskom has also laid out a wheeling process that has been proven and ratified, leading to local sites that are already wheeling.

The number of wheeling projects will further increase as Eskom's unbundling process progresses and we see multiple IPPs on the network.

Wheeling has, for years, been practised successfully in several open electricity markets in Europe, with energy brokers allowing end-users to procure power from five or six different independent power entities. This is what we believe is on the cards for South Africa.

Leading the change

As a pioneering South African solar energy provider, SolarAfrica is in the process of developing several industrial-scale solar PV installations with Eskom grid connections. These will inject renewable energy into the grid and service large-scale power users through power purchase agreements (PPAs) and wheeling agreements.

The first company in South Africa to offer solar financing through power purchase agreements, SolarAfrica was named the continent's leading solar energy firm, receiving the Africa Solar Industry Association's African Solar Company of the Year award in 2021.

In our view, these are exciting times for energy users, and the possible energy cost savings for large energy users are in the billions. As well as the benefit of this new energy generation capacity being green, the economic benefit is significant.

Note [1]
Pending finalisation of the further proposed amendments to the Electricity Regulation Act, currently in process, Eskom has stated that it is looking to have the independent Transmission System Operator (TSO) formally established within this year.

For more information visit: https://solarafrica.com

Driving industrialisation in renewables

The South African Wind Energy Association (SAWEA) has reaffirmed its push for sector industrialisation, advocating for increased local manufacturing. Led by the SAWEA Manufacturing and Local Content Working Group, the industry has set clear local manufacturing targets with a specified timeframe. The association has reiterated that its approach to the industry's growth is to consistently deliver new wind power generation to the grid responsibly and sustainably, in line with the SA Renewable Energy Masterplan (SAREM), which falls under the ambit of the Department of Trade, Industry and Competition (DTIC) led industrial strategy.

Estimating that the sector can deliver 1.6 GW per year, aligned with the country's energy roadmap, local content targets have been set between 56% and 61% by 2030. Most of this will be achieved in locally manufactured wind turbine towers and steel anchor cages, and it also includes smaller components, equipment and related services.

"The required research will be conducted to define and quantify exactly what new components will be added to the current mix to achieve these local content target thresholds," said Niveshen Govender, CEO of SAWEA.

The 80 MW Noupoort Wind Farm in the Northern Cape, completed mid-2016, includes 35 wind turbines, each 152 m high.

Considering that the targets set by the Department of Mineral Resources and Energy (DMRE) and DTIC are currently pegged at 40% local content, and the wind energy industry has achieved 47%, exceeding a 43% commitment, the association has outlined the policy certainty and procurement criteria required if it is to achieve these new power generation targets and fulfil its role in stimulating the economy.

In its recent submission to the SAREM, the association indicated that the renewable energy sector requires, first and foremost, a stable and consistent pipeline with foreseeable and predictable timelines between renewable energy procurement rounds. This is essential to attract significant investments to rebuild the manufacturing sector and develop a local market based on competitiveness and added value.

"We are working on delivery solutions to the industrialisation agenda, rooted in strong local manufacturing capability. To achieve this we need to address market conditions and investor certainty off the back of rolling procurement rounds and off-take over the next ten years. This will allow the sector to develop its supply chain and ensure product quality and compliance, at the same time as delivering jobs and clean power to South Africa in line with the favourable pricing tariffs the sector offers," Govender added.

Furthermore, SAWEA has stated the need for the industrialisation policy to offer sector incentives to allow for the development of robust local capabilities, so the wind industry can compete with international markets and support local manufacturers to become competitive for export markets.

"Transformation goes hand-in-hand with the industrialisation of the wind power sector. Market certainty is the most important aspect to building a local manufacturing industry. Hence, we require the DMRE to provide consistency, in line with the IRP2019, to kick-start industrialisation with upfront certainty on a number of REIPPPP rounds and their primary local content framework," Govender said.

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

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Zest WEG is one of the largest manufacturers of Mini Substations, Distribution Transformers, Power Transformers (up to 45 MVA 132 kV) and Mobile Substations, including transformers for renewable energy generation (photovoltaic and wind farms) in South Africa.

Operating two manufacturing facilities, one in Wadeville and the other in Heidelberg, we have the capability to design, engineer and manufacture the complete range of transformers presently in use in the country's energy generation, transmission, distribution, mining, industrial, rail and renewable sectors. All of it is designed to clients' specifications and international standards.

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Genset solutions provide for seamless plant switchovers

As power outages and load shedding continue to plague the optimal performance of industrial and mining process plants, Zest WEG is providing standby power solutions that ensure no power loss when these disruptions strike.

Damian Schutte, Electrical Engineering Team Leader at Zest WEG, says many plants face complex and lengthy restart routines if there is a power failure on the main grid – and this severely compromises plant efficiencies.

"With our design and manufacturing experience, we can provide genset solutions that can be started up prior to an outage, so the plant can continue operating seamlessly while switching from utility to standby power, and back again to the utility," says Schutte.

Adding to this, he highlights that Zest WEG's customer-focused approach means it responds positively to the challenges companies face in scheduling and implementing backup systems. In a recent project in the Western Cape, the Zest WEG team provided a customer in the marine sector with a customised genset solution to suit its specific needs, and to help the customer face unexpected circumstances.

The 550 kVA gensets in the client's generator plant room on site.

The customer was experiencing considerable plant downtime due to load shedding by the national utility, as it would take some time to bring the plant back to operation. The engineered solution includes six 550 kVA generators, two 11 kV transformers, medium voltage (MV) switchgear, and breakers for synchronising between the generators, and with the utility supply.

Schutte says, "The smaller size of generator provides flexibility and was a cost saving, as some units can be switched off, depending on the site load requirement."

When frequent load shedding was suddenly announced by the utility, the customer asked Zest WEG for an urgent temporary solution while the project was being implemented. The team brought three of the gensets on stream to keep the plant functional until the planned solution was in place.

Bradley van der Spreng, Business Development Consultant at Zest WEG, highlights that all major components for power plant solutions such as these can be manufactured and assembled by Zest WEG and its Brazil-based parent company, WEG. The company can also accommodate a client's specifications should they refer to a nominated supplier, allowing for the gensets to be built for easier on-site installation.

"Our extensive engineering and programming on these systems has confirmed that it is critical that they are fully tested before being delivered to site," says van der Spreng. "Usually, whatever we specify in the contract can be tested in-house at our advanced facility in Cape Town."

Customers are invited to attend the factory acceptance test (FAT), which includes load testing of the generators at different loads up to 110%, synchronisation checks, and MV tests, if this is part of the scope.

For more information contact Zest WEG.
Tel: +27 (0)11 723 6000
Email: info@zestweg.com, visit: www.zestweg.com

Grid independence for Stellenbosch shopping mall

In mid-2021 AEG Power Solutions, a global provider of power supply systems and solutions for demanding applications, successfully commissioned its Convert SC Flex storage converter with 1 MW capacity as part of the micro-grid that serves the Rembrandt Mall in Paarl, South Africa. The micro-grid system combines solar panels and 0.9 MWh lithium-ion battery energy storage, plus the storage converter and enables the mall to operate independently from the local municipal power grid during the day.

The micro-grid system combines solar PV panels, battery energy storage and storage converters.

As South Africa's power supply faces frequent managed outages – especially during peak demand periods – the need for alternative supply sources is growing. Increasing electricity prices per kWh, varying between peak/off-peak and low usage times also raise the need for more efficient energy management. The new system installed at the Rembrandt Mall has the added advantage of enabling peak shaving, helping to manage electricity supply prices to a minimum.

The micro-grid system was developed with Solar Plexus Africa, a leading micro-grid system supplier providing electricity generation and storage solutions for industrial and commercial customers across Africa.

Currently the system Incorporates eleven 82 kWh batteries, to be extended to 1.2 MWh battery capacity in total.

Dawie Joubert, owner of the shopping mall, said, "The decision to use lithium-ion batteries was based on their durability of 6 000 charging cycles, which leads to a battery lifespan of about 15 years in the current setup. And a key advantage of AEG Power Solutions' storage converter is its grid-friendly integration with low harmonics, which is a significant factor for electricity grids with low stability."

The system has been running fully since July 2021 and has an expected amortisation period of 4 to 5 years.

For more information contact AEG Power Solutions.
Visit: www.aegps.com

Grid connection approved for solar PV micro-grid

PepsiCo SSA has installed a 1.8 MW solar PV plant plus battery storage at its distribution centre east of Johannesburg.

The Ekurhuleni Municipality has approved the grid connection for a large solar photovoltaic (PV) plant and battery system, marking a significant milestone in the development of embedded generation renewable energy projects in South Africa. The PV and lithium-ion battery system will be one of South Africa's largest micro-grids: a 1.8 MW solar PV facility alongside a 2.9 MWh battery, and being grid-connected it will help to stabilise the local grid.

PepsiCo Sub-Saharan Africa (SSA) procured the system from the SOLA Group, with the aim of securing energy supply and reducing carbon emissions at its distribution centre near Kempton Park in Johannesburg.

"We are pleased to have implemented such a landmark project at one of our South African facilities," said Umesh Himraj, Engineering Sustainability Lead at PepsiCo SSA. "This investment in renewable energy forms part of our PepsiCo positive journey – a strategic end-to-end transformation strategy with sustainability at the centre of how the company will create growth and value," he added.

The micro-grid solution was engineered and constructed by the SOLA Group. CEO, Dom Wills said, "The solution we devised uses the roof space at PepsiCo's facility to house solar modules which generate enough solar electricity during the day to run the plant entirely, and store excess power in the battery. The solution provides near 100% renewable energy for the facility."

Until more recently, micro-grids have been an appealing but expensive option for businesses, but the substantial cost reductions in renewable energy technology, in parallel with the unreliability of the national grid and rising electricity tariffs, are now making them more feasible for large energy users.

"We did not expect it to be financially viable for large energy users to defect completely from the grid before another two years. However, with continuing compounded electricity price increases, such investments are proving to be valuable for these energy users, providing cheaper power and immunity from load shedding. In addition, many companies have sustainability targets and are looking to make their operations more environmentally friendly," Wills says.

For more information contact SOLA Group.
Tel: +27 (0)10 597 3538
Email: info@solagroup.co.za
Visit: https://solagroup.co.za/

Communications solutions for battery energy storage systems

HMS Networks offers a number of communications solutions for battery energy storage systems.

HMS Networks offers a number of communications solutions for the fast-expanding battery energy storage sector. Battery Energy Storage Systems (BESS) require communication capabilities to connect to batteries and peripheral components, communicate with the power grid, monitor systems remotely and much more.

BESS may be one of the keys to solving the global energy crisis and making the world more sustainable. Because green energy sources such as wind and solar are not always available, battery parks can make it possible to store the energy produced for use when there is less sun or wind.

Battery energy storage systems are made up of battery cells, combined into battery packs, which can then be combined into containers and these in turn can make up battery parks. The systems may use new or recycled batteries and combine many different components. Battery energy storage systems – at smaller or larger scale – need secure and streamlined communication capabilities to function.

CAN-based devices

Since the battery market was originally spearheaded by the car industry, CAN (first developed for the automotive sector) is the communication standard of choice in many systems. Here, HMS offers an extensive portfolio of communication solutions under the Ixxat brand – for PC connection, networking, line extension, galvanic isolation and other applications. In networking, the protection of components is crucial, from external sources (such as lightning strikes) and from system-related issues (ac/dc noise). Device protection is essential to avoid damage and the Ixxat brand includes device protection products.

Networking gateways

Battery energy storage systems often combine different equipment from different industries within a single application – batteries, BMS, PLCs, fire detection units or air conditioning. To combine such different equipment, it is necessary to interconnect various protocols and network standards. CAN, Modbus, BACnet, KNX and other protocols can be easily linked via intelligent gateways from HMS, which handle the all-important data exchange while also enabling centralised control.

Cloud and SCADA connectivity

Intelligent networking is also required to connect to cloud solutions or SCADA systems. This connection can be made by using Smart Grid (SG) gateways from HMS that support both energy and industrial fieldbus protocols, as well as protocols required for cloud connection.

The SG gateways enable centralised control and remote access for predictive maintenance, logging or data visualisation using the i4SCADA® solution from the HMS-owned company WEBfactory®. The SG gateways also provide robust cybersecurity features.

For more information visit: www.hms-networks.com

Recording weather data at PV or wind farms

With a range of connected sensors, the weather station provides data to PV or wind farm management systems.

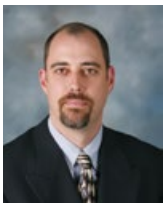
The weather station available from Phoenix Contact incorporates PLCnext Control and records the values of wind speed, wind direction, temperature, irradiation, humidity, and the amount of precipitation at the installation site. The weather data can be used to determine the efficiency of a solar photovoltaic (PV) system, for example, so the system can respond directly to any deviations from the expected yield.

Several SOL-ES sensors can be connected to the weather station via standard interfaces. The pre-configured sensors are immediately available to transmit weather data. Instead of wiring each sensor individually, M12 connections with Y distributors can be used to connect them in series. This reduces the amount of wiring required on site and makes it easy to integrate the sensors into the overall system. All sensors meet the requirements of IEC 61724-1 for Class A systems. Due to the broad portfolio of environmental sensors, the weather station can be adapted to meet each customer's specific needs for given sites.

The sensors can be configured easily via web interface. This means no programming knowledge is required to commission the weather station. The weather data is saved locally and made available to the user via a user interface. As well as being used in integrated PV park management, and on wind farms, the weather station can be applied as an autonomous system in other industrial applications.

For more information contact Phoenix Contact SA.
Tel: +27 (0)11 801 8200
Email: info@phoenixcontact.co.za
Visit: www.phoenixcontact.com/en-za

Measuring water content in natural gas



Sam Miller, Endress+Hauser Optical Analysis.

Sam Miller, Head of Technical Marketing, TDLAS/QF, Endress+Hauser Optical Analysis

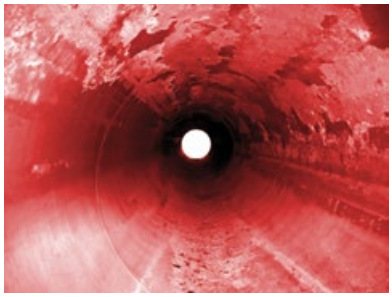
Contaminants in natural gas can cause various problems for pipeline operators and petrochemical plants, especially when combined with water. This makes accurate and reliable measurement of water content in natural gas streams critical, but traditional techniques often fall short. New analysers offer much improved performance.

Natural gas composition is controlled to some extent. Wherever natural gas is traded commercially, there are regulations as to its chemical content and attributes such as calorific value. Local specifications and ranges vary, but typically there are limits for total sulphur, hydrogen sulphide (H_2S), carbon dioxide (CO_2), oxygen (O_2), and water (H_2O). All of them are considered contaminants. Sulphur and its many compounds represent the most widely encountered contaminants in all fossil fuels and are known for their toxicity and pollutants. Oxygen degrades amine and some mercaptans which are used in natural gas treatment, and CO_2 dilutes the overall heat value.

The greater problem results when these contaminants combine with another: water. All of them work together with water to produce acids that can attack carbon steel piping, valves and other equipment to cause internal corrosion and metal loss over time. Natural gas pipelines can corrode from the outside and inside, but internal metal loss is more difficult to recognise and measure. If the water condenses, it can react with the carbon dioxide or hydrogen sulphide to form an acid that might collect in a low spot and cause internal corrosion.

For natural gas producers, pipeline companies, and users, water content, both liquid and vapour, in the gas flow is understandably a concern, as a pipeline leak or break caused by unchecked corrosion can cause enormous damage. Knowing the specific moisture content of the gas flow in real time is therefore critical.

Above: Natural gas can come from various sources (fossil-based, renewable) which means its composition and attributes vary.



Right: If water mixes with contaminants in natural gas, corrosive acids can form that attack the inside of carbon steel piping.

Correct, consistent measurement

There is a small selection of measurement technologies that can determine the amount of water in a gas pipeline. All typically involve extracting a sample for individual testing, rather than inserting a sensor for a continuous real-time reading. However, a common drawback of these electrochemical and electromechanical approaches is the high potential for contamination. Some contaminants, such as compressor oil, methanol, and amine, can cause inaccurate readings. Other contaminants can poison the sensor and necessitate its replacement.

A tunable diode laser absorption spectroscopy (TDLAS) analyser is the most reliable mechanism to measure water content in natural gas. TDLAS analysers use an infrared wavelength laser to isolate the distinct peaks in the wavelength absorption spectrum, indicating water and other components in the stream. This means the analyser can provide a water content measurement unaffected by glycol, methanol, amine, or hydrogen sulphide.

Real-time monitoring

TDLAS analysers enable fewer outages, lower operating costs, and offer increased reliability, all of which provide a long-term competitive advantage for users. The J22 TDLAS gas analyser from Endress+Hauser, which includes the diagnostic, monitoring and verification functions of the Endress+Hauser Heartbeat technology, offers comprehensive process monitoring. Alarms for critical measurement values can prevent process outages.

The J22 gas analyser includes web server functions that provide access to the data from any Internet-capable device, such as a laptop, smartphone or tablet. This is especially important if the instrument is installed in locations that are difficult for technicians and users to access.

The TDLAS analyser is designed with robust internal components protected by a solid enclosure, making it unnecessary to install the analyser in a protected space.

Simple maintenance

Analysers require specialised enclosures to protect the delicate mechanisms from the harsh surrounding environment. The J22 gas analyser has a robust enclosure, combined with improved isolation and enclosure heating, which allow for it to be deployed in wet and cold climate zones.

Whenever maintenance is required, analysers can be highly complex or difficult to take apart, and extensive adjustments are needed during reassembly. Some analysers require matched component sets, which forces users to purchase costly spare parts kits or send the analyser back to the factory. This can impact the availability of measurements at critical transfer points. The J22's modular design and easy-to-remove gas sample cells enable simple maintenance without long downtimes, even if the instrument is difficult to access.

Summary

Ensuring the reliable and safe operation of natural gas pipelines and other petrochemical systems requires the prevention of internal corrosion – which is caused largely by condensation in conjunction with other contaminants.

In cases where the water content is critical, operators have to date had to rely on electrochemical methods, but the results are often inadequate. In contrast, TDLAS analysers enable a high degree of accuracy and offer user-friendly interfaces, plus they deliver measurement values on a continuous basis at intervals of just a few seconds. That means users can determine at any time if the gas quality specification is being met or if corrective measures must be initiated. Furthermore, users can monitor the instrument continuously by means of the diagnostic data. This provides for quick detection of gas contaminants and rapid implementation of the measures needed to rectify the problem. With improved connectivity, users can access the analyser from virtually anywhere. □

For more information visit: www.endress.com

Phosphate precipitation in wastewater treatment plants

The problem of phosphate precipitation in wastewater treatment plants is typically addressed by adding iron (III) chloride ($FeCl_3$) into the aeration basin. The phosphates dissolved in excess wastewater are chemically mixed with sludge flocculants and transferred with sludge to the sludge treatment stage. This process reduces phosphate concentration in waterways and serves to minimise the potential for abnormal algae growth and the detrimental effect on the aquatic ecosystem. However, because an overdose of iron (III) chloride results in severely polluted water – toxic to people as well as the environment, a completely dependable method of process monitoring is needed. Kobold was tasked to provide a solution.

The ideal would be continuous flow measurement of the dosing chemical with a direct data connection to the process control system, which would guarantee water treatment plant owners maximum safety. It would ensure that possible errors were discovered in good time, not only after the event (during sample taking) when it is too late to rectify them.

Developed for use in wastewater treatment plants, the Kobold MIK flowmeter is designed to control dosage of iron chloride.

The Kobold MIK magnetic-inductive flowmeter was developed specifically for this application and provides an optimal and economical solution for safe dosage of $FeCl_3$. The unit has already proven itself in service, specifically for electric conductivity liquids, acids and caustic solutions, drinking, cooling and wastewater, groundwater, raw water, and aggressive or salty solutions. But it is unsuitable for oil (which lacks conductivity).

The MIK is housed in polyvinylidene fluoride (PVDF) and the electrodes in contact with the medium are made of tantalum. Both materials have proven to be totally chemically resistant. With the directly mounted transmitter in stainless steel housing, the device forms a compact and robust unit, ideal for fitting inside cramped control cabinets. It allows detection of small dosage amounts from 10 ml/min.

The device operates according to the principle of electromagnetic measurement – Faraday's law of magnetic induction – where a voltage is induced in a conductor moving through a magnetic field. The electrically conductive measuring agent acts as the moved conductor. The voltage induced in the measuring agent is proportional to the flow velocity and therefore presents a value for the volumetric flow. The flow rate is calculated on the cross-sectional area of the pipe. The measurement is dependent on the process liquid and its material properties, such as density, viscosity and temperature. The device may be equipped with a switch, frequency or analogue output.

With an analogue 4-20 mA signal (or optional pulse output) the MIK communicates the measured values continuously to the users' process control system. Thus it allows for immediate response to the latest process

conditions. This results in increased efficiencies and cost savings in the amount of iron chloride required to achieve phosphate removal, as well as in the vitally important aspect of environmental protection. Areas of application include: flow monitoring, flow measuring, dosing and counting for machine building, and in the automotive, cement, chemical, and paper industries, as well as laboratories. Kobold asserts that automation guarantees high standards of plant safety even at unmanned plants.

The Kobold MIK magnetic inductive flowmeter is available from Instrotech.

For more information contact Instrotech.
Tel: +27 (0)10 595 1831
Email: sales@instrotech.co.za
Visit: www.instrotech.co.za.

A new era in mass flow control

The FLEXI-FLOW is Bronkhorst's newest Mass Flow Controller series. With this revolutionary instrument, users are able to measure and control gas flow, and measure the temperature, and also measure and control the upstream and downstream pressures in the process application with one flexible instrument. "This is the future in mass flow control," says Vincent Hengeveld, Product Manager FLEXI-FLOW.

"The FLEXI-FLOW is based on a unique thermal mass flow measurement technique that combines fast and stable chip sensors with reliable and accurate bypass technology."

The FLEXI-FLOW mass flow and pressure meter/controller is designed to address recognised challenges in applications where, for example:

- space is limited and a compact flow instrument is needed
- various instruments are used for measuring flow, temperature, and pressure
- the process handles multiple gases
- swift and stable gas flow control is needed
- an easy-to-use instrument with easy monitoring possibilities would be preferred.

Here, the FLEXI-FLOW Compact series is the instrument of choice. It is available from Mecosa, the sole agent for Bronkhorst® in Southern Africa.

For more information contact Mecosa (Pty) Ltd.
Tel: +27 (0)11 257 6100
Email: measure@mecosa.co.za
Visit: www.mecosa.co.za

The new FLEXI-FLOW from Bronkhorst.

KROHNE flowmeters are used for measurement of slurry feeds to hydrocyclones.

Flow measurement in hydrocyclone feedlines

Hydrocyclones are typically used for separating slurry particles, based on particle weight. They are the most widely used type of classifier and their performance is considered critical to comminution efficiency and the profitability of the processing plant as a whole. Bespoke electromagnetic flowmeters for the mining industry can help plant operators optimise cyclone performance and maximise throughput in line with classification targets.

Magnetic flow meters from KROHNE have a track record in hydrocyclone feedline applications. They combine abrasion resistance, high accuracy and repeatability, enabling long-term stable flow measurement in slurry feedlines. Meter design and the use of wetted materials are key to increasing plant uptime and reducing maintenance costs, as is demonstrated in the following application report.

This report relates to a large gold and copper facility which operates four hydrocyclones. In each hydrocyclone feedline, one electromagnetic flowmeter is installed. One of the main selection criteria for the flowmeters was minimal maintenance, with high measurement integrity over a long period of time.

The processing of coarse and fine materials in hydrocyclones causes major abrasive wear. The maintenance costs of the flow control are driven by the costs of replacing a flowmeter. These include the purchase price of a new meter as well as production downtime, manpower, crane time, and the flanging and installation of the new flowmeter. Further, maintenance costs are driven by the frequency of replacements. The use of inappropriate materials can lead to meter replacement being required every three to six months per line.

Through appropriate material selection and application engineering, KROHNE has been able to change the replacement frequency of the electromagnetic flowmeters from every six months to three years. The selected electromagnetic flowmeter (EMF) is the OPTIFLUX 4300. The meter's design and liner provide the necessary toughness and versatility to maximise instrument lifetime in the cyclone feedlines. The rugged polyurethane liner has a high abrasion resistance. The flush mounted Hastelloy® C coated electrodes create less obstruction in the flow and are therefore less prone to wear and noise. The electrodes have a carbide coating, extremely durable for an extended lifetime.

The inner diameter of the flowmeter exactly matches the inner diameter of the connected process pipes. With abrasive applications, even the smallest difference in inner diameter can accelerate wear. The installation of type 3 protection rings on the inlet of the flowmeter also prevents a difference in the inner bore.

Using the KROHNE flowmeter has led to a significant reduction in maintenance costs and an increase in plant uptime for the customer. It has enabled extended meter lifetime – from six months to three years – and in this way, KROHNE has been able to save the facility 1.5 million USD per line every three years.

For more information contact KROHNE.
Tel: +27 (0)11 314 1391
Email: salesza@krohne.com
Visit: http://za.krohne.com

Accuracy in critical temperature measurements

The Fluke 1586A Super-DAQ Precision Temperature Scanner claims best-in-class accuracy for critical temperature measurements. With up to 40 analogue input channels and scan rates as fast as 10 channels per second, the Super-DAQ is ideal for applications such as thermal mapping, process sensor calibration, quality control testing, lifecycle testing, process monitoring and environmental testing. These are common in various industries, including the pharmaceutical, biotechnology, food processing, aerospace and automotive industries.

The temperature scanner can be used for critical temperature measurements in various industrial applications.

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

The 1586A can measure thermocouples, platinum resistance thermometers (PRTs), thermistors, dc current, dc voltage, and resistance. It offers temperature measurement accuracy of +/- 0.005°C for PRTs, 0.5°C for thermocouples, and 0.002°C for thermistors.

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

The Fluke 1586A Super-DAQ Precision Temperature Scanner is available from Comtest and authorised Comtest Channel Partners.

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

Electrical valves open new opportunities in plant engineering

Valve specialist GEMÜ is expanding its valve selection for the GEMÜ eSyLite motorised actuator with three further valve types. With the larger selection of electrical valves, plant engineers and operators can find a tailor-made solution more easily.

In addition to the GEMÜ R629 eSyLite plastic diaphragm valve already available, the GEMÜ 629 diaphragm valve with stainless steel body and the GEMÜ 519 and 529 globe valves extend the range for simple, motorised open/close applications.

Four GEMÜ eSyLite valves offer plant engineers and operators an opportunity to operate electrically driven plants more efficiently than before. In plants in which, for example, solenoid valves of large nominal sizes use a relatively large amount of electricity, the GEMÜ globe valves from the eSyLite series are a cost-effective alternative. With low switching cycles and medium switching speed, they take on shut-off tasks as precisely as solenoid valves, and at the same time offer the advantage of reducing operating costs with their low electricity consumption.

The GEMÜ eSyLite series also opens up new opportunities for plant optimisation for applications where, to date, there have been no affordably priced alternatives to electrical ball valves. Automation can thus be further advanced with the new eSyLite valves.

Where pneumatic valves could not be used previously and plant engineers and operators relied on manual valves instead, a motorised alternative is now available with which the plant can be automated cost-effectively.

The GEMÜ 519 eSyLite globe valve.

The new valves complete the GEMÜ eSyLite series. The robust and self-locking motorised linear actuator has a safety switch-off function including overload protection. A manual override and an optical position indicator are integrated as standard. The valves are optionally available with the GEMÜ eSyLite actuator, with the GEMÜ 1215 electrical position indicator, or with an integrated emergency power supply module.

For more information contact GEMÜ.
Visit www.gemu-group.com

Safety and reliability in transformers for mines

The mining sector's focus on safety and production efficiency makes it unsurprising that mines are increasingly choosing dry-type transformer technology rather than the traditional oil-cooled options. David Claassen, Managing Director of Trafo Power Solutions, which specialises in the design and supply of dry-type transformers, outlines some of the reasons for this.

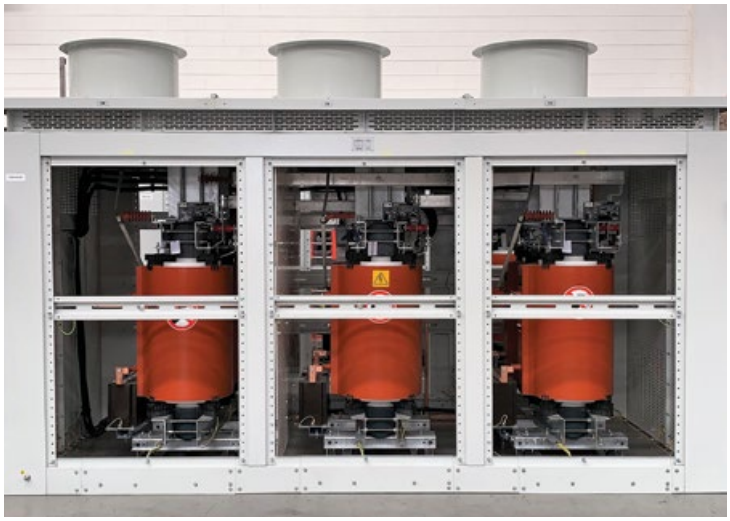
"The past decades have seen the mining sector entrench a culture of zero harm, resulting in a strict approach to health and safety issues," Claassen says. "With the current commodity boom, there is added incentive to optimise production, requiring the highest possible levels of reliability and performance from all equipment."

Both these imperatives are well served by the particular benefits of dry-type transformers, which are cooled by air and do not contain oil as a coolant. The absence of oil means dry-type transformers can be applied in a wider range of applications – and without added civils infrastructure – as they have a higher safety rating.

Fire safety

Dry-type transformers are categorised as F1 in terms of international fire resistance ratings, indicating a low level of risk. Their design and materials of construction make them self-extinguishing and flame retardant, and they will not emit harmful gases. This is important for both opencast and underground mines, especially those with designated hazardous areas where equipment is required to meet stringent fire-safety related specifications.

Additionally, with the pressure on mines to produce consistently to target, there is a growing focus on ensuring maximum uptime of operations. As well as providing higher safety levels, dry-type transformers offer high reliability and require very little maintenance – in turn securing lower service costs and less operational downtime.



Three dry-type transformers in a single compact housing designed to meet the available footprint.

A containerised energy solution incorporating a dry-type transformer on a mobile skid.

Mobility

Trafo Power Solutions has been engaged in transformer design and installation in a variety of mining applications around Africa, ensuring that each solution meets the customer's requirements. In opencast mines, for instance, there is often a requirement for transformers to be mobile. This means they also need to be robust, to endure being moved over rough terrain on skid-mounted platforms.

Working in close collaboration with leading Italy-based manufacturer, TMC Transformers, Trafo Power Solutions ensures its transformers have a rigid construction and the structural integrity to stand up well to movement and vibration. The absence of oil as a coolant also means there is no risk of oil leakage under these conditions.

Environmental elements are another factor to be considered, as the transformers can be located outdoors and are designed to be protected from dust and moisture. The solution usually includes high levels of ingress protection – at level IP54 or IP44 – to maintain performance and longevity.

Constrained spaces

With their inherent safety advantages, dry-type transformers can be used in many underground applications. Trafo Power Solutions has the in-house design capacity to custom engineer the transformer's dimensions, weight and other factors to match the constraints presented by trans-

porting and installing the transformer underground. This includes ensuring the transformer's size and mass are within the limits of the cage in a vertical shaft, or the dimensions of a decline shaft. Often, the size of the transformer for mining applications can be large and Trafo Power Solutions brings considerable ingenuity to keeping the unit's size to a minimum.

Assisting this process is the extensive experience of TMC Transformers in the marine industry, where space is always at a premium. Trafo Power Solutions leverages this experience and TMC's scope of offerings to meet similar underground challenges. A key aspect of the design focuses on the transformer's cooling capabilities, as this underpins the unit's reliable operation.

The options adopted to reduce a transformer's footprint include air-to-air heat exchangers. For more extreme conditions, water-cooled transformers, which have a very limited footprint, can be designed and manufactured.

Coal and graphite mining

In mining, certain minerals present their own demands. Coal mining, with highly flammable dust, calls for a dry-type transformer which is rated and tested for hazardous conditions. Within the different hazard classifications, the units must be completely self-contained and flameproof in Zone 1, for instance.

Graphite is another mineral that calls for special attention in transformer design, as the dust is highly conductive and flaky. The shape of the particles allows the dust to build up on surfaces rather than rolling off; this creates pathways for electrical short circuits, which must be avoided at all costs.

Trafo Power Solutions emphasises the importance of clearly understanding the conditions that prevail at each mine, so that these are considered at each stage of the design process. The priority is to keep dust and moisture out of the transformer, and ensure adequate cooling takes place for the unit to operate effectively at 100% load.

Cooling

For each application, Trafo Power Solutions conducts an in-depth analysis of the requirements and the environmental conditions, and TMC applies the latest thermo-dynamic software to simulate cooling across the transformers' hot-spots while maintaining high IP ratings where necessary.

To accommodate the cooling needs of the transformer, the options start with naturally ventilated transformers and extend to a range of other methods. There is the forced air (AF) forced ventilation design, for example, which further presents the option of using air-to-air heat exchangers and auto heat exchangers.

"The availability of technologies like these allows us to design and manufacture dry-type transformers for the most demanding mining conditions, where there are high levels of dust and moisture," Claassen says. "This ensures the transformers are cooled sufficiently to deliver their expected performance and reliability."

He cites as an example, a recent project in which Trafo Power Solutions' experience and design expertise paved the way for an innovative cooling solution in a constrained space.

A large dry-type transformer had to be mounted onto a trailer of limited dimensions, along with electric motors and medium voltage variable speed drives (VSDs).

A 3 900 kVA dry-type transformer with multi-voltage secondaries, housed in an IP54 enclosure.

"We took advantage of the fact that the VSDs were already using a water-cooling system," Claassen says. "With that in mind, we designed a solution in collaboration with other service providers to the project – in which our transformer could interface with this existing water-cooling arrangement."

In closing he reiterates that dry-type transformers offer mines notable gains in terms of safety, uptime and productivity, and a growing number are taking up these benefits. □

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

Centralised monitoring of remote substations

One of the largest electricity cooperatives in the United States, Berryville Arkansas-based Carroll Electric Cooperative Corporation, was facing an ongoing challenge of managing its large and geographically dispersed network of substations efficiently. Without the ability to monitor substation performance remotely, or receive notifications from remote equipment, personnel had to travel to substations for various issues, which delayed response times and resolution of the issues. NovaTech Automation provided a solution.

David Smith, Engineer – Communications at Carroll Electric said, "If we had to make a change or investigate an issue, our linemen, technicians, or engineers would have to drive to the substation. If it was an outage, customer calls would be coming in as we were trying to determine if there was an issue at the substation."

With a network of 41 substations and over 10 000 miles (more than 20 000 km) of line serving over 100 000 accounts across 11 largely rural counties in Arkansas and Missouri, driving out to a substation from Carroll Electric's head office could take as long as an hour and a half. The lack of remote monitoring and management ability was getting in the way of the cooperative's mission to provide the most reliable and affordable service to its members.

"We knew a SCADA (supervisory control and data acquisition) system would address our remote management needs," said Smith. "What we wanted was a centralised way to monitor the megawatts per substation and the amperage per feeder, to ensure the loading levels were not exceeding our thresholds. This issue becomes even more of a risk during the colder winter months."

After undertaking a comprehensive search, Carroll Electric selected the OrionLX system from Pennsylvania-based NovaTech Automation, a substation automation company that has served the power transmission and distribution market for more than 40 years.

The new interactive SCADA system makes use of open-source web technologies to enable remote monitoring of data from the substations.

NovaTech's Orion Substation Automation Platform is a communication and automation processor that can connect to nearly any substation device in its native protocol, perform advanced maths and logic, and securely present the source or calculated data to any number of clients in their own protocol. The OrionLX system can be integrated with any equipment, including that of competitors, and is often connected to microprocessor-based relays, meters, event recorders, IEDs (intelligent electronic devices), and RTUs (remote terminal units). It is then connected to an existing enterprise network or SCADA system.

In this case, the system includes OrionLX RTUs in each substation, which send data back to a master unit located at Carroll Electric's head office.

Selecting the right system

"We had two primary criteria for the selection of a suitable SCADA system, beyond the specific functional requirements," said Smith. "We needed a system that was easy for us to program on our own and was affordable. We did not want to be burdened with ongoing software, licence, or maintenance fees."

Ease of programming was important to Carroll Electric's engineering team – for the initial HMI setup and for adding new installations in the future. The cooperative began with a single substation pilot for which NovaTech delivered the initial HMI (human machine interface).

The Orion system uses open-source web technologies and preconfigured template pages to simplify the building of interactive SCADA and local HMI screens, enabling users to view data from connected IEDs and RTUs using standard web browsers.

Beyond interface design improvements, the integration of key features, such as an alarm annunciator application, are among the areas that substation automation platforms have advanced significantly.

The alarm annunciator in the NovaTech platform is managed through the same WEBserver software. It includes preconfigured pages for data archiving/sequence of events recording, alarm annunciation, one-line diagrams,

IED faceplates, control screens, alarms, trending, and communications diagnostics.

"We gave NovaTech our substation specs, and the NovaTech team wrote the original master and substation files for us," said Smith. "From then on, we were able to modify the program to fit each successive substation ourselves."

Rollout to substations

Carroll rolled out the Orion system across 41 substations one at a time. For each installation, the technicians wired the system, ran Ethernet cables, and set up the relays in the control house before the engineering team set up and tested each Orion unit.

"It really was pretty easy," said Smith. "Since the Orion program already had the pictures of our devices in the field, it was not difficult for us to configure the HMI to each new substation's individual specs."

One-line diagrams in the Orion HMI show the status of the entire substation at a glance. This enables Carroll Electric's dispatch team to tell quickly which feeders are open and if there are voltage issues. Feeder breaker zoom screens allow more detailed information to be viewed at the office, such as: ground trip blocked, non-reclosing, max amperage, power factor, and fault currents.

Remote monitoring

Since installing the SCADA system, Carroll has been able to respond to issues more quickly, resulting in shorter outage times for its customers. Overcoming the need for personnel to drive out to a substation when there was an issue with a feeder or transformer, now most issues can be diagnosed remotely. Another advantage is that where previously, during extreme cold weather, employees would be posted at various substations to collect amperage readings throughout the day, monitoring is now done from the office. The engineering team logs into the substation devices remotely to view settings, sequence of events and make changes if needed. "Our monthly substation checks are much more efficient," said Smith. "We can download device settings, event logs, and load data from the office without having to visit our substations in person."

The remote monitoring capabilities the SCADA implementation has brought to Carroll's engineering team have enabled it to manage the scope of its geographically dispersed network and support the cooperative's mission for reliable and cost-effective service more efficiently. □

For more information visit: www.novatechautomation.com

Assessing transformer condition

In a recent three-part series of blogs under the title *Assessing Transformer Condition*, Doble Engineering Company looked at various test and analysis methods used in this critical service. The series is authored by Simon Sutton, who has over 25 years' experience in the electricity transmission and distribution industry, predominantly in the cables sector, and currently works as Director of Services for Altanova, a Doble company; Lance R Lewand, Technical Director for the Doble Insulating Materials Laboratory; and Andy Davies, who, as well as his work with support and training for Doble's online asset management tools, provides transformer consultation for customers across the EMEA region.

The three-part series looks at:

- The importance of sending high quality oil samples to the laboratory to be tested
- The types of problems that can be identified by Dissolved Gas-in-oil Analysis (DGA) and what next steps may be taken
- Other oil tests that are conducted, and the important information they can reveal.

The blogs are informative, offering valuable insights from Doble's extensive experience in this field. *Electricity + Control* presents only a summary outline here, with brief extracts. Readers can learn more from the Doble website.

Part 1 deals with Common tests & Best practices. The authors note at the start: "Transformers are subjected to electrical, thermal, and chemical stresses during their operational life that degrade the insulating oil and solid insulation, cause corrosion and oxidation, and create the conditions for incipient faults to develop, which may shorten the life of the asset. These ageing processes are necessarily considered during the transformer design phase. However, when degradation occurs faster than anticipated, this is considered accelerated ageing. A high resistance joint causing localised overheating, or partial discharge degrading the solid insulation are examples of premature ageing.

"Although simple visual inspection of the transformer tank (to look for corrosion or leaks) or IR surveys (to identify overheating pumps) yields important condition information, not all issues will be visible from the outside. Fortunately, incipient faults occurring within the transformer can be identified and diagnosed by examining the chemical, physical and electrical properties of the liquid dielectric within it. This is usually done in an external laboratory although some larger utilities or industrial entities undertake in-house testing."

The importance of high quality samples

"An oil sample can reveal information about the condition of the asset; this includes evidence of overheating, partial discharge and arcing, paper degradation, water ingress, oxidation, presence of chemical and physical contaminants, and more. Consequently, oil testing is a key method for assessing a transformer's condition and identifying incipient faults before they become critical. A single measurement is valuable, but trending changes in the data over time enhances the diagnosis, revealing the severity of the situation and enables asset managers to plan appropriate actions. The authors emphasise that ensuring good results for an assessment starts with the key first step of delivering a good oil sample to the lab.

The value of Dissolved Gas Analysis (DGA)

In Part 2 the authors suggest that DGA is possibly the most powerful tool for assessing transformer condition. "Commonly performed according to ASTM D3612C (also detailed in IEC60567), this diagnostic test measures the concentration of certain key gases dissolved in the oil. Additionally, provided oil samples are taken at regular intervals, the rate of gas generation can also be determined. This information enables specialists to understand which faults are emerging and their severity.

"While acetylene is the most important gas to measure for detecting severe faults, all gases are important with a view to identifying incipient faults."

Checking oil quality

In Part 3 the authors consider some of the other tests which provide further information on oil quality. These include testing for water content, relative saturation and breakdown voltage, as well as power factor testing, colour testing, and interfacial tension measurement, all key indicators of accelerated aging.

For more information visit: www.doble.com

Equal opportunities in the technical workplace

A professional highlight for Edith Kikonyogo, ABB's Local Division Manager for Energy Industries in Southern Africa, has been leading the team that established the operation and maintenance philosophies on four of the first local solar photovoltaic (PV) plants. "There was not a lot of expertise to draw on in South Africa at the time, but the team pulled it off – to see the plants into operation successfully, as well as delivering on guaranteed plant performance and the safety aspects of the operations."

Diversity and inclusion (D&I) in the workplace is a major focus for ABB globally. In its D&I Strategy 2030, the group aims to double the percentage of women in management across its offices from 12.5% (in 2020) to 25%. With clear targets in focus, it is working towards greater gender representation from entry level up to global senior management.

"Each year I have witnessed gains being made in this regard. ABB continues to cultivate female leadership capacity purposefully and continues to provide programmes and tools to empower women and give them more agency over the trajectory of their careers," says Edith. She is responsible for growing the business in the power, water, and oil and gas sectors in the region. She is accountable for all matters relating to the division's market strategy, operations, organisational capacity and, most importantly, the growth and wellbeing of all staff. Edith has over 13 years' managerial experience and a total of 17 years' experience in the industrial automation and power industry.

She has been with ABB for 18 years, during which time she has held various technical and managerial roles, including Africa Hub Service Manager – Power Generation. Her professional experience spans project engineering, project management, energy management consulting, sales and sales management, profit and loss responsibility and, most recently, board and fiduciary responsibilities. Edith holds a Bachelor of Science degree and a Master of Science degree in electrical engineering, both from the University of the Witwatersrand, and is registered as a Professional Engineer with the Engineering Council of South Africa.

Looking at the broader context, Edith says, "Overall, my biggest accomplishment is the wellness and wholeness of my family." In terms of changes needed at a company and societal level to increase the visibility and role of women, she would like to see barriers to entry and growth in the workplace removed for women and says deliberate effort needs to be made to identify the issues that stand in the way of women advancing in their careers. Resources then need to be assigned to lower or remove these barriers, so women have as fair a chance to advance as any other person. She notes, for example, barriers relating to childcare, a responsibility which generally falls to women, rigidity around working hours, limited options around work assignments for women who are mothers to young children. She says creative solutions need to be sought to retain and allow women to advance in the workplace.

Edith Kikonyogo, ABB's Division Manager for Energy Industries in Southern Africa.

Tryphinah Nkomo, ABB's Sales and Marketing Manager for Process Automation, Energy Industry, Sub Saharan Africa.

Edith's advice to young women starting out in their careers, especially in traditionally male-dominated industries, is that few things trump hard work. "I have not yet encountered a form of prejudice that does not eventually bow to excellence; be assured that hard work will pay off. Also, show up as yourself, rather than some version that you might imagine would be better suited to the workplace. The earlier you embrace the feminine aspects of your character as strengths rather than as weaknesses, the quicker you will come into yourself and fulfil your potential," she says.

Tryphinah Nkomo, Sales and Marketing Manager for Process Automation, Energy Industry, Sub Saharan Africa, says: "There is visible progress in the right direction." Tryphinah is responsible for business development and sales covering the power, water, oil, gas and chemicals segments. She is proud of the young people she has taken under her wing as a mentor, who are currently blooming in their own space.

"I find joy in helping others unleash their potential and grow. I have assumed different roles throughout my career within the technical environment. I made sure that in every single opportunity I was awarded, I gave my best," she says.

In closing, Tryphinah adds: "Women should be given equal opportunities without any prejudice. Over the years women have continuously proven they are as capable as their male counterparts." Her advice to young women starting out in their careers is to work hard and claim their positions. "We do not get ahead because people do us favours; we need to put in the effort and prove our worth."

For more information visit: www.abb.com

Common cyber threats in the industrial environment

Eduardo Di Monte, Cybersecurity Portfolio Strategic Growth Leader, Rockwell Automation

Cyber criminals are typically able to move faster than companies. This means companies need to know where their vulnerabilities are and where the likely threats will come from.

Given the current nature of the cyber threat landscape, no organisation is immune from becoming the target of cybercriminals. Over the past year we have seen companies of all types and sizes, irrespective of industry or sector, fall victim to a cyberattack. Although previously digital sectors such as eCommerce companies were the first on the radar of criminals, this has now shifted towards industrial targets.

Often companies in industry have not updated or enhanced their cybersecurity processes for a significant period. It is common for legacy systems to still be using the same security protocols they had when first issued, which means attacks can quickly and easily interfere with operations. There is a misconception that cyberattacks are increasing in sophistication or level of complexity; in reality criminals are using well-established tactics and seeking the easiest, most readily available opportunities.

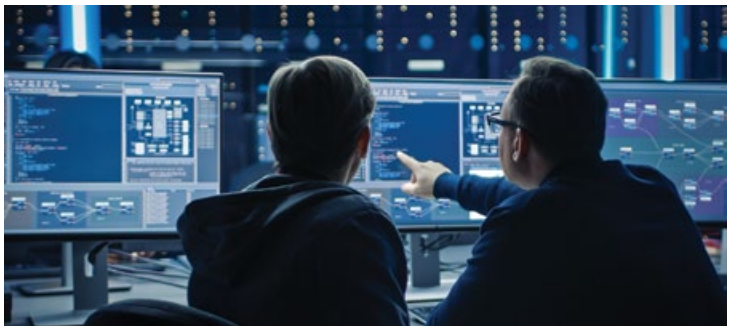
Leaders need to start prioritising cybersecurity systems. This starts with understanding where in the company the most common threats exist.

Protect business-critical practices

Typically, the main goal of an attack is to target a critical business practice and create the biggest impact in the shortest timeframe. If criminals can affect business-critical practices, they can set in motion a chain reaction across other areas of the business, including supply chains, magnifying the impact and creating knock-on effects. Criminals aren't looking to cause momentary disruption; they are attacking companies where they know the most damage will be felt. They are targeting business-critical practices.

Protect your employees

In the modern world, criminals have many more points of entry through which to attack, given the fragmented nature of company operations. Often, attacks aren't highly sophisticated or targeted operations; instead, they tend to start as wide as possible before narrowing down onto a specific person or endpoint. More often than not, the way in is through an employee's unintentional mistake or unprotected equipment.



With reliance on digital processes increasing, companies need to engage cybersecurity expertise to protect their operations.

Techniques such as phishing are still a major focus for attacks, with cybercriminals targeting the weakest link in a chain and attacking there, quickly. It could be something as simple or obvious as an employee clicking on a link in an email without thinking, or working on a machine from home that is not secure. These are low-risk low-cost operations for the attackers, and they have the global marketplace available to them.

Protecting your employees is paramount to protecting the business. Encourage the workforce to follow standard protection practices and have systems in place to protect them by offering regular training geared towards improving cyber-hygiene. Simple measures such as these can significantly limit the chances of a cyberattack.

Protect IT equipment

The more an organisation relies on technology, the larger the threat surface it needs to defend. When adopting any new software or devices into business-critical processes, companies need to know how they will protect the technology. Companies that adopt new systems without properly securing them first, present the best opportunities to cybercriminals.

With reliance on digital processes only increasing, companies need to treat cybersecurity the same way they treat legal matters. Every business is aware of the legal issues they may face and experts are engaged at every turn to prevent any issues arising. The same approach is needed for cybersecurity.

Companies should engage with cybersecurity experts and professionals ahead of adopting a new technology, just as they would do with lawyers for new contracts. This too can have a dramatic impact on bolstering cyber-hygiene.

Becoming harder to hack

The core concept behind effective cybersecurity is to make it extremely hard and expensive for criminals to even try to attack. Having an enhanced approach to security embedded across IT systems from the outset acts as a key deterrent to potential attackers. A good place for businesses to start is with some form of visibility and detection capability, while improving the overall speed of response to threats. Effective cybersecurity solutions should be put in place early and dynamically and continually improved over time. A simple action plan established early and updated regularly will be more effective at deterring potential attacks than many business leaders might initially think.

For more information visit: www.rockwellautomation.com.

A world first: Anglo American's hydrogen-powered mine haul truck

Anglo American plc (Anglo American) on 6 May launched a prototype of the world's first and largest hydrogen-powered mine haul truck designed to operate in everyday mining conditions at its Mogalakwena platinum group metals (PGMs) mine in South Africa.

The 2 MW hydrogen-battery hybrid truck, generating more power than its diesel predecessor and with a 290-tonne payload, is part of Anglo American's nuGen™ Zero Emission Haulage Solution (ZEHS). nuGen™ encompasses a fully integrated green hydrogen system, consisting of production, fuelling and haulage system, with green hydrogen produced at the mine site.

nuGen™ is part of FutureSmart Mining™, Anglo American's innovation-led approach to sustainable mining – which brings together technology and digitalisation to drive sustainability outcomes, including its commitment to carbon neutrality across its operations by 2040.

Speaking at the launch at the Mogalakwena Mine, President Cyril Ramaphosa said: "What we are launching here today is not only an impressive piece of machinery. It is the genesis of an entire ecosystem, powered by hydrogen.

"Developing the hydrogen economy is a strategic priority for our country. It will be a valuable driver of economic growth and employment and it will contribute to our decarbonisation efforts. The nuGen ™ project provides demonstrable proof of the potential of this sector. It takes us from conceptualisation to reality," Ramaphosa said.

Duncan Wanblad, Chief Executive of Anglo America, said: "nuGen™ is a tangible demonstration of our FutureSmart Mining™ programme changing the future of our industry. With diesel emissions from our haul truck fleet accounting for 10 to 15% of our total Scope 1 emissions, this is an important step on our pathway to carbon neutral operations by 2040. The mining industry is playing a considerable role in helping the world decarbonise, through its emissions footprint and the metals and minerals it produces that are critical to low carbon energy and transport systems.

"At Anglo American, over the next several years, we envisage converting or replacing our current fleet of diesel-powered trucks with this zero-emission haulage system, fuelled with green hydrogen. If this pilot proves successful, we could remove up to 80% of diesel emissions at our open pit mines by rolling out the technology across our global fleet."

Technical Director, Tony O'Neill, commented: "We are proud of what our team, working with expert partners, has achieved in under three years. This is a world-class innovation and bears testament to our technical vision and determination to deliver a cleaner and smarter future for mining.

"These game-changing innovations are why we began our FutureSmart Mining™ journey in 2014, knowing how much of a difference we can make, in the energy transition and across our societal footprint. Innovative, clean and independent power systems, such as our nuGen™ ZEHS project, present a significant part of the emissions solution."

Natascha Viljoen, CEO of Anglo American Platinum, said: "PGMs play an essential catalytic role in many clean-air

The 2 MW hydrogen-battery hybrid haul truck has a 290-tonne payload.

technologies, including those related to hydrogen production and hydrogen-fuelled transportation. As part of our market development work, we have for some years been working towards establishing the right ecosystem to develop, scale up and deploy hydrogen-fuelled solutions.

"Hydrogen has a significant role to play in achieving a low carbon future – particularly as an energy carrier enabling the development of a renewables-based power generation system. We are particularly excited about the potential of nuGen™, among other opportunities, as we work towards the development of South Africa's Hydrogen Valley."

Sébastien Arbola, Executive Vice President for Thermal Generation, Hydrogen and Energy Supply at ENGIE, said: "At ENGIE, we realise the importance of green hydrogen in the decarbonisation of heavy-duty mobility, and we are dedicated to helping industry players accomplish their carbon neutrality goals. We are partnering with Anglo American to provide renewable hydrogen for its proof of concept. Through this partnership, we aim to unlock the potential of green hydrogen in South Africa and pave the way for the decarbonisation of the mining industry."

Anglo American has been a longstanding champion of the potential offered by the hydrogen economy, recognising its role in enabling the shift to greener energy and cleaner transport. For South Africa, with its abundant renewable energy resources in solar and wind, and as the world's largest producer of PGMs, the hydrogen economy presents the opportunity to create new engines of economic development, including the creation of new jobs and the development of the PGMs sector, as well as contributing to the country's decarbonisation objectives. It has been identified as a national strategic priority, as conceptualised in the Hydrogen Valley initiative.

For more information visit:
https://southafrica.angloamerican.com

Manufacturing Indaba returns as a live event

Manufacturing Indaba will this year return to an in-person platform. It will take place on 21 and 22 June 2022 at the Sandton Convention Centre in Johannesburg. After the virtual events of the past two years, due to the Covid-19 pandemic, the 9th edition of the conference and exhibition will be hosted as a physical event.

Manufacturing Indaba 2022 will be hosted as an in-person event at the Sandton Convention Centre.

Reigniting economic growth

The pandemic has impacted negatively on industry broadly, on value chains, trade, labour markets, foreign direct investment, and remittance flows. It has hindered the economy's ability to increase real incomes over the long term, imposing a heavy debt burden. As the health crisis subsides, yet remains with us, economic recovery has become a priority, and inclusive and sustainable industrialisation is fundamental to building a better future.

Manufacturing plays an unequalled role in driving economic development. This is evident in how industrial growth builds the overall GDP and productivity of a nation. A rise in manufacturing output promotes further production in the manufacturing sector as well as in other sectors through direct production linkages and indirect multiplier effects, driving the growth of the economy as a whole. A resilient manufacturing sector paves the way for a nation to provide a decent standard of living for its citizens and is recognised as a key accelerator for Africa's robust and inclusive growth.

Further, manufacturing provides multifaceted productive advantages. First, mass production introduces economies of scale: the more units produced, the lower the per-unit cost, and the higher the value of outputs per input. Second, manufacturing tends to have strong links to other economic sectors, creating demand for skills, inputs, manufacturing components, transportation, and storage. Reigniting manufacturing boosts a restart across a wider range of activities, including those in the services sector. Third, many innovations and technological advances originate in manufacturing, and spill over into other industries, enhancing their levels of productivity.

Reigniting manufacturing will boost a restart across a wider range of activities via supply and services links.

Significant shifts in the structure of global production present industry in South Africa and Africa the opportunity to capitalise on the continent's resources and potential in implementing domestic manufacturing and a commodity-based industrialisation process. This provides substantial scope for job creation and the promotion of inclusive economic transformation.

Industrialisation will entail adding value to domestic products, soft and hard commodities and developing forward and backward linkages to regional and international value chains. It remains essential to develop and expand SMEs, industry clusters and private-public partnerships, to leverage financing for the industrialisation process.

In addition, implementation of the African Continental Free Trade Agreement (AfCFTA) will develop regional value chains and accelerate productive transformation. Governments and organisations need to harness digital innovations to reduce production costs and create policies for skills development, public procurement, and foreign investment to reinforce industrial development.

Manufacturing Indaba 2022 offers attendees the chance to identify significant players, financiers, influencers, and leaders, and to gather insights into new solutions and business models, as well as access to new markets, new clients, and the opportunity to grow prosperous manufacturing businesses that can contribute to the nation's and the continent's economic growth.

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

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