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What can we learn from the past year?

Can you believe another year has passed? And a new year has begun?

When we reflect on what has transpired, we can only do so in the context of acknowledging that every country on this continent really does need to be a player on the world stage.

We read so often of divides – in particular the digital divide. And how we have seen this manifest as Covid struck and schoolchildren, for example, were suddenly not able to be in class.

It does give us pause to realise how difficult it is for many South Africans to be effective in an online environment. Furthermore, it emphasises how so many jobs simply cannot be done online. At all.

So, these have been terrifying times for many: industry has haemorrhaged jobs; many state interventions have been inefficient or ineffective; and leadership has been lacking in many sectors.

But what we do need to be taking from the past year, as industry, is a realisation that it cannot be business as usual. It simply cannot.

We have been thrust into the age of digital transformation and we have been thrust into a world where skills simply must be revised.

It is a humbling thought that we live in a nation where (notwithstanding some prominent areas of excellence) our children are faced with some of the poorest maths and science education on the planet.

We really should not be tolerating this.

And the lack of a scientific background, in general, resonates with much of what we see happening in society. I have been fascinated to watch the debates around vaccination, for instance, evolve here and elsewhere. Interestingly, it sometimes takes an actuary, not a medic, to really crystallise out the obvious.

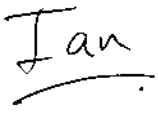
It has become abundantly clear that proper education is a fundamental requirement of this developing nation.

But as we reflect on another year passing, each of us should be asking what our company has learned; where we have developed new ways of doing things; what new skills we may need to develop among our staff; and how we can optimise our efficiency in the new year.

It is not all doom and gloom: I like to think of it as a series of circumstances that have forced us to be more resilient than ever, to identify opportunities, and to recognise that it can only get better. Really, it can.

I wish you and yours all the very, very best for 2022. Please stay safe, and do not drop your guard.

On behalf of the whole team here at *Electricity+Control* – our Editor, Leigh Darroll, our Advertising Manager, Heidi Jandrell, our Layout Artist, Darryl James, and Administration Manager Karen Smith and her team, as well as on behalf of our Publisher and Deputy Publisher, Karen Grant and Wilhelm Du Plessis – all the very best. Let's all look to the year ahead with renewed hope – and ready for anything circumstance can throw at us!



Ian Jandrell

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

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Quality is key to high-performance automation solutions

Systems Automation & Management (SAM) is a dynamic business, a leading systems integrator, software developer and automation solutions provider with extensive in-house engineering expertise and experience. Having been in operation since 1988, SAM has seen the evolution of automation systems and kept pace with today's still faster-changing technologies. Established in South Africa and working with blue-chip clients primarily in the mining and power utility sectors, the company has grown to operate across other African countries and globally.

Managing Director Claudio Agostinetto says for SAM, quality is a non-negotiable and is key to its achievements. He outlines four core principles which form the foundation for the company's operating practice:

- We work mainly with the top three or four world players in automation solutions
- We also develop our own products and niche solutions for specific applications
- Quality is essential – in our products and service and everything we do
- We seek to develop long-term relationships with our clients, suppliers, subcontractors and employees.

SAM works with automation and control systems and equipment mainly from Siemens, ABB, Schneider Electric, Rockwell Automation/Allen Bradley and other suppliers recognised for their quality standards.

It has also developed in-house solutions to address particular challenges. For example, Agostinetto says, the company developed the X5/X7 card which overcomes legacy issues. The modular CPU (central processing unit) provides a 'bridge' enabling existing equipment to function with the latest software. Specifically, it enables a switch from Siemens SIMATIC® S5 to SIMATIC® S7 and SIMATIC® PCS7, replacing the S5 PLC with SAM's X5/X7 processor. SAM is currently involved in a number of commissioning projects for clients migrating from old to new systems. Using the X5/X7 processor means this can be done with minimal downtime and without the cost of having to change all existing hardware.

Another solution developed in-house is the EMDAS energy management and data acquisition system which SAM developed through its work with power utilities. EMDAS monitors metered inputs for power generation plants. It provides a complete measurement and data storage environment with reporting options enabling hourly, daily and ad-hoc reports.

An additional dimension of SAM's capabilities is in machine design and automation. Agostinetto highlights that SAM Mech has designed, for example, laser diamond cutting machines, automated diamond polishing machines, and automation solutions for Toyota, among others.

The company holds DEKRA certification for its ISO 9001: 2015 Quality Management System, with a specific focus on its project execution procedure. However, regarding quality, Agostinetto emphasises that: "Quality is really a state of mind; it is in the way people work and it has to be integral to every aspect of the business. Quality also extends to the way we interact with our clients and suppliers. In every project we look to select the right skills for the project team and the right products and solutions to meet the client's needs. And we work with clients to develop solutions that will meet their needs now and well into the future."

SAM has offices in Johannesburg, Durban, Limpopo and on the west coast, as well as internationally, in Botswana, Namibia and Denmark. The company operates globally. It is currently working on a number of remote commissioning projects, mainly in mining, in countries as far afield as Canada, Chile, Australia, Kazakhstan, and South Korea – and across the African continent from Angola to Zimbabwe, Zambia and Nigeria. □

SAM provides customers in mining, power and general industries with a comprehensive range of automation and control services and solutions.

For more information contact SAM.
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Robotics in SA's food and beverage industry

Linda Eales, Robotics Division Manager at ABB South Africa

The future has never looked more unpredictable for South Africa's food and beverage sector, as it battles a perfect storm of pressure brought on by Covid-19, changing consumer and retail consumption patterns, disrupted supply chains and ongoing scrutiny around food safety.

The Food and Beverage (F&B) sector has been battered by a number of high-profile food safety scares in recent years and, in some areas, it is struggling to keep up with mega-trends like digitalisation and shifting consumption patterns. The good news is that this could be a perfect opportunity for the local F&B industry to reposition itself for the present and future.

F&B manufacturers increasingly need more flexibility on their production lines to enable them to adapt to changing consumer tastes and demands. At the same time, they require higher levels of productivity and efficiency, while maintaining the highest levels of product quality. In many cases, the answer to these challenges is to install a robotics solution, which makes F&B operations safer and more productive.

Globally, the uptake of robotics is growing rapidly. In an ABB Industry Survey in January 2021, covering 1 650 large and small businesses in Europe, the USA and China, 84% of businesses said they would introduce or increase the use of robotics and automation in the next decade. Nearly half (43%) said they were looking to robotics to help them improve workplace health and safety, and more than a third (36%) are considering using robotics to improve the quality of work for their employees.

The South African F&B industry is lagging behind these regions in implementing robotics. There are a couple of reasons for this: robotics is seen by some as an expensive solution, and there is the lingering perception that robots will take jobs from people.

As well as improving efficiency and driving down costs, robots can increase production flexibility.

It can be argued that neither is true. Plants that use robotics tend to have fewer breakdowns, and higher productivity. The cost of a plant standing still for several hours far outweighs the cost of a robot. And plants that install robots can create more jobs for people to cope with higher outputs. Instead of a team of people manually palletising 80 kg bags of material, a robot can do that job faster and more effectively, and the people who were doing it can be re-deployed in jobs as forklift drivers, for example, or quality assurance controllers, or maintenance operatives.

The future of F&B manufacturing

Robotics is nothing new. It has been used at a basic level in the F&B industry for some time in applications such as the ultrasonic cutting of cheeses, cakes and gateaux; using water jets to cut bread rolls; collating meat and fish products into packing formats before primary packaging; and the automated de-panning of various bakery products in the confectionary and biscuit segments.

It is becoming more important – and more sophisticated. In the ABB Industry Survey conducted in January 2021, 85% of respondents said the pandemic had been 'game-changing' for their business and industry, with Covid-19 a catalyst for accelerating investment in automation. 51% said robotics could enhance social distancing.

In this time of a pandemic, robotics can play a key role in ensuring food safety by ensuring personnel work safely and eliminating by-product contamination. This means fewer risks to workers' health and safety, and improved food quality and traceability; and it frees up people to perform higher-value tasks while securing food safety.

The convenience factor is another major driver of automation in the sector. F&B manufacturers are increasingly being challenged to supply the right range of products, in the right sizes and formats, in the right types of palletised loads, for the right sales channels – at the right time.

The businesses that are using robotics in their operations are seeing notable results. In Brazil, ABB robots are supporting Nestlé, the world's largest food and beverage company, to improve the productivity of pallet loading in its chocolate manufacturing facilities by 53%, using a new palletising robot solution.

A South African beverages manufacturer has reduced the risk of injury and increased productivity using a single robot palletiser. Previously, four people at a time would

Robots can also assist in handling different product and packaging sizes and formats.

At a glance

- At this juncture of converging mega-trends like digitalisation and shifting consumption patterns, the F&B industry has an opportunity to reposition itself for the present and future.
- Increasing flexibility, productivity and product quality are all key considerations; in many cases, robotics offer a solution.
- Robotics can also play a role in ensuring people work safely and ensuring food safety.

pack cartons and crates, palletising heavy loads at heights of 1.5 metres and more, while another four would rest. They would then rotate every 30 minutes to an hour. Now, the palletiser is delivering higher production volumes at lower risk. A number of other South African food producers have increased their production levels by using robots, as robots allow line speeds that cannot be maintained if products are packed by hand.

While the initial aim is always to improve efficiency and to drive down costs, we also find great flexibility in using robots where clients have many product sizes and pack formats. One client is using robots to pack different formats (500 g, 1 kg and 2 kg bags) into various sized boxes without the need to change any mechanical setup, as the packing robots are more flexible than a gantry type 'pick and place' system.

One concern that we are hearing from some F&B operators is that they do not have the skills to use robots. It must be said that employees who are comfortable with operating a tablet or smartphone will be able to program and re-program the new robots with ease, using ABB's fast set-up and intuitive software tools. Customers will also benefit from ABB's global industry and application expertise, which has been developed from installing more than 500 000 robot solutions since 1974 and is supported by ABB's network of over 1 000 global partners.

The future is here for South Africa's F&B industry. We just need to embrace it. □

For more information visit: www.new.abb.com/robotics

New partnership to advance network optimised livestreaming

World leader in global, mobile satellite communications, Inmarsat, recently announced that Australia-based Harvest Technology Group has joined its Application and Solution Provider (ASP) Programme, an ecosystem for providers of software, hardware and solutions, and original equipment manufacturers (OEMs).

Harvest offers ground-breaking remote control, livestreaming, communication and monitoring solutions for the mining, agriculture, electrical utilities, oil and gas, and transport sectors. It securely streams high-definition real-time video, voice and data over ultra-low bandwidth connectivity enabling communications for remote locations, or networks with restricted bandwidth.

As an ASP member, Harvest will have access to Inmarsat's global L-band satellite connectivity network, ELERA, and worldwide reach to scale its solutions into new sectors and geographies. Harvest's Network Optimised Livestreaming solutions cut data usage on existing networks by up to 80% with much lower bandwidths than previously possible. Even with ultra-low bandwidth connectivity, remote workers can livestream 30 fps HD video, high-res images, two-way communications, and data in real time ensuring users can carry out their activities in remote locations safely and efficiently.

Commenting on Harvest Technology Group's joining the ASP Programme, Mike Carter, President of Enterprise at Inmarsat, said: "We are pleased to welcome Harvest Technology to our ASP programme and to be working with the company to support its ambitious growth plans. Innovative solution providers like Harvest are using leading-edge technology to help industries respond to some of the biggest global challenges. Inmarsat stands ready to support them in their journey by providing reliable connectivity with our industry-leading ELERA narrowband network, as well as go-to-market alignment and support."

Harvest offers remote control, livestreaming, communication and monitoring solutions for the mining, agriculture, electrical utilities and other sectors.

Paul Guilfoyle, Group CEO of Harvest Technology Group said: "Here at Harvest, our ambition is to improve connectivity for front-line team members and the people who support them. Our ability to maintain the highest level of security and data fidelity during transmission means we can provide a solution for companies in all industries.

"Harvest gives customers in some of the world's most remote or dangerous locations 'eyes and ears'. Our solution enables them to manage their operations reliably to increase efficiency and reduce costs, and importantly, to keep people out of harm's way."

For more information visit: www.inmarsat.com

Cobots assist with intricate assembly details

Of the many processes involved in finalising a consumer product, the final step can often be the most intricate. For this OMRON customer, the last step in production is to fasten the cover holding screw, closing the unit – in this case, an electric shaver. Traditionally, the full process was completed manually, with an electric screwdriver in a multi-step process. This repetitive task is exactly the kind of application where an OMRON cobot can help.

When a leading global manufacturer of personal care equipment needed a production solution combining cost reduction with quality improvement, the company approached OMRON, a trusted partner it had worked with many times. For this particular line, the company needed help with a specific task, at the end of the production line.

Meeting the challenge

Tightening the final screw into a personal grooming device – an electric shaver – might seem simple enough. But the intricate process requires great care, accuracy, and attention to detail, where there are differing form factors and models, with differing placements of screws for each model. That is why it is usually finalised by hand.

Designing the solution

Barry Oorbeek, Key Account Manager Industry Solutions at OMRON Benelux explains: "The customer approached us to see if it was possible to bring in a collaborative robot to help the operator. In designing a solution, we first undertook a thorough audit of needs. Omron Safety Services Europe (OSSE) conducted a machine risk analysis, then a Sistema calculation, to define the requirement specifications for the system integrator," he says. "From there we could prioritise and plan for the commissioning phase of the project.

"In the setup, we used the intuitive plug-and-play software to establish virtual 'safety fences' prior to installation. This set clear boundaries around the cobot, to limit its range of movement to its specific area of operation." This ensures complete predictability, so the operator had a confident understanding of where the cobot would be, and what it would be doing, at all times.

Safety was a key criterion as the cobot is working close to people in the final steps on the production line.

Safety first

For the customer, the key criterion was safety, as the cobot would be working close to people on the plant.

From the various options suitable for the task, the customer chose the OMRON TM5-700, a unit built for quick start-ups, rapid changeovers and inherent safety. In this regard, Oorbeek adds that, "From the points highlighted in the machine risk analysis, OSSE conducted extensive force- and pressure-testing, going through each potential risk point, establishing the maximum permissible pressure, and confirming that the cobot was able to instantly and accurately sense the results of its actions."

The testing covered all the delicate movements involved in screwing the unit cover into place, so the cobot detected when the screw was firmly in place, without overtightening. And as everything is programmable, once the actions are performed correctly once, they are fixed in memory, for right first time – every time – action.

Quick start-up and easy operation

An intuitive human-machine interface in the machine controller provides full overview and control of the cobot, which is designed for ease of use. Operators need only five minutes' instruction before starting to work with the system, which is engineered to keep pace with the speed of the manual production line.

"This system goes a long way to solving a common problem in production lines," says Oorbeek. "Repetitive tasks done by hand can suffer from quality variation over time. With this solution, the customer has an ideal combination: the flexibility of an operator to handle the diversity of components, with the accuracy and sensitivity of the OMRON cobot to perform the repetitive screw-fastening process."

The customer in this case already has a large installed base of OMRON robots in place, with some automated screwdriving in automated lines. But this particular workstation is used for a variety of form factors and end-products, so it was decided to bring a cobot on board, as there may be multiple changes per day of the products that are being finished. "OMRON cobots are designed to be flexible, in the way they are simple to program, and in the way they can be used. Here for instance, the customer can achieve one-minute exchange of dies, moving from one product type to another very quickly."

Oorbeek says, "We have a delighted customer. The process quality has improved, and the customer has an integrated solution that was quickly verified and validated." The same customer is also investigating the use of OMRON cobots in other areas of its production facilities. □

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

TSN is setting the foundation for smart factories

TSN is an enabler for Industry 4.0. [© Moxa]

Leading automation vendors are already adopting Time-Sensitive Networking (TSN) which is acknowledged to represent the future of industrial Ethernet, as it sets the foundation for data-driven interconnected, smart factories. More than a simple, product-level solution, the technology offers a systemic solution to support determinism, convergence and process transparency.

Looking at the role of TSN in shaping the future of industrial automation, Chih-Hong Lin, Global Technology Partner Manager at Moxa, a leader in industrial communications and networking with a focus on securing industrial networks, and a member of the CC-Link Partner Association (CLPA), sees it this way.

Connected industries of the future will rely on a single, converged network. This facilitates access to data by enabling both vertical and horizontal communications in order to share actionable insights across the entire enterprise. The knowledge gathered will drive productivity and competitiveness. Such a setup can also considerably simplify network architectures as well as maintenance activities, reducing costs.

"This vision for future-oriented data sharing, in line with Industry 4.0, contrasts with legacy communications which are characterised by 'islands of automation' where machines are mostly isolated. This means we currently have to rely on multiple, often semi-proprietary standards to share data within the different layers of the automation pyramid," Chih-Hong Lin says.

"In addition, each different protocol can rarely communicate with the others, preventing the transfer of key information across an enterprise. And as machines and systems expand, networks become increasingly complex to address these changes."

Next generation networks

Existing network technologies – even when well established – may not be able to address the needs of next generation industries. A first, significant step to address change is to use solutions offering large bandwidth – that is – 1 Gbit/s.

Chih-Hong explains: "One of the reasons that systems have remained partially isolated is to avoid interference. As businesses move away from this model and enlarge their networks, they need sufficient bandwidth to guarantee that time-critical data, such as control traffic, can always be transferred in a deterministic way. By doing so, they can support more applications and start benefitting from the gains offered by converged networks."

The next step is to implement TSN technology, which is increasingly being recognised for its relevance. "When I first came across TSN, about five or six years ago, I thought it was just another technology with limited impact. But the more I learned about it, and as the standards behind TSN have developed, the more I could see the game-changing role of this solution for next-level communications. It is now clear how TSN will change industrial automation and the way we currently run businesses," he says.

Businesses around the world are aware that TSN is an enabler for Industry 4.0 as it supports converged, deterministic networks that are at the core of smart, interconnected factories. "We see a growing number of proactive players in the industry that are keen to adopt TSN. In the Asian market players are moving particularly fast, embracing the technology and developing innovative real-world applications and use cases. Nonetheless, more conservative companies may be more hesitant in investing in TSN now, although they do recognise the role of this solution in futureproof industrial automation," he adds.

Chih-Hong Lin says effective TSN implementation presents two main requirements. "Firstly, it is important to have strong support from an industrial Ethernet organisation such as the CLPA, to deliver suitable TSN-compatible network technologies. Secondly, it is essential to have a broad range of available products supporting the technology. CC-Link IE TSN can meet these two requirements."

For more information contact CLPA-Europe.
Email: john.browett@eu.cc-link.org
Visit: eu.cc-link.org

Design automation and collaboration in product development

Siemens Digital Industries Software has released the 2022 version of Solid Edge® software, which introduces embedded rules-based design automation, greater capabilities to work with point-cloud, mesh and imported data without the need for translation, as well as new tools for 2.5 axis machining and ultra-efficient upfront fluid flow simulation. Part of Siemens' Xcelerator portfolio of products, Solid Edge is an intuitive product development platform to accelerate all aspects of product creation, including 3D design, simulation, visualisation, manufacturing, and design management.

The new embedded Solid Edge Design Configurator adds rules-based automation and enables quick customisation of products based on design parameters and rules, saving time and enabling the capture and reuse of intellectual property in intelligent models.

CAM Pro 2.5 Axis milling is now included in Solid Edge Classic, Foundation and Premium for customers with active maintenance. Fully integrated, it maintains full association with design data and provides automated tool path creation, combined with machining simulation, to help achieve optimised machining operations.

New CAD Direct capabilities allow insertion of third-party data formats without the need for translation, and maintaining association. Solid Edge 2022 continues to integrate Siemens' leading convergent modelling technology, allowing users to mix b-rep and mesh geometries in the same model, again without conversion, making mesh data more useful and reducing product modelling time. Full-colour point cloud data can also now be used for visualisation directly within Solid Edge. This is especially useful when retrofitting factories or plants, allowing for the positioning of designed equipment in the context of the point clouds.

Solid Edge 2022 has been engineered to support product development and manufacturing processes.

Solid Edge 2022 is available through Xcelerator as a Service, providing access to Siemens' next-generation, cloud-based collaboration solution including Xcelerator Share, which provides design-focused capabilities (such as 3D/2D CAD view/mark-up), augmented reality and secure project-based sharing to the Solid Edge community.

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

Meeting the growing need for interconnection

Teraco Data Environments, Africa's largest vendor-neutral data centre and interconnection services provider, recently announced the completion of Phase 1 of CT2, its new hyperscale data centre in Brackenfell, Cape Town – the largest data centre in the Western Cape. The new facility supports the growing demand from enterprises and cloud providers for data centre capacity. CT2 offers highly resilient and secure colocation facilities in line with Teraco's long-term vision of enabling digital transformation across Africa.

CT2 represents a strategic addition to Platform Teraco, offering enterprises a scalable platform for IT infrastructure deployment and, at the same time, sustaining performance, reliability, security, and a comprehensive network choice. The first phase comprises a 25 000 m² building, 8 000 m² of data hall space, and 18 MW of critical power load. Teraco has secured adjacent land and power for future expansion which would bring the total critical power load to 36 MW.

Aerial view of CT2, Teraco's new hyperscale data centre in Brackenfell near Cape Town.

As part of Teraco's broader Cape Town campus, both CT1 and CT2 data centres provide enterprises with direct access to Platform Teraco, a rich ecosystem of over 250 network providers, global cloud on-ramps, subsea cable systems, access to over 50 managed service providers, and direct peering at NAPAfrica, Africa's largest Internet exchange point. Clients deployed in either of these facilities can connect to AWS Direct Connect and Microsoft Azure ExpressRoute directly or via Teraco's Africa Cloud Exchange.

The multibillion rand data centre facility extends Platform Teraco's capacity in the Western Cape significantly, according to Jan Hnizdo, CEO of the company. "As part of the African IT landscape, Platform Teraco is a key element in contemporary businesses' digital transformation strategies, with its diverse industry ecosystems and open interconnection marketplace." CT2 is connected to all the other Teraco data centres through the ecosystem of network operators in the facility, making it suitable for the distributed interconnection defined architecture of modern enterprise.

For more information contact Teraco. Visit: www.teraco.co.za

Streamlining distribution from warehouse to customer

A combination of robotics and intelligent palletising software enables more efficient distribution.

Robotic logistics are the future of supply chain management, according to Yaskawa Nordic Sales Director, Lee Moulder.

In 2018 American companies reportedly spent some $1.5 trillion on logistics expenses. It's a sum that signifies the importance of supply chain management to businesses. And central to any logistics system in supply chain management is the warehouse.

"In the food and beverage industry, for example, there are typically mixed case warehouses," says Moulder. "They house various products and items under the same roof and from these centres pallets are distributed to the different customers and stores."

Each store will have its own set of requirements and not all of them will order the same items from the warehouse. "The distribution centres therefore need to pack different orders every day for the various stores," Moulder explains. "It's a complex process, packing the specific number of goods requested by each store, and more so when factors such as packing kosher products separately need to be taken into account."

Traditionally, most warehouse sorting and packing tasks have been done manually. As businesses demand more efficiency and accuracy, however, there's been a shift towards automating processes and implementing smart solutions.

The pairing of robotics with intelligent warehouse software like WSR Server – which provides for mixed palletising – simplifies the process. It overcomes the need to do everything by hand, which tends to be laborious and is more prone to human error.

"Using a combination of robotics and software like intelligent palletising software (IPS), the warehouse manager can create the perfect pallet," Moulder says. "For instance, where a retail store requires a particular range of products, IPS groups the order and sends it to the warehouse control system. The individual pallets containing the specific items will be picked out and brought to a de-palletising station where they are de-layered, depending on quantities required. From there, the items are picked and buffered, then off to the mixed palletisers to be prepared for shipment."

The use of robotics in warehouses has other benefits as well.

For more information contact Yaskawa SA.
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Visit: www.yaskawa.za.com

Halving CO_2 emissions by 2030 – it can be done

Jean-Pascal Tricoire, Chairman and CEO, Schneider Electric.

At the Schneider Electric Innovation Summit World Tour 2021, presented just ahead of COP26 last year, Chairman and CEO Jean-Pascal Tricoire pointed to achievable pathways to net zero as set out in* The 2030 Imperative: A race against time, *the report by the Schneider Electric Sustainability Research Institute.

The world can accelerate urgent climate action and halve carbon dioxide (CO_2) emissions by 2030, according to Schneider Electric. A leader in the digital transformation of energy management and automation, the company has been recognised by research firm Corporate Knights as the World's Most Sustainable Corporation in 2021.

In its annual Innovation Summit World Tour Schneider Electric sought to address global climate challenges and guide customers, partners, regulators, and policymakers on rapidly reducing emissions to decarbonise the world's economy in this decisive decade. Attendees had the opportunity to experience the company's digital and sustainable innovations and learn more about Electricity 4.0 and Next-generation automation.

We need to act fast

Tricoire urged attendees to adopt critical decarbonisation measures and offered Schneider Electric's own research as a blueprint to stay within a global warming trajectory of 1.5°C. The report details the need to reduce emissions by 30 to 50% within this decade, compared to current levels. Missing this makes it virtually impossible to limit temperature rise to a 1.5°C threshold, as outlined by the Intergovernmental Panel for Climate Change (IPCC).

Modelling done by the Schneider Electric Sustainability Research Institute shows how 10 Gt CO_2/year can be realistically and affordably abated by 2030. The report focuses on a subset of global greenhouse gas emissions. Out of 50 Gt CO_2e/year, *The 2030 Imperative* scenario finds a 30% (10 Gt CO_2e/year) abatement opportunity from a 30 Gt CO_2/year baseline of all energy-related emissions, signalling a significant acceleration from current pledges (ranging around 3 Gt CO_2e/year, which is 10% of the emissions reduction target). There remains however around 20 Gt CO_2e/year of non-energy related emissions which is not covered in the report's modelling.

Schneider Electric is calling for a three to five times' greater effort from governments and corporates. The institute believes the only realistic roadmap for success is to deploy proven digital technologies alongside increased electrification as the fastest way to decarbonise buildings, transport, and industry. This approach will buy time to address hard-to-abate sectors. The modelling clearly shows alternative pathways will place too high a burden on consumers.

The report by the Schneider Electric Sustainability Research Institute highlights avenues of opportunity to reduce CO_2 emissions and emphasises the need to act fast.

"Despite the increased momentum around sustainability and more companies adopting ambitious targets to tackle climate change, our research reveals how we need to speed up. At Schneider Electric, we are part of the solution. To support organisations in their quest to decarbonise at pace and deliver on their climate commitments, we are accelerating the expansion of our global sustainability consulting services business to meet the increasing demand for substantial progress on energy transition and climate action goals," Tricoire said. "What organisations need today is a trusted partner who combines strategic planning and target setting with a proven track record of implementing solutions to deliver faster, tangible, sustainable outcomes. Having successfully overcome many sustainability challenges ourselves, and in so doing, achieved world-leading digital and electric solutions in our own facilities, we are well-positioned to help others go faster and further."

Decarbonising value chains

Building on its sustainability leadership and the ambition of the 2021-2025 Schneider Sustainability Index, Schneider Electric is accelerating its global sustainability consulting business and expanding on a 10-year track record of success in energy and sustainability services.

Today, Schneider Electric is a world leader in energy efficiency, energy management, renewable energy procurement, carbon reporting, climate risk assessment, and supply chain decarbonisation, providing software and consulting services to more than 30% of the Fortune 500 companies. Customers include Johnson & Johnson, Walmart, Faurecia, Kellogg, Takeda, Velux Group, Unilever, and T-Mobile, among others.

Increasing demand for Schneider's 'ambition + action' advisory services is driving this expansion, which includes:

- Climate action consulting and affiliated supply chain decarbonisation and climate risk assessment services
- Communications services, including ESG reporting/ratings and reputational and sustainability claims
- Circularity and traceability services
- ESG modules for the award-winning EcoStruxure™ Resource Advisor platform to track societal and governance metrics.

Being part of the solution

As part of its ambition to drive sustainable innovation and build net zero pathways, Schneider Electric helps customers in many sectors to innovate and move to open, interoperable, digital and simplified systems and smarter ways of doing business. In its Innovation Summit World Tour, the company introduced digital innovation for carbon abatement in homes, buildings, data centres, power grids, and industries.

- Electricity 4.0

Today, we are witnessing the convergence of digital and electric at scale with software. Electric makes energy green and the best vector for decarbonisation. Digital makes energy smart to drive efficiency and eliminate waste. This convergence delivers what Schneider Electric terms 'Electricity 4.0', powering the New Electric World with Smart Green Energy.

- Data Centres: The new APC™ Smart-UPS™ Ultra 5 kW is the industry's first 5 kW uninterruptable power supply (UPS), designed to deliver more power, flexibility, and intelligent monitoring in the smallest footprint, freeing up valuable IT space for edge applications. Schneider data centre customers have reduced their carbon footprint by 37%.
- Smart Homes: Schneider has also introduced a series of smart, sustainable home solutions that help cut energy waste. By 2050, households are expected to be the single largest consumers of electricity, and the biggest contributor of CO_2 emissions, with as much as 34% generated by homes.
- Resilient Digital Grids: Schneider's range of pure air SF_6-free technology for net zero grids is extended with the RM AirSeT ring main unit and modular switchgear and the MCSeT active medium voltage air insulated distribution switchboard.
- Smart Electrical Distribution: The rethinking of Schneider's low voltage TeSys Giga, Canalis Busbar, PrismaSeT Active, New Gen ComPacT, TransferPacT and EcoStruxure Power™ digital products will deliver a simpler, more sustainable, safe and secure user experience for installer and service partners to enhance the resilience of the world's growing digital economy, as part of the Partnerships of the Future programme.

- Industries of the future

Step changes in efficiency and agility can be achieved through artificial intelligence, digital twin technology, human insight supported by advanced analytics, and vendor-agnostic industrial software – including Performance Intelligence from AVEVA, to deliver resilient and sustainable next generation automation.

- EcoStruxure™ Automation Expert 21.2 provides water and wastewater plants with complete life cycle management. Claimed as the world's first software-centric automation system, it seamlessly integrates IT and OT services to boost security, increase system longevity, and evolve over time. As a universal automation solution, EcoStruxure™ Automation Expert can be implemented with existing hardware. The virtualised controller can run on any Windows or Linux edge computing device, providing industrial enterprises with unprecedented flexibility. Research indicates that this kind of digital collaboration has the potential to unlock more than $100 billion in value for industries.
- EcoStruxure Machine increases efficiency for machine builders and shortens development time. With the new Lexium MC12 multi carrier for transporting, grouping and positioning products, OEMs can achieve greater productivity and flexibility with up to 40% savings on investment costs and 50% faster machine installation and commissioning. Combined with digital twin technology, the new multi carrier also reduces machine design and time-to-market by up to 30%. □

At a glance

- In a recent report the Schneider Electric Sustainability Research Institute details the need to reduce emissions by 30 to 50% within this decade.
- It suggests the only realistic roadmap for success is to deploy proven digital technologies alongside increased electrification, to decarbonise buildings, transport, and industry.
- Schneider Electric is extending its global sustainability consulting business and expanding on its success in energy and sustainability services.

For more information visit: www.se.com

Mercia Grimbeek, Chair, SAWEA.

Dr Crispian Olver, Executive Director of the Presidential Climate Commission.

Looking to the next decade of growth in wind energy

At Windaba 2021, held in early October last year at the Cape Town International Convention Centre, the wind energy sector celebrated 10 years of wind energy in South Africa – and looked to the next decade of growth in the industry against the background of a changing energy landscape, locally and globally. In her opening address, Mercia Grimbeek, Chair of the South African Wind Energy Association (SAWEA) highlighted the milestones to be celebrated and the challenges ahead. The full address is shared here.

Our celebration of ten years of wind energy in South Africa brings us to a confluence as our industry stands ready for the next decade of growth. We are ready to play our part in building the economic landscape of South Africa at a time when, like many other nations, we are ravaged by the impacts of the protracted health pandemic.

As we are all aware, South Africa's energy availability is at an all-time low, having decreased dramatically over the past twenty years, when in fact the country requires more power to keep the wheels of industry turning and meet the needs of a growing population.

To achieve this, key elements require alignment, including supportive policy and political will; rolling procurement; the ability to drive the local manufacturing sector in addition to other localisation requirements; investor confidence and access to Green Finance; and a sector transformation framework – many of which are already in place.

In addition to celebrating the renewal of the REI4P with Bid Window 5 (BW5) successfully

Jeffreys Bay Wind Farm spans 3 700 hectares between Jeffreys Bay and Humansdorp in the Eastern Cape and supplies 460 000 MWh of renewable energy a year to the national grid.

concluded and the imminent release of BW6 and future bidding rounds as outlined by the DMRE (Department of Mineral Resources and Energy), as exciting are the published amendments to Schedule 2 of the Electricity Regulation Act. Just two months ago (with effect from 12 August 2021), the DMRE's lifting of the self-generation threshold to 100 MW, without licensing required from the National Electricity Regulator, brings about a beginning of South Africa's first free market in the energy space.

This opens up the market to the private sector, based on demand and supply, which will in essence drive investment in the energy generation sector and support economic growth, and at the same time diversify generation sources away from a single risk entity.

The industry can now easily enter into power purchase agreements with private entities, especially intensive energy users (IEUs), which make up a significant portion of the country's GDP, and deliver projects quickly, which will stimulate economic recovery.

While the wind energy sector has much to celebrate, it has faced many challenges and continues to do so, grid connectivity being but one of them. If we are to fully embrace the renaissance of the wind industry, we must acknowledge that business as usual will not serve us well.

We are uniquely placed to help change the face of electricity generation in South Africa. If we want to be the economic catalyst, it is imperative that we work alongside the grid operator to address transmission bottlenecks. It is imperative that we advocate for continued regulatory change to incentivise renewable energy generation and to ensure that as we strive to achieve climate change goals and objectives, we do so equitably. It is therefore imperative that we provide meaningful input and support the drafting of South Africa's Renewable Energy Masterplan (SAREM).

We are now in the position, ten years on, to leverage off lessons learnt and map the way forward for an increase in local manufacturing. We know that successful localisation hinges on a predictable and continued procurement pipeline and to achieve that we, as SAWEA, with the support of our members and industry in general, must now intensify our conversations and engagements with stakeholders such as the DTIC.

The industry supports and encourages a Just Energy Transition and recognises the need to support accelerated skills development programmes in the wind sector. During the conference breakaway sessions we will specifically explore the training and skills development opportunities available as well as potential areas for expansion. In line with an increase in localisation, industry will not only harness the wind but also the employment and economic benefits of utility scale deployment.

In conclusion, we have much to celebrate and many milestones to be proud of. Wind IPP's are already moving into geographic locations previously ignored in the earlier stages of the REI4P, thanks to maturing technology that sees wind turbine generators being built with higher hub heights. Many of our members will be celebrating BW5 preferred bidder status (preferred bidders were announced at the end of October 2021), marking the renewed commitment to the REI4P. Furthermore, we have begun engaging with various stakeholders to inform the industry's Gender & Diversity Charter, to be released in the first half of 2022. We have forged new relationships and lost dear colleagues and industry leaders.

Today we can proudly say that we have transitioned; we are no longer a nascent industry.

We are an industry to be recognised and we look forward to a decade of rebirth and taking up our responsibility as a catalyst for our country's economic recovery. □

At a glance

- To increase electricity supply and power growth in the country's economy, key elements need to be aligned: supportive policy, rolling procurement, local manufacturing capacity, and others.
- One of the critical challenges facing wind energy, and the renewable energy sector generally, is grid connectivity.
- The industry encourages a Just Energy Transition and recognises the need to support accelerated skills development programmes.

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

Wind energy in the Just Energy Transition

Delivering the keynote address at Windaba 2021, Dr Crispian Olver Executive Director of the Presidential Climate Commission (PCC), addressed the wind industry on the role of the sector in South Africa's Just Energy Transition and specifically in achieving the country's decarbonisation targets. He highlighted that by 2050, a renewables-dominated power system will be the most cost-competitive system for South Africa.

"Transitioning South Africa's power system to Net Zero will require the deployment of roughly 150 GW of wind and solar capacity by 2050. This is almost four times the total capacity of South Africa's coal power plants today. It represents an investment of around R3 trillion, within the next 30 years, requiring significant expansion and upgrades to the transmission and distribution infrastructure," Olver said.

He added, "To reach Net Zero by 2050, South Africa will need to speed up deployment of renewable energy capacity – a rate of 4 GW of renewables installed every year will need to be achieved, which is roughly ten times the current pace of new-build."

It is widely agreed that in addition to accelerating the deployment of renewable power, the repurposing of retiring coal-fired plants, support for electric vehicle manufacturing and an export-oriented green hydrogen industry, should all be included in the mitigating efforts.
For more information visit:
www.climatecommission.org.za/

Complex stator rewind at Eskom pumped storage power station

Marthinusen & Coutts (M&C) performed a significant rewind in 2020 when it was contracted by leading international hydro power generation OEM – Voith Hydro of Germany – to wind the stator of Unit 1 at Eskom's Drakensberg hydro pumped storage power station near Bergville in KwaZulu-Natal.

The massive stator winding contract, undertaken by a winding team from M&C under the supervision of Voith, was the final stage in the refurbishment of three of the station's four motor-generator units. Eskom engaged Voith to refurbish Unit 1.

Richard Botton, M&C's Divisional CEO, who project-managed the winding of the stator of the 281.5 MVA reversible motor-generator, said: "We have worked with Voith over several years, during which time we have performed similar projects, such as a stator rewind at Eskom's Ingula pumped storage scheme and others. These projects have stood us in good stead and almost certainly played a role in Voith's decision to award us the contract for Unit 1."

Work was due to have started early in 2020 but got under way only in late August as a result of Covid-19 and the ensuing strict lockdowns. "This left us with only three months to complete the rewind – half the period originally allocated. We introduced two shifts per day with a 10-man team on each shift to ensure the work was completed on time," Botton said.

After removal of the rotor, the 6.5 m diameter stator was wound in situ. Deploying a Voith-supplied winding kit, the winding teams were required to install 720 heavy-duty stator bars that had to be connected in an extremely complex bus arrangement. "Our teams had to undergo special training by Voith technicians before starting their work," Botton pointed out.

The contract was completed on schedule in mid-November 2020. A further demonstration of the depth and range of expertise M&C offers in its field followed when Engineering & Technical Executive Rob Melaia recommissioned the unit.

The turbine hall at Eskom's Drakensberg pumped storage power station.

[Image courtesy of Eskom]

After the rotor was removed, M&C technicians set to work inside the stator to install several hundred stator bars as part of the stator winding contract.

Recommissioning Unit 1

When international travel restrictions prevented Voith from flying in one of its own senior engineers from Germany to recommission the unit, the company asked Botton if M&C could assist. He recommended Rob Melaia to perform the recommissioning, as Melaia has previously commissioned other power plants as part of repair and refurbishment contracts M&C has undertaken. These have included the N'zilo hydro station in Katanga province, DRC, in 2013 and the SA Bureau of Standards' National Electrical Test Facility's High Power test laboratory in Gauteng last year.

After checking and approving Melaia's credentials, Voith assigned the recommissioning to M&C. Hours of conference calls followed between Melaia in his office at M&C's main repair facility in Cleveland, Johannesburg, and senior technicians at Voith's head office in Heidenheim, Germany, who provided detailed instructions on the required procedures.

He performed the recommissioning successfully over a period of five days in March 2021. Commenting on it, Melaia said: "By the time I got to the site I was thoroughly briefed on what I was required to do. The process was challenging and I had to give it all my attention. The single thing that gave me the greatest confidence was knowing that M&C had done the winding of the stator; I wouldn't have felt so confident if anyone else had done it."

Mike Chamberlain, M&C's Marketing & Commercial Executive, commented: "In this contract M&C has again demonstrated its ability to rewind complex large machines, including complying with the OEM's stringent specifications. M&C also demonstrated its flexibility in adapting to the delays caused by circumstances outside its control – the team ensured that the project was delivered on time."

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Energy-efficient drive technology

At the FMB trade fair which brings together machine manufacturers and their suppliers and was held mid-November last year in Bad Salzuflen in Germany, NORD DRIVESYSTEMS presented its DuoDrive geared motor, the energy-efficient IE5+ synchronous motor, the new decentralised NORDAC ON frequency inverter as well as the NORDAC PRO SK 500P control cabinet inverter.

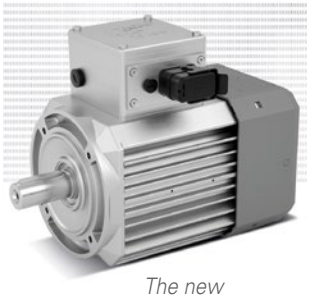
The patent-pending DuoDrive is an innovative geared motor which integrates the high-efficiency IE5+ synchronous motor into a single-stage helical gear unit housing and sets new standards in terms of performance, installation space and version reduction. It delivers optimised system efficiency, high power density, compact housing dimensions and low noise emissions. The elimination of many wearing parts provides for lower maintenance and, combined with the simple commissioning, this results in a significantly reduced total cost of ownership compared to existing drive systems.

The IE5+ motors achieve lower losses than the IE4 series to set new standards in energy efficiency. The new permanent magnet synchronous motors achieve their high efficiency – at times significantly above efficiency class IE5 – via a wide torque range and are optimally suitable for operation in the partial load range. They are also suitable for use in intralogistics and hygiene-sensitive areas in the food and pharmaceutical industries. The new IE5+ motors are available in ventilated or smooth versions up to a power of 4.0 kW. They can be combined with all gear units and drive electronics from NORD DRIVESYSTEMS in a modular system.

Another new product, the decentralised NORDACON frequency inverter features an integrated Ethernet interface, full plug-ability and a compact design, all supporting an economical plug-and-play solution for IIoT environments. The frequency inverter can be mounted directly on the drive housing and covers lower power ranges of up to 1.0 kW. NORDAC ON was designed for use with asynchronous motors, whereas NORDAC ON+ is intended to be combined with synchronous motors.

NORDAC PRO SK 500P frequency inverters feature a variety of interfaces and functions to suit various application requirements. Plug-in control, safety and option modules ensure maximum flexibility in a compact book-size design format for space-saving installation in control cabinets.

For more information contact NORD DRIVESYSTEMS.
Visit: www.nord.com



The new IE5+ motors from NORD DRIVESYSTEMS have considerably lower losses than the current IE4 series.

Selecting an ac power supply for test applications

An AMETEK Programmable Power White Paper by Grady Keeton

Today's electronic products must work under all types of conditions, not just ideal ones. That being the case, ac sources used in test applications must not only supply a stable source of alternating current, they must also simulate power-line disturbances and other non-ideal situations.

Fortunately, today's switching ac power sources are up to the task. They offer great specifications and powerful waveform-generation capabilities that allow users to generate complex harmonic waveforms, transient waveforms, and arbitrary waveforms more easily than before. Some can provide both ac and dc outputs simultaneously and make measurements as well as provide power. This level of flexibility is making it easier to ensure that electronic products will work under adverse conditions.

When choosing an ac source, it is important to consider the following criteria:

- Current requirements for the device under test
- Worst-case input current (including transient demands, such as inrush)
- Crest factor of the load's current
- Power factor
- Regulation and distortion
- Response time and slew rate
- User and test-system interfaces
- Facility requirements.

Current requirements

When selecting an ac source for your test application, it is essential to consider how much current the unit under test (UUT) will draw. Be sure to include inrush current and transient currents that may occur during intentional input voltage swings and during different modes of operation the device may use.

Ac sources used in test applications need to supply a stable source of alternating current and must be able to simulate non-ideal situations as well.

Worst-case input current

Rectifier-type power supplies and motors are notorious for drawing high inrush currents. These may be anywhere from two to ten times the nominal run current and they will draw this current over a period from a few cycles to several seconds.

The response of the ac power source to inrush current is dependent on the method the source uses for current-limiting. Ac power sources are designed to protect themselves from excessive load current by either folding back the voltage (current limiting) or shutting down the output (current-limiting shutdown) and in many cases, this is user selectable.

In some instances, it may not be practical to have an ac source that can supply the full inrush current demanded by the load. If the test does not require the stress test from this current, it may be possible to use the current-limiting foldback technique for these tests. Ac motors can draw up to seven times the normal operating current when first started. How long the motor will draw this current depends on the mechanical load and the motor design.

For loads such as motors and rectifier-type power supplies, an ac source that is folding back its output voltage to limit current will result in a longer start-up time for the device under test. A source that cannot supply the proper level of voltage and current may remain in the current-foldback state too long, causing the device under test to not start correctly or to shut off altogether.

If you need to measure the inrush current, or the test calls for supplying the full inrush, you will need an ac source that can supply the full peak inrush current so that the source never reaches the foldback state.

Crest factor

Crest factor is the ratio of the peak current amplitude to the rms amplitude of an alternating current or pulsating direct current waveform. For UUTs that draw an input current with a high crest factor, it is important to select an ac source with low impedance and high peak instantaneous current capability. Low source impedance facilitates the quick transfer of current to the load. High peak current is provided from these sources for pulse widths ranging from 60° to 30°. The narrower the pulse width, the higher the crest factor capability of the high peak current source.

Switch-mode, or rectifier-type power supplies that are

not power factor corrected, are examples of UUTs that have a high crest factor. They draw current from a power source in narrow pulses at the peaks of the voltage waveform. These pulses can be from 3 to 4 times the value of the rms current.

Many ac sources can only support a crest factor of 1.414 (the peak of a sinusoidal current waveform). If the source cannot supply a load that exhibits a high crest factor, it may reduce its output voltage to unacceptable levels, have a distorted output, or shut down completely. In whichever case, the UUT will not be tested properly. With a crest factor rating of up to 3.25:1 the AMETEK CSW Series ac source, for example, can drive difficult nonlinear loads with ease. This translates into driving a rectifier, for instance. It has a 52 A peak current at 13 Arms at a 120/208 three phase output.

Power factor

If the load has a low power factor, this will cause a derating of the output capacity of most linear ac sources. This is due to the added reactive power being dissipated by the source, and the current being drawn much closer to zero crossing of the voltage waveform. The graph (Figure 1) shows a typical curve that would be used for derating a linear source's output capacity.

Switching ac power sources, on the other hand, need not be derated for power factor as they operate quite differently with reactive loads. The power devices dissipate much less power and as a result operate at a cooler temperature.

However, it is necessary to derate the VA rating of both switching and linear sources when performing tests at low voltage settings. This must be taken into account when testing a device at its worst-case, low voltage input. For example, on the CSW series, each phase amplifier is rated for 1 850 VA maximum. The amplifier has a maximum current rating of 16 A from 0-115 V and a maximum voltage rating of 156 V. The current derates in a linear manner above 115 V to maintain the maximum limit of 1 850 VA (that is, 1 850 VA/146 V = 12.67 A).

When operating at voltages below 115 V, the current is the limiting parameter. At 5 V output there is 16 A available providing 80 VA. In other words, you cannot obtain 1 850 A at 1 V.

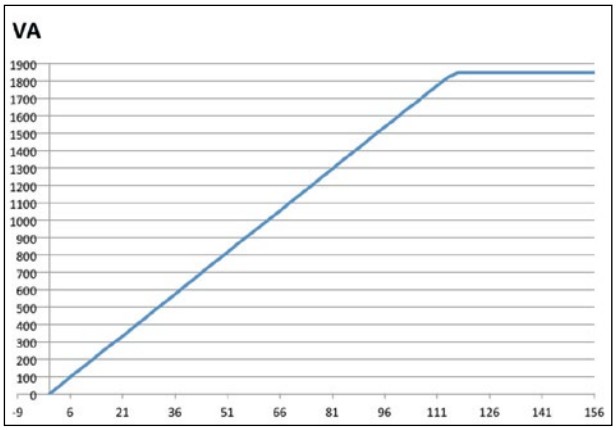


Figure 1: The graphs shows a typical curve that would be used for derating the output capacity of a linear source.

At a glance

- There are a number of critical factors to be considered in choosing an ac power source for test applications.
- Switching ac power sources today provide the flexibility to ensure electronic products can be tested to work under adverse conditions.
- With digital signal processing technology, switching ac sources can be programmed to provide different kinds of waveforms to test products.

Regulation and distortion

Load and line regulation should be tight, and distortion low. Poor regulation and distortion can lead to faulty test data that may not be discovered until units are in the field, or lead to false failure in testing. Typically, good quality ac sources will have a voltage accuracy of ±0.1% and a maximum total harmonic distortion (THD) of no more than 0.25%.

Ac power sources with poor regulation are sometimes called 'soft sources'. A soft source has a high output impedance and low peak current capability and cannot provide the peak currents that may be required for stress testing components properly. This leads to a higher failure rate. For example, if a soft source is used to perform the tests specified by IES LM-41-1985: 'IES approved method for photometric testing of indoor fluorescent luminaires' to test a fluorescent lamp and ballast, the source would produce a distorted waveform and the test results would be invalid.

Response time

Another consideration is the load response time, or the time it takes an ac source to respond to a change in the load. Ac sources with fast load response times generally have low source impedance and tight regulation. Ac sources with these characteristics are sometimes called 'stiff sources' because their outputs remain constant, even when switching from no load to full load.

Typically, stiff sources have used analogue technology to provide tight regulation and low source impedance, but sources that use switching technologies now perform just as well as linear sources. An example of this type of ac source is California Instruments' CSW Series. It has a voltage accuracy specification of ±0.1%, a THD specification of 0.25%, and very fast load response times.

Slew rate

For many tests that require simulated real-world conditions, such as fluctuations in voltage, sags, surges, dropouts, or spikes, a source with a fast slew rate is needed. The slew rate of an ac source is the time it takes the source to respond to a change in the programmed voltage or frequency. High performance ac sources typically have slew rates of less than 50 µs.

User and test-system interfaces

AMETEK offers many different interfaces, including RS-232, USB, GPIB, and Ethernet, to integrate an ac source with a test system. In addition to the hardware, AMETEK supplies IVI drivers with each ac source for use with National

Instruments LabVIEW and LabWindows/CVI. Other user-developed systems are readily supported due to the use of SCPI programming syntax. This eases the tasks of ATE system programming and integration.

In addition, a Graphical User Interface application is supplied to provide a means of remote operation. Figure 2 shows how this application can be used to create a test waveform with harmonic content.

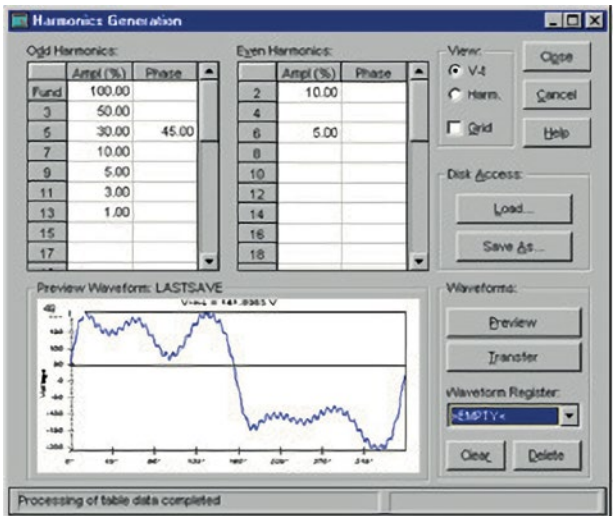


Figure 2: A graphical user interface can be used to create a test waveform with harmonic content.

Facility requirements

If the ac source must supply a lot of power, new power distribution and disconnects may be needed at the test facility. Physical and environmental requirements must also be taken into account. Large ac sources can require significant floor space and will require a high volume of airflow within a specified temperature range.

Cleanliness is another consideration. Airborne contaminants from some manufacturing processes can result in conductive particulates being drawn into the cooling air flow and causing the source to fail. In order to avoid these failures, ac sources should be placed in clean areas with temperatures and humidity held within the ratings required for the respective source.

Switching sources offer advantages

When selecting an ac source for test applications it is worth considering switching ac sources.

The digital technology used in modern switching ac sources improves the performance of the sources and offers users a number of other features that make testing with complex waveforms easier. The California Instruments' CSW Series can, for example, be used as an ac source, dc source, or provide a combination of ac and dc sources.

Using the latest digital signal processing (DSP) technology, modern switching ac sources can easily be programmed to provide whatever kind of waveform is needed to test products. These include waveforms with harmonic content to test for harmonic susceptibility and ac and dc transients. And because these waveforms are digitally generated, the user can control when these events happen.

In addition to these powerful waveform-generation capabilities, the CSW Series offers advanced measurement capability. The measurement system digitises voltage and current waveforms in real time and provides detailed information on voltage and current waveforms, including detailed harmonic information on acquired waveforms. □

AMETEK is represented in South Africa by Comtest.
For more information visit: www.comtest.co.za

A wireless remote monitoring solution

The standalone DEK Wireless Kit includes everything needed for a remote preventive-maintenance monitoring solution. Complexity is removed, and installation is fast. The end-to-end kit contains a gateway controller, software, connectors, solar panel, battery backup, wireless transceiver, weatherproof enclosure, pre-paid access to cloud software tools for 90 days and embedded cellular connectivity that can be activated in minutes through a self-service portal. Just decide which assets you want to monitor and add other sensors as you choose. Banner application engineers are available to provide advice and direction to users setting up a new system.

The DEK Wireless Kit for remote monitoring provides for simple installation and wireless connectivity.

Asset managers will appreciate that the installation can be done without a consultant, with minimal controller programming, and without a steep learning curve. Another distinguishing feature of the DEK Wireless Kit is that the controller can be loaded with a variety of freely available configuration files from Banner's website library, so the user can get up and running quickly. Asset managers do not need to struggle with the installation and can be confident the system has been set up correctly. Furthermore, buying a packaged solution reduces start-up costs as well.

The DEK Wireless Monitoring Kit is ideal for solitary, self-sustained monitoring of critical assets, where there is no power or Ethernet. It features solar power charging of the on-board battery, factory-enabled cellular connection to the Banner cloud, and wireless communication of sensor data to the controller, which in turn uploads it to the cloud. The packaged solution frees operations from sending technicians into the field to make manual measurements and observations. Equipment is protected by weatherproof enclosures for any environment.

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Visit: www.turckbanner.co.za

Full protection for compressors

Well-maintained compressors can handle pressure well and build up pressure reliably. However, imbalance, wear or dirt can quickly affect the compressor and its performance, and in the worst case lead to a complete pressure drop and system standstill. ifm offers an all-in-one solution of hardware and software, which provides information about the status and maintenance requirements of compressors in use at all times. This means plant operators know when a compressor is losing pressure – and can act before reduced performance affects the whole production process.

The system solution provides continuous diagnostics and detects motor damage, with full coverage of the real operating hours. It monitors imbalance, wear and overall vibration and detects winding problems or dirt in the motor by monitoring temperature.

ifm provides solutions to suit different types of compressors, allowing for easy integration. The application package is designed for screw compressors as used in:

- compressed air supply for machine tools
- general compressed air supply
- the food industry
- granule conveying on injection moulding machines
- sealing air monitoring on machine tools
- assembly lines in the automotive industry
- placement of electronic components
- weight compensation on presses

among other applications.

The system solution includes: a vibration sensor, screw mounting or adhesive mounting, an inductive sensor for rotational speed detection, a temperature sensor and signal converter, 24 V switched-mode power supply, diagnostic electronics, and connection cables with socket. Analysis software is available as an option with LR Smart Observer visualisation and alarm.

Consistent monitoring of compressors allows for maintenance to be carried out as needed, saving time and costs.

Implementing condition-based maintenance when required instead of managing maintenance at fixed service intervals allows for reduced maintenance costs and scheduled replacement of parts. When imbalance, vibration, shaft misalignment and rotor wear in the compressor are detected in good time, unplanned downtime can be prevented. As well as supporting condition-based maintenance, data acquisition and analysis means processes can be optimised.

ifm's application package extends from the sensor to evaluation and network-based analysis. Solutions are scalable and can be extended to other applications and/or ERP systems.

For more information contact ifm South Africa.
Tel: +27 (0)12 450 0400
Email: info.za@ifm.com, visit: www.ifm.com

A new vibration test system for Dragonfly Aerospace

Dragonfly Aerospace, a leading NewSpace developer of compact, high-performance imaging satellites and payloads, is investing in a 3 000 m^2 design and manufacturing facility in Techno Park, Stellenbosch. It is envisaged that with 1 000m^2 of cleanroom area for satellite and imager assembly and testing, this facility will catapult Dragonfly to the forefront of microsatellite constellation production.

The facility forms part of Dragonfly's preparation for serial production of imaging satellites and payloads, intending to deliver up to 48 imaging satellites per year.

To optimise its production workflow, Dragonfly is expanding its in-house environmental test equipment with an electrodynamic shaker system that will be used to simulate launch and flight vibration. TANDM, a test, measurement and automation solutions partner, supplied and installed a Brüel & Kjaer LDS V8900 electrodynamic shaker with a hydrostatic-bearing slip table. Shaker control will be achieved with the Crystal Instruments Spider 81, a premium vibration controller suited for Random, Sine, RSTD (Resonance Search, Track & Dwell), Shock and TTH (Transient Time History) Control. This adds the potential to conduct development and certification based on launch vibration specifications, shortens the development cycle and enables Dragonfly to deliver certified products to market.

Dragonfly Aerospace's design and manufacturing facility in Techno Park, Stellenbosch.

Bryan Dean, CEO and Co-founder of Dragonfly Aerospace said, "The B&K V8900 shaker from TANDM is a key piece of equipment for our environmental testing and production process. Even with the smoothest launch vehicle, the trip to space is still a pretty wild ride and we need to make sure our systems are still in perfect condition when they get there."

For more information contact TANDM.
Mobile: +27 (0)87 092 0920
Email: info@tandm.co.za, visit: www.tandm.co.za

Ultrasonic sensors for safety applications

Matthias Sollmann, Pepperl+Fuchs

The protection of personnel in industrial environments places high demands on safety engineering. Protection systems need to be robust and completely reliable and they need to meet strict guidelines and standards. Pepperl+Fuchs recognises that the higher the degree of automation, the more important this aspect becomes. Examples of this are in production and warehouse logistics, where automated transport systems are being used increasingly.

Automated guided vehicles (AGVs) and other automated transport systems move in areas where people work and therefore need to be able to stop quickly at any time to avoid collisions. As multiple AGVs may often be moving around at the same time, safety technology is also used to protect the vehicles when they encounter other vehicles.

The USi-safety ultrasonic sensor system from Pepperl+Fuchs combines the robustness of ultrasonic sensors with intrinsically safe electronics. It is therefore suitable for the safe control of machines and AGVs, among other things. It meets the requirements of Category 3 PL d of ISO 13849 and is the only safe ultrasonic sensor on the market.

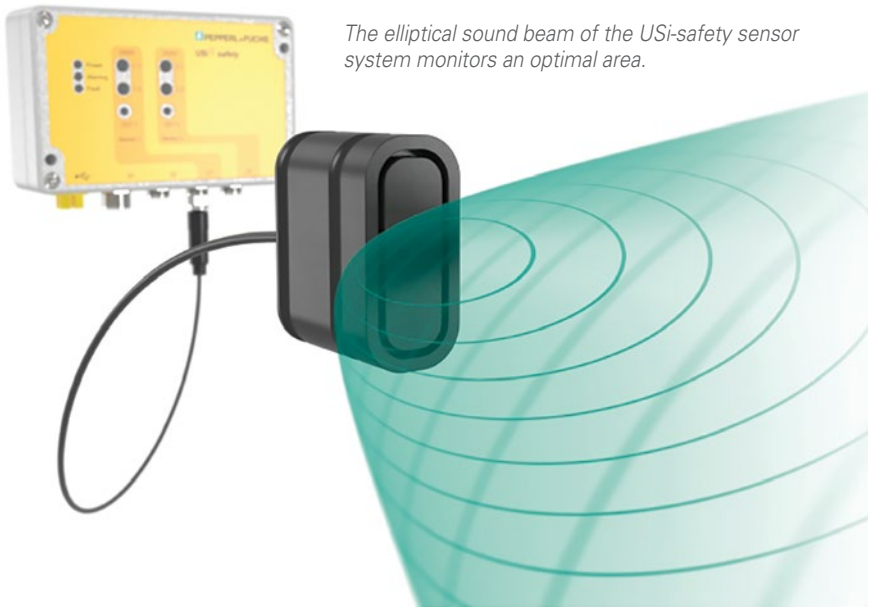
A robust measuring principle

It is essential that sensor systems should be able to detect obstacles under all circumstances. This is where the design of ultrasonic sensors has an advantage over other technologies, such as photoelectrics. Optical sensors rely on the unimpeded dispersion of light. If the light beam is obstructed, deflected, or insufficiently reflected, they cannot reliably detect the target object. In outdoor use, vapour and dust or fog, rain and snow can 'swallow' the light pulse. Object-specific properties such as irregular contours, holes and recesses in the surfaces can also cause the optical measurement to be disrupted.

Ultrasound is almost completely unaffected by such interference factors. By definition, the optical properties of a surface are not relevant. When detecting irregular contours, design-related properties are helpful: the sound beam always hits the target object on a surface, and the sensor detects more than a single point or a scan line. It is therefore unaffected by holes and recesses in the target object. Dust, vapours and precipitation have little effect on the sound. In addition, ultrasonic sensors are almost entirely unaffected by contamination or coatings adhering to the surface.

An elliptical sound beam

The sound beam of an ultrasonic sensor is usually radially symmetrical. By contrast, in USi-safety it is wide in one axis and narrow in the other. This asymmetry gives the sound beam a distinctly elliptical shape and enables the sensor to cover a large area. The resulting safety zone is 80 cm wide at a distance of 1.5 m. Various adjustment options make it possible to detect small objects or components from a long distance. The maximum detection range is 2.5 m, which allows an AGV to monitor the entire space in its direction of travel.



The elliptical sound beam of the USi-safety sensor system monitors an optimal area.

The ultrasonic transducer itself is particularly compact, at just 27×21×13 mm, which means it can be installed in forklift arms, for example, and other compact applications. This 'miniaturisation' is possible because the sensor is separated from the control interface and can be placed a cable length of up to three metres away. The USi device has connections for two sensors, allowing both forklift arms to be protected during forward and reverse travel. The high IP69K degree of protection makes the ultrasonic transducers resistant to dust, and they can also withstand high-pressure cleaning.

USi-safety offers two independent channels, each of which complies with ISO 13849 Category 3 PL d.

At a glance

- In production facilities and warehouses ultrasonic sensors can be used to protect people and AGVs where they are working in the same area.
- For safety applications ultrasonic sensors have an advantage over other sensor technologies in that they are unaffected by environmental factors such as dust or vapour.
- Compact ultrasonic sensors can be integrated into forklifts, for example, AGVs and machines, to ensure safe operation.

Reliable electronics, intuitive parameterisation

Each ultrasonic sensor unit is assigned two fail-safe outputs via the electronics. Two microcontrollers in the control interface monitor both the sensor function and each other. Noticeable deviations of the sensor units or between the controllers automatically trigger the safety circuit. Reliable protection is possible from each of the two independent sensor channels. Thus, the requirements for a safe sensor system are already fulfilled when only one sensor unit is connected. For signal output to a safety controller, one signal output is available for each sensor unit as well as safe OSSD outputs with short-circuit and cross-circuit monitoring.

If multiple AGVs are moving through the warehouse and encounter each other, interference between the ultrasonic sensors of the different vehicles is suppressed by dedicated software. Fixed interference variables and reference objects for tamper protection can be hidden. Switching points, output logic, periodic tests, and safety- and ultrasound-specific parameters can all be set intuitively using the parameterisation software. This also automatically generates safety records for plant documentation.

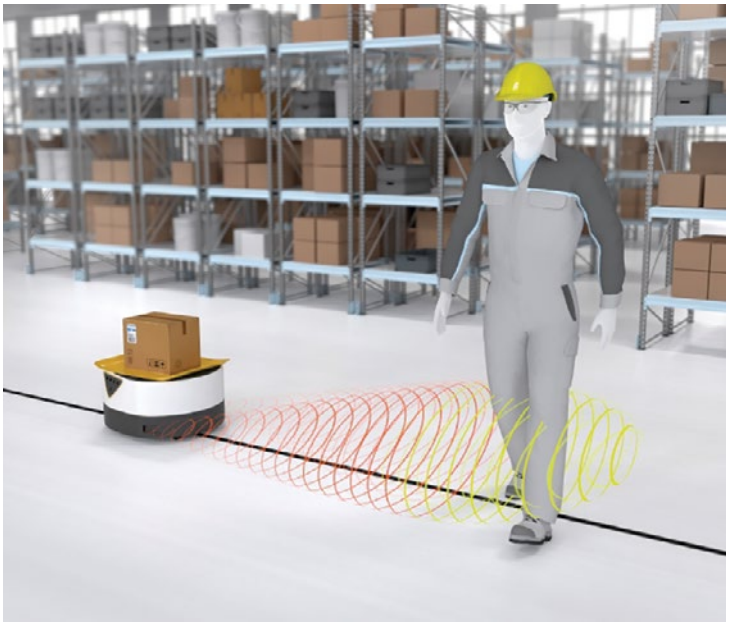
Some practical examples illustrate where the USi-safety ultrasonic sensor system can be used for collision avoidance, personal safety and machine protection.

In automated forklifts

For collision avoidance in automated forklifts, for example, in addition to the main direction of travel, the secondary directions – such as travel in the fork direction and the lateral zones – need to be considered for protection as well. The small sensor units of USi-safety can be integrated at any point, directly in the forks of automated forklifts. The decoupled control interface can be located separately in the chassis of the vehicle. The three-dimensional sound field of the sensor units thus secures the hazardous area directly in front of the fork arms. Airborne dust and other environmental influences do not affect detection.

In track-guided AGVs

In the case of track-guided AGVs, the vehicles follow markings on the ground. The tracks are often located in areas where people also move around and the safety of people needs to be ensured without the transport being interrupted unnecessarily. Optical systems, which are used for free navigation and the protection of personnel, can be supplemented or replaced by alternative protective equipment such as USi-safety systems. The sensor units can be integrated flexibly into the AGV. The parameterisation software can be used to adapt the detection range of the sensor units quickly and easily to the specific environmental conditions. The signal output can be used to reduce speed or to output a warning signal, for example. And the safety outputs reliably trigger a stop in a hazardous situation.



USi-safety can be flexibly integrated into AGVs.

For machine protection

In machines, critical areas are usually protected with photoelectric light grids. In some environments, such as the wood industry, such sensors are often falsely triggered due to the inevitable generation of dust or airborne particles. The machine then switches to a safe state, after which the light grid must be cleaned and the system restarted.

As an alternative, USi-safety produces a 'sound curtain' that is unaffected by wood dust, airborne particles, and adhered contamination. This technology reliably protects the machine without any unnecessary interruptions to the production process. Machine parts that extend into the measurement field can be learned by teach-in, and are also useful as a means of tamper protection. For example, if such a reference target is no longer detected due to tampering, the system will go into a safe state. □

For more information visit: www.pepperl-fuchs.com

A major technological shift in flameproof glanding

Tests and field incidents have shown that in hazardous areas explosive gases or liquids can migrate down the interstices of cables, bypassing traditional cable gland inner seals. Hence the SANS/IEC 60079-14 installation standard requires that barrier glands be fitted on Ex d (flameproof), Ex norm (restricted breathing) and Ex p (pressurised) equipment, and on cables which run from hazardous areas to non-hazardous areas.

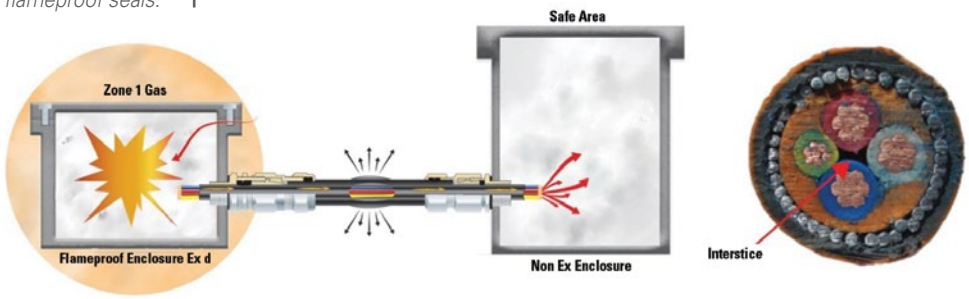
A barrier gland is designed to fill all the interstices and gaps around the individual cable conductors within the cable inner bedding, thus providing a 100% barrier seal against the migration of explosive gases and liquids down the cable. Traditional inner rubber compression or tapered seals can never achieve this level of sealing.

The IEC/SANS 60079-1 test standard requires that Ex d glands with rubber elastomeric type compression or tapered displacement seals must withstand a pressure of 30-bar. This test is intended to simulate an internal explosive pressure generated within a flameproof enclosure. However, these tests are performed on solid steel mandrels and do not take into consideration the real-life properties of cables experienced in the field: that the bedding is susceptible to creep or cold flow, for example, and that they are not completely filled, not solid nor gas tight. This means that although traditional glands with compression or tapered seals will easily pass the 30-bar pressure test on a steel mandrel, they will perform very differently when installed on the multitude of different types of cables in use in hazardous areas in modern plants.

With the increased awareness of the updated IEC/SANS 60079-14 requirements and the wider mandatory requirement for barrier glands over the traditional elastomeric taper/compression seal type glands, CCG designed a faster, easier and safer means of installing barrier glands. The VORTEx Injection Resin Barrier Gland® uses a two-part quick-setting resin which is instantly and accurately mixed and injected into the gland seal pot by means of a double injection cartridge and a vortex mixing nozzle. Being a liquid, the resin flows around the cable conductors filling all the voids and then sets in just minutes, forming a 100% gas-blocking seal.

The bright yellow resin and clear resin chamber allow the installer to inspect the resin fill easily.

Since it launched the VORTEx® range of glands at the Offshore Europe Conference and exhibition in 2019, CCG has seen tremendous uptake of the solution, having supplied two major expansions in the Shell and SANTOS coal seam gas fields in Australia, the Sriracha Thai Oil refinery project and the Saudi Aramco Zuluf, Abu Safah, Berri and Safaniya Oil Field development projects. As international safety standards and specifications change and engineers become more aware of EEHA safety related issues, Ex d I/II certified VORTEx Injection Resin Barrier Gland® technology is seen by the industry not just as a game changer, it has been recognised as a major technological shift in cable gland design and safety, making flameproof glands with old style compression or tapered seal technology all but redundant.



Explosive gases can be transmitted through unfilled cable, bypassing traditional flameproof seals.

For more information contact CCG.
Tel: +27 (0)11 394 2020
Email: info@ccgcablegland.co.za
Visit: www.ccgcablegland.co.za

SABS welcomes judgement against trademark abuse

Towards the end of 2021, the South African Bureau of Standards (SABS) reported the judgement in the High Court of South Africa Gauteng Division, Pretoria (Case 66330/2020), in which the judge had ruled in favour of the SABS in a matter involving the unlawful use of the SABS trademark. The High Court instructed the supplier of sanitisers and disinfectants concerned, to cease using the *'SABS Approved'* trademark and to remove it from all its products and packaging.

The High Court further instructed the supplier to remove from its products any references that contained or were associated with the *SABS Approved* trademark. Judgement was granted on 21 October 2021 and damages were awarded in favour of the SABS.

The trademark had been used unlawfully by the supplier of sanitisers and disinfectants at the height of the Covid-19 pandemic. While this case related to a range of products aimed primarily at the household market, it sets a strong legal precedent with respect to unlawful (and irresponsible) use of the *SABS Approved* trademark in any way.

"Products that falsely claim to be *SABS Approved* can cause a myriad of problems for consumers, with the most concerning impact relating to consumers' health and safety," says Jodi Scholtz, Lead Administrator at SABS. "The SABS welcomes this judgement as a win for consumers."

For more information contact the SABS.
Visit: www.sabs.co.za

Acoustic imaging cameras for specialised maintenance

Adding two new models to its range of acoustic imaging cameras Teledyne FLIR provides tailored solutions to serve the needs of end-users working in different utility infrastructure and plant environments. The FLIR Si124-LD is designed specifically to detect leaks in compressed air systems, and the Si124-PD is designed for partial discharge detection in high voltage electrical systems.

Both devices include easy-to-use onboard analytics with access to an online portal through the FLIR Acoustic Camera Viewer cloud service. The software enables users to perform quick diagnostics tasks and to conduct deeper analysis. With this data, Si124-PD users can determine the severity of partial discharge issues in high voltage equipment and attend to any problems in order to improve reliability of the electrical grid. Similarly, the Si124-LD model helps users determine the severity of compressed air leaks, potentially saving tens of thousands of dollars in energy costs.

Rob Milner, Global Business Development Manager – Condition Monitoring at Teledyne FLIR says, "The FLIR Si124 family of acoustic imaging cameras provides for more precise issue detection by offering an unrivalled number of integrated microphones with improved microphone signal-to-noise ratio as well as a top detection frequency of 35 kHz, to help users further pinpoint problem areas. The Si124-PD and LD editions feature the same robust artificial intelligence software capabilities of the Si124, and are customised to provide a more economical option for particular uses, such as locating corona at a utility substation or compressed air leaks in a factory setting. Taken together, the family of Si124 devices can help reduce inspection times up to 10x compared to using traditional methods."

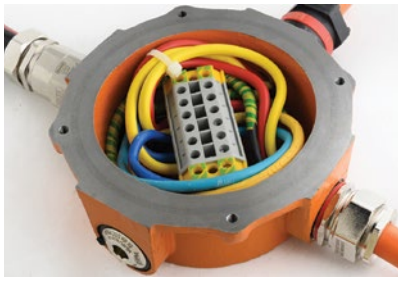
The two new models of acoustic imaging cameras provide for detection of air leaks and partial discharge.

The new Si124-PD camera for partial discharge detection features automatic electrical fault classification for partial discharge issues, including surface discharge, floating discharge, and discharge into air. The PD Severity Assessment software feature is included in the FLIR Acoustic Camera Viewer cloud software.

The Si124-LD camera features real-time, on-device leak sizing and cost analytics.

Both new models and the original Si124 are available for purchase globally from Teledyne FLIR and its authorised dealers.

For more information visit: www.flir.com



The combination of Pratley's flameproof junction boxes with its Kwikblok® terminals prevents arcing or sparking across electrical connections.

Flameproof junction boxes

Pratley has been manufacturing flameproof junction boxes since the 1960s. Over the years, it has refined the design of the enclosures, making Pratley's cast iron flameproof junction boxes well-known in the mining and petrochemical industries.

With the recent IECEx approval of its junction boxes, Pratley has demonstrated its commitment to world-class product development and innovation. One of the innovations the company has introduced is to offer its increased safety (Ex e) Kwikblok® terminals as a termination option inside the flameproof junction box, in essence doubling the level of protection.

Pratley Electrical Research & Development Manager, Sven Breedt says, "By combining our flameproof junction box with our Kwikblok® terminals, we can prevent arcing or sparking across the connections themselves." In addition, electrical current limitations prevent those terminals from exceeding their service temperatures, as well as limiting creepage and clearance or tracking distance. This means the terminals are spaced such that there can be no arcs or sparks across the connections, adding a second dimension to the safety.

Flameproof junction boxes are specifically designed to house equipment that arcs or sparks, so any termination type can be fitted into the enclosures. However, with the inclusion of increased safety terminals inside a flameproof enclosure, the termination's rating is pushed up to Zone 0 (two independent levels of protection via EPL Gb, per SANS/IEC 60079-14/26), which means it can be installed in an environment where there is a constant hazard.

Another key differentiator of the Pratley flameproof cast iron junction boxes is the IP68 rating, the standard being a minimum IP54 rating. The increased rating means Pratley's junction boxes are completely dust-protected and watertight with up to 2 m of water head.

"If a Zone 0 rating is not needed, we recommend our non-sparking end connectors, as these have a locknut to secure the connections so they cannot vibrate loose. Here a sleeve is also fitted on the outside as a means of insulation," Breedt highlights. "The important point to remember, if you are advising anyone on such an installation, is that this termination is now suitable for Zone 0 applications, with minimal additional consideration," Breedt says.

He adds that the Pratley junction boxes are manufactured from fine-grained cast iron for increased strength, robustness and impact resistance. This is critical, as they are intended to withstand extremely high explosion pressures.

For more information contact Pratley.
Tel: +27 (0)11 955 2190
Email: sales@pratley.co.za,
Visit: www.pratleyelectrical.com

Put your best foot forward

Safety footwear plays an important part in creating a safe and healthy work environment, protecting workers' feet – and workers themselves – from inherent dangers in the workplace.

Safety shoes are available with different features and specifications – from steel midsoles, to steel toecaps and metatarsal protectors – all designed to protect the feet. While necessary to protect the outside of the foot, safety footwear is not always good for the foot itself.

This relates to the issue of designing ethical safety footwear, that is, footwear that protects the foot and best promotes foot health. Safety footwear designers should allow for the natural action of the foot to stimulate healthy blood flow, and at the same time protect the wearer from various workplace hazards. An additional challenge presents itself in the fact that the feet of South Africans are different to those of some other nationalities.

How do we strike the balance between protecting workers' feet and keeping them healthy? Those in charge of workplace health and safety need to look at three things.

The Bova Trax 2.0 range of safety footwear protects workers' feet from workplace hazards and promotes healthy feet.

The shape, alignment and proportional design of the mould is important, but so too is the positioning and flexibility of the sole. With increased sole flexibility, the new Bova Trax 2.0 range has improved the flexion of the sole significantly, which increases blood flow through the feet and the body. Healthy blood flow in the feet has many positive effects. It prevents fatigue, aids concentration, decreases stress and supports healthy cardiovascular and foot function.

The weight of a safety shoe or boot can affect the wearer's energy levels. Reducing the weight on a sole reduces the energy that has to be exerted per step. For an individual taking 8 000 to 10 000 steps a day and spending long hours on their feet, any reduction in the weight of the shoe will reduce physical exertion. Weight in the Bova Trax 2.0 range has been reduced by 261 g per pair (based on a pair of size 8 shoes) on average. This takes the equivalent of 1.3 kg off the back and reduces energy exerted by up to 2.8% per step.

Employers should look for safety footwear that provides multiple layers of shock absorption and comfort. Safety footwear in the Bova Trax 2.0 range provides three layers of comfort technology that work together to absorb shock, reduce fatigue and improve overall foot health.

Bova Trax 2.0 has been designed in consultation with an expert podiatrist and guided by data from South African wearers. The safety footwear range provides more flexibility, is lighter in weight, has better traction and delivers greater comfort than safety footwear previously available.

For more information contact Bova.
Tel: +27 (0)87 057 7770, visit www.bova.co.za

Inspection and testing of lifting equipment

As a fully registered Lifting Machine Entity (LME), Dekra Industrial SA can provide registered Lifting Machine Inspectors (LMIs) in various approved categories, to conduct comprehensive inspection and load testing services of lifting and rigging equipment. This includes overhead cranes, truck-mounted cranes, lifting tackle, mobile elevating work platforms (or 'cherry pickers' as they are commonly referred to), and offshore cranes shortly to be added.

"We are pleased to have attained our LME registration," says Johan Gerber, Managing Director of Dekra Industrial RSA. "The addition of the lifting inspection division broadens our offering further, being the third element in our 'one-stop' approach as a holistic provider of non-destructive testing (NDT) and inspection. It complements our existing services of corrosion control with rope access, and NDT inspections using drones."

The role of Project Leader: Industrial Lifting Inspections division has been assigned to industry expert Jarques ('JP') Müller, who is well-known and highly regarded in the lifting industry, locally and pan-Africa, and has been registered as a Lifting Machine Inspector since 2008.

With over 20 years' experience in the inspections, maintenance, NDT and lifting industries, Müller brings a wealth of experience to the table, having been at the helm of a number of successful companies before joining Dekra Industrial.

Making use of his extensive lifting inspection-related business development and project management experience, Müller will be responsible for a substantial portfolio including divisional set-up, LME applications, procedures and documentation, development and implementation – as well as for driving the management, growth and expansion of the lifting inspections division, and extending Dekra Industrial's lifting and rigging client base throughout Southern Africa.

"Dekra Industrial is already established in the steel sector and this new division opens up opportunities in other vertical areas, in the maritime industry, for example, as well as the general industrial and manufacturing sectors, industrial refineries, oil and gas, light and heavy engineering and mining, petrochemical, offshore and agriculture. Almost every sector uses cranes and truck-mounted cranes, offering many possibilities," says Müller.

"My aim is to ensure that the highest priority is given to effective operational set-up and management of the lifting inspections division, to meet and exceed client requirements for high-quality, safe services," he says.

"My experience in lifting and rigging around the world includes work in the Netherlands and Nigeria before I returned to South Africa in 2007. I was also involved in one of the heaviest load tests ever carried out in South Africa: a 1 200-tonne load test in Cape Town harbour. I look forward to bringing my experience and skills to Dekra Industrial in this next exciting stage of my career," Müller says.

Johan Gerber, Managing Director, Dekra Industrial RSA.

JP Müller has been appointed Project Leader of the new Industrial Lifting Inspections division.

Gerber adds, "We are very pleased to have JP on board, as he is well-known in the industry and has a wealth of experience which will assist us in bringing new opportunities to our current and future clients across a number of industries. Our expansion also includes access to qualified LMIs, and we will ensure the transfer of lifting industry skills within the company too."

For more information contact Dekra Industrial SA.
Visit: www.dekrasa .com

A transformer is a transformer – right?

This seems to be the general consensus regarding transformers and, notably, in making buying decisions on them. However, this is not the case and there is much more to a transformer than initially meets the eye. Answering a number of important questions upfront and some indicators on what to look for in comparing transformers from different suppliers will enable the buyer to make an informed decision before issuing the purchase order.

The operating environment

First consider where the transformer is going to be used.

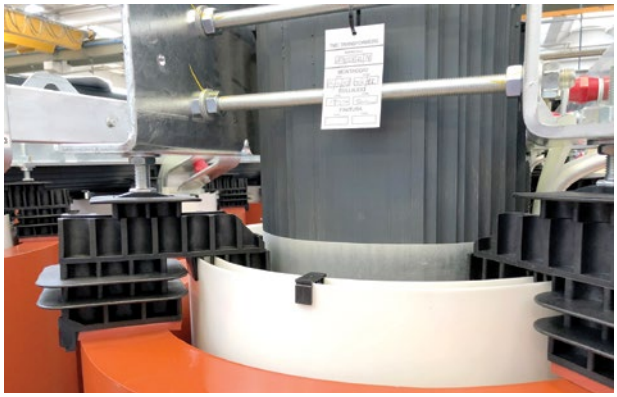
A transformer designed for a South African climate will not be the same as one designed to be installed in Russia, for example. Details such as the minimum, maximum and average temperature at which a transformer can safely operate will affect the design and consequently the price of the transformer. This is predominantly due to the temperature rise of the transformer as well as the temperature winding class.

In dry-type transformers there are two main temperature winding classes: Class F and Class H. Class F allows the transformer to operate safely at temperatures up to 155°C without damage. This is taking into consideration that with an insulation of Class F the maximum allowable temperature rise of the transformer at full load, according to the IEC standards, is 100°K, or 100°C above the ambient temperature. For example, if the ambient temperature is 30°C, the transformer will be at 130°C. It may seem unlikely that a transformer would ever reach 155°C but this can easily happen if the room or container in which the transformer is placed is restrictive in terms of cooling.

As an alternative, a higher insulation class, such as Class H, may be considered. This allows the transformer to operate safely at temperatures up to 180°C without damage. It provides for a higher safety factor and a maximum temperature rise of 115°K.

A further option would entail lowering the allowable temperature rise of the transformer. This can be done either by changing the temperature rise of the transformer or by moving up to a higher insulation class, which in turn will increase the price of the transformer.

A casting plant with specialised resin mixing facility, unique to cast resin transformers.



Fully assembled cast resin transformer, tag secured, with all fasteners torqued and marked.

Cooling is always an important consideration and needs to be well understood before requesting pricing for a transformer.

Both oil-cooled and dry-type transformers are available in multiple cooling options with the most common being natural air (AN). AN uses the still air surrounding the transformer to keep it operating within the correct temperature range. The second most common option is forced air (AF). With this cooling method, air is actively moved over the radiators, or over the core and windings, to keep the temperatures in check.

Depending on the transformer application and where it will be used, water cooling can also be an option. This is most commonly seen in transformers for marine vessel applications where space is limited and ambient temperatures are high.

It is always important to establish the rated AN value of the transformer before any auxiliary cooling devices are added.

Some manufacturers may offer the rating requested but with cooling done using the AF method. This could mean they are using a smaller transformer but overloading that transformer to deliver the required power rating. As long as this is clearly disclosed upfront, it can be a useful solution in certain cases, particularly when a transformer's size is restricted in terms of available space.

A cast resin transformer ready for acoustic level and partial discharge tests.

There is, however, a trade-off with this approach. Essentially it means there is another system to be maintained, and another system which may fail. Should such an instance occur, the transformer could not be operated at its rated power without the temperature being out of design specification – which could result in damage. There may also be a need to de-energise the transformer to perform maintenance or repairs, which can be time-consuming and costly. Correctly, AF cooling should be used for short-term overloads and not for full-time overloading.

Transformer losses

A transformer's losses constitute another crucial factor that needs to be understood. These comprise two parts – load losses and no-load losses.

No-load losses are a constant and are independent of the power being drawn. This type of loss is also known as core loss, as the losses stem from the current used to magnetise the core.

Load losses vary according to the amount of power being drawn. These are also known as copper losses.

It is important to note the relevant IEC standards determining what the maximum allowable load and no-load losses may be. Generally speaking, the worse a transformer's losses are, the cheaper it is to produce.

In core design, high-grade grain-oriented core steel is a preferable material. However, it must be said that there are different classes of this steel. Load losses depend on the winding material's properties, including the diameter and purity of material, which have a direct effect on the resistance of the winding material. The greater the winding resistance, the higher the losses.

Resistance of a material is subject to the temperature at which it is measured. Losses need to be calculated at a reference temperature and the two prescribed reference temperatures are 75°C and 120°C. With their particular metallurgical properties, copper and aluminium become more resistive as the temperature increases. Clearly, losses quoted at lower temperatures will always be better than those quoted at higher temperatures.

When comparing datasheets it is important to ensure load losses are cited at the same reference temperature, allowing a fair comparison.

At a glance

- Transformers are critical elements in power distribution systems and should be chosen with careful attention to particular factors.
- Key questions to consider in the specification for any given application include, among others:
  - Where is the transformer to be used?
  - How is it cooled?
  - What levels of load losses and no-load losses are allowed for?
  - What measures does the manufacturer have in place for quality control and testing?

Test bay facility where all the equipment's calibration labels are in place.

Although high load and no-load losses are the more common concern, what if the losses are extraordinarily low and the transformer is available at a better price? Again, questions need to be asked.

The first factor to look at is the transformer's weight. Similar transformers from reputable manufacturers will have similar weights. This is due to manufacturers using similar specified conductors and core materials; to achieve the losses specified within the relevant standard the design will be similar in nature. This also implies that core weights and winding material weights will be relatively constant.

When the weight of a transformer is significantly lower than that of a comparative option proposed, and the transformer is offered with better losses and cheaper pricing, the question to ask is whether this transformer has been rated at 100% for continuous duty at the power rating the customer has specified, or if it has been allowed to operate only for short periods at the specified rating. Essentially, this would indicate that the transformer is being overloaded to supply the required power.

Loading of a transformer

A further important factor to understand in transformers is the load the transformer will supply. With today's modern load there is no such thing as a perfect load. Power electronics and many other switching electronics have contributed to non-sinusoidal waveforms, and hence harmonics. The Total Harmonic Distortion (THD(i)) that a transformer will encounter significantly influences the design of that transformer.

For instance, a transformer designed for standard distribution loads allows for a THD(i) of no more than 5%. A THD(i) of ≤5% is appropriate for today's general distribution loads. When the rating of the transformer THD(i) is closer to ≤1%, the transformer is, in effect, being rated for an ideal grid solution. The THD(i) of a transformer can

have a significant impact on the overall price of the transformer. This is due to differences in construction such as core designs, electrostatic shield and winding construction.

Harmonics are problematic because they can lead to excessive heating of the transformer and create hot spots within the core caused by excessive eddy currents. This can lead to insulation breakdowns between the core laminates – and over time the complete failure of the transformer. The windings can also be expected to see additional heating and encounter higher peak voltages, which can lead to inter-turn winding failures if the insulation system is not appropriate.

This is further exacerbated by loads such as data centres, and supply sources such as solar power, which have extremely high harmonic distortions, sometimes as high as 73%.

A transformer designed for a standard distribution load and placed in such an environment would not survive. In such circumstances, a number of changes would need to be made. Most importantly, an electrostatic shield should be installed between the primary and secondary windings of the transformer to ensure leakage currents are grounded.

A quick method to understand how harmonics would affect a standard transformer is to look at a derating graph. Figure 1 below illustrates that the greater the THD(i)% of the transformer, the more the transformer will need to be derated. It must be noted that the indicated values present only an example; the correct relation between the THD and K Factor is known only with the complete harmonic spectrum.

The other unit of measurement for a transformer harmonic load handling characteristic is known as the K Factor: the higher the K Factor, the greater the THD(i)% a transformer can handle. There are five main K Factors, as tabled in Figure 2 above right, each with an equivalent THD(i)% rating.

Cast resin transformers

With an understanding of how subtle design changes can affect the suitability of a transformer for a given application, as well as the price, it is also important to ask the transformer manufacturer what quality control programmes are in place.

Quality control programmes will ensure that at all stages of manufacturing all raw materials and components can be tracked, and will confirm that the raw materials received have been verified to be within specification as set out by the designer of the transformer.

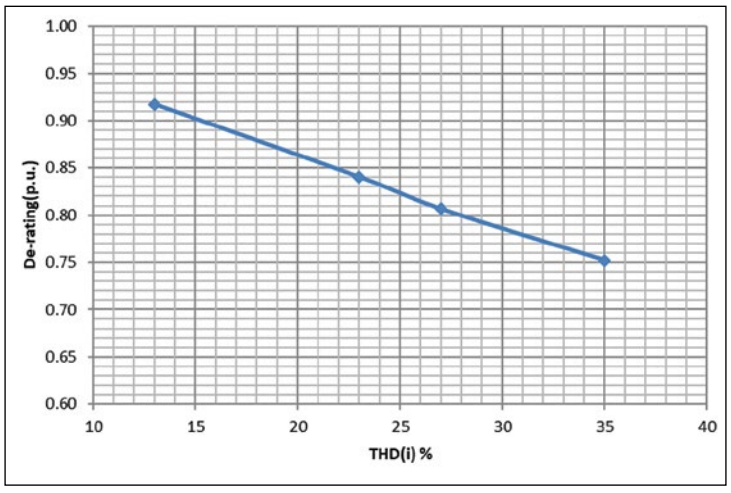


Figure 1: The greater the THD(i)% of the transformer, the more the transformer will need to be derated.

K Factor	THD(i) %
1	5
4	24.1
10	44.3
13	52.9
20	72.7

Figure 2: The higher the K Factor, the greater the THD(i)% a transformer can handle.

Although in theory the construction of cast resin transformers is simple, the transformers are anything but simple to build. The resin poses the biggest challenge as it must deal with expansion and contraction, and act as an insulator as well as provide mechanical strength. There are two aspects to casting a successful medium voltage winding: the composition of the resin itself, and the casting process.

Larger manufacturers prefer to have their own casting plants where they can mix their own proprietary composition of resin fit for the application. This allows for further control over the process of the MV winding casting. When operating a casting plant, certain safety checks need to be in place, such as regular sampling and testing of the resin to ensure its chemical composition has not broken down. A reputable manufacturer will always be able to provide customers with these reports. Track records for transformers that have been built for similar applications can also be requested and these will provide information on how they have performed.

Testing transformers

All transformers should be tested in accordance with the respective standards and it is important to ascertain whether the selected supplier has the necessary certification for testing.

It is also important to check when the manufacturing facility was last audited; this should provide the assurance that all the test equipment has been recently calibrated.

Test results should also be checked: how were the results derived, and was this done using the facility's own programme? If so, has an independent third party verified the programme, and specifically that it cannot be manipulated to produce favourable results?

When witnessing a factory acceptance test it is crucial that the person witnessing these tests understands them and has the knowledge to scrutinise the results provided, not simply taking them at face value. The customer needs to know that the results correlate with the specifications of the order placed. Most facilities will also issue, a couple of days before the customer and/or allied parties are invited to witness the testing of the transformer, a test procedure guide. Different facilities use different procedures for testing and the person or people witnessing the tests need to assess how the tests will be conducted and whether the tests are conducted in accordance with the relevant standards.

All the factors outlined here need to be taken into account to ensure that transformers purchased are of sound quality and will last. □

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

Eskom's Transmission Development Plan 2022 to 2031

Eskom recently shared its Transmission Development Plan (TDP) for the period 2022 to 2031. The plan was shared with various stakeholders in a virtual public forum, as Eskom is required to do in terms of its transmission licence requirements issued by the National Energy Regulator of South Africa (NERSA), which call for Eskom to publish a TDP annually.

The virtual forum forms part of a consultative process where industry, various business sectors, local government, and other infrastructure development partners, have the opportunity to influence the long-term development plan of the transmission system.

For the planning period 2022 to 2031, 30 GW of new generation capacity is expected to be built, mainly from renewable energy sources (solar photovoltaic and wind) in areas with limited network infrastructure. To provide for an adequate and reliable transmission system, Eskom plans to increase the transmission infrastructure by about 8 400 km of extra-high-voltage lines and 119 transformers to bring on board 58 970 MVA of transformer capacity over the next 10 years.

Group Executive for Transmission, Segomoco Scheppers said, "The total Eskom Transmission capital plan amounts to R178 billion over the next 10 years. Of this amount, R144 billion is required for new capacity expansion projects to meet the reliability requirements, connection of new generation capacity and loads, as well as to acquire servitudes. A further R34 billion is required for refurbishments to the existing asset base and procurement of production equipment, as well as strategic spares."

Eskom's planned investment in the national transmission grid amounts to R178 billion over the next 10 years.

Scheppers said, "Work is in progress to allow the connection of utility-scale renewable generation projects for Bid Window 5 of the REIPPPP, expected by 2024/25, and the additional 2 000 MW capacity to be procured through the RMIPPPP, expected to be available during the course of 2022."

For more information contact Eskom.
Visit: www.eskom.co.za

Transformers and switchgear for new LNG/helium project

Local electrical equipment specialist, Zest WEG, is supplying transformers, switchgear and containerised modular substations to Tetra4, South Africa's new onshore natural gas and helium project being developed by emerging producer Renergen.

Tetra4 is the country's first and only holder of an onshore petroleum production right. Located near Virginia in the Free State, the natural gas in the deposit reportedly contains world-beating concentrations of helium – up to 12% compared to typical levels of around 0.5%.

The first phase of the project is advancing well, with the construction of the liquid natural gas (LNG) and helium plant scheduled for completion by the end of 2021 or early in 2022.

Lukas Barnard, Zest WEG Sector Specialist – Oil and Gas Business Development, says the equipment ordered from Zest WEG is on track to be delivered and installed within this project schedule.

"The transformers we have been contracted to supply are a 7 MVA 33/11 kV unit and two 1.5 MVA 6.6/0.4 kV units, which are being manufactured locally at our transformer facility in Wadeville," says Barnard. "We will also supply the 33 kV, 11 kV and 6.6 kV medium voltage switchgear, which will be installed into two six-metre containerised substations, being manufactured locally by Zest WEG at its Heidelberg facility.

"The medium voltage switchgear will be installed in the modular substations in Heidelberg, where a factory acceptance test will be conducted before equipment is transported to site," he adds. "The complete package is managed with a single point of contact – a project manager – at Zest WEG, to simplify and streamline administration for the customer."

Renergen says it sought a supplier with the necessary experience and expertise and, more than that, it needed a partner that could meet the tight delivery requirements,

The locally manufactured 7 MVA transformer ready for transportation to site.

Switchgear installed inside one of the six-metre containerised substations.

with enough flexibility to find solutions to the challenges related to a project of this nature.

"There have been many benefits working with local companies, including additional flexibility and control, and the ability to react quickly to changes and challenges that arise as we roll out the project," says Nick Mitchell, Renergen Chief Operating Officer.

"The support of local business also has far-reaching economic benefits for the communities in which they operate and this remains a critical balance for us to achieve in the project, although not all the components can be manufactured locally or are available locally. Working with local business also reduces currency risk by minimising our exposure to exchange rate fluctuations."

Renergen noted, too, the advantage of Zest WEG's packaged solutions capability, especially in a project like this with multiple streams of work that need to be coordinated across multidisciplinary teams. Barnard says this is where Zest WEG's project manager added considerable value in terms of management, procurement and project flow.

"When multiple contractors and suppliers are involved, the project flow becomes more complex and can generate significantly more risk," he says. "Our project manager was able to work with the customer to mitigate these risks and streamline the rollout."

He also notes the advantages of the containerised and E-House modular substations in fast-track projects. Manufacturing the units in a dedicated facility, Zest WEG provided an efficient solution while reducing the on-site responsibilities of the project developers.

"Building a brick-and-mortar substation means more personnel and activity on site over an extended period, with all the related health and safety implications such as inductions and medical checks," says Barnard. "It is quicker and far more convenient to build it in a well-equipped facility such as ours where we can also run factory acceptance tests before delivery."

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

New 132 kV GIS switching station in Cape Town

Gas-insulated switchgear in the City of Cape Town's 132 kV Foreshore indoor substation, where ACTOM Power Systems supplied and installed the electrical works in 2009.

In November 2021 ACTOM Power Systems was awarded the electrical works contract for a new 132 kV gas-insulated switchgear (GIS) indoor switching station by the City of Cape Town.

The latest contract at the Morgen Gronde switching substation in Brackenfell will supply power to a large-scale data centre campus that is being built on an adjacent site and is premised as the first of several in the vicinity.

"This is the fourth substation contract we have received in as many years involving the provision of power to local cyber facilities, which is indicative of how this particular market segment has become a primary driver for the development of substation infrastructure countrywide," said John McClure, Power Systems' Operations Manager at ACTOM Power Systems. He added that this project also caters for envisaged future developments and network strengthening in the surrounding area.

In tendering for the contract Power Systems partnered with an international switchgear supplier, Xian XD Switchgear Electric Company of China. This makes Morgen Gronde the first of its kind in the City of Cape Town where the GIS switchgear will be designed and manufactured by an OEM outside of the conventional Europe-based producer niche.

"Consequently, we were put through a rigorous evaluation, with multiple rounds of comprehensive clarifications and close examination of our technical offering in particular, including all GIS type test certification, to ensure absolute conformity with every detail of the applicable IEC standards," McClure pointed out.

"A valuable spin-off of this process, however, is that with full technical compliance now established, it stands us in good stead to extend our GIS offering in collaboration with Xian XD to the larger South African market."

Xian XD will supply a 20-bay 132 kV GIS switchboard for the Morgen Gronde switching station. The contract also includes the provision of a substation control system which provides for all events, measurements and operations to be controlled from either a local HMI station or the city's main control centre. "This substation control system (SCS) means the entire switching station will be fully automated with completely remote functionality," McClure highlighted.

Other ACTOM businesses involved in the project are Static Power, which will supply dc chargers and battery banks for backup power, and ACTOM Electrical Products, which will supply all cabling and cable accessories.

Construction of the switching station building will take another year or so to complete and Power Systems will only gain access for the electrical installation following that. Hence the contract is scheduled to run through to May 2023.

"However, the structural design of the building has to incorporate the parameters of our specific equipment, so we are under pressure to complete all the electrical designs to ensure the ground-breaking is not delayed," said McClure.

For more information contact ACTOM Power Systems. Visit: www.actom.co.za

Unlocking grid capacity for renewable energy

The team at Penwortham substation.

Following on the successful installations of the world's first large-scale use of transformational power flow control technology on its network last year – as featured in *Electricity + Control*, June 2021 – National Grid Electricity Transmission (NGET) in the UK is expanding its use of the technology.

NGET owns the cables and substations that form the electricity transmission system in England and Wales and is using this innovative technology to make the most of its network, avoiding the need to build new infrastructure and contributing to the UK's net zero ambitions.

As in other parts of the world, connecting more renewables to the network, the phasing out of fossil fuel generation and electrification of transport are changing the way power flows across the UK. This means that circuits become unequally loaded, causing overloads on some circuits which limits the capacity of the entire network.

By using Smart Wires SmartValve™ modular power flow control technology, NGET can remove bottlenecks and unlock unused capacity on the existing network. As the system operator, NGET has already installed 48 SmartValves across five circuits at three of its substations in the north of England, enabling the network to carry 1.5 GW of extra capacity, enough to power about one million UK homes with renewable energy.

With the increasing volume of renewable generation seeking to connect to the network, NGET sees a pressing need for more capacity in the area in 2022. By scaling up the initial SmartValve deployments near Harker and Penwortham, NGET can unlock extra capacity on the existing circuits and transfer more renewable power to its customers in a timely and cost-effective way.

For more information visit: www.nationalgrid.com or www.smartwires.com

Financing SA's Just Energy Transition

One of the key developments emerging from the global climate conference COP26 saw South Africa's President Cyril Ramaphosa join other leaders in announcing a historic partnership with the governments of France, Germany, the United Kingdom and the United States, as well as the European Union, to support a just transition to a low carbon economy and a climate resilient society in South Africa.

A statement issued by The Presidency at the time noted that in preparation for COP26, South Africa submitted its revised Nationally Determined Contribution (NDC) to reduce domestic carbon emissions to within a target range of between 420 Mt CO_2e and 350 Mt CO_2e by 2030. This revised target is compatible with the ambitious goals of the Paris Agreement and represents the country's best effort to confront climate change which, without large-scale mitigation and adaptation efforts, will have a devastating impact on sub-Saharan Africa.

The Political Declaration issued on 2 November 2021 to establish the new partnership states that partner countries will mobilise an initial $8.5 billion (R131 billion) over the next three to five years through a range of instruments, including grants and concessional finance, to support the achievement of South Africa's revised NDC through a just transition to a low carbon and climate resilient economy.

The highly concessional finance to be mobilised through this partnership will accelerate investment in renewable energy and development of new sectors such as electric vehicles and green hydrogen. It will provide a significant boost to investment and growth and ensure Eskom can access resources to finance the repurposing of coal-fired power stations due for decommissioning over the next 15 years.

Welcoming the partnership, President Ramaphosa said: "Climate change is an existential challenge that confronts us all, and South Africa is committed to playing its part in reducing global emissions. The partnership we have established today marks a watershed moment for our own just transition, and for the world. It is proof that we can take ambitious climate action while increasing our energy security, creating jobs and harnessing new opportunities for investment, with support from developed economies."

Bold and ambitious actions are required from all countries to confront climate change and South Africa has consistently argued that developed economies must support a just transition in developing economies. The Political Declaration issued at COP26 represents a first-of-its kind partnership to turn these commitments into reality, and a model for similar forms of collaboration globally. At the heart of the partnership is the importance of a just transition, which includes support for workers and communities affected by the transition away from coal and enables the creation of quality green jobs. For the transition to be just, decarbonisation must be implemented in a way that promotes and sustains employment, livelihoods and economic inclusion for historically marginalised communities and sectors of our society. A joint taskforce is to be established to take the partnership forward over the coming months.

Eskom plans to decommission and repurpose its aging coal-fired power stations over the coming years.

The Political Declaration which forms the foundation and framework for the partnership is premised on a number of considerations and resolutions, clearly prescribed and recognising, among other things:

- the urgency with which the international community collectively needs to act to halve global greenhouse gas emissions by 2030 and achieve global net zero CO_2 emissions by 2050, to prevent the worst impacts of climate change on people and the environment
- the need for a just, equitable and inclusive transition for workers and affected communities so that all are protected against the risks and benefit from the opportunities presented by the transition, and no one is left behind
- the progress made by the South African government – as well as leadership from Eskom, organised labour, businesses, civil society, and local governments – towards the net zero aspirations set out in South Africa's Long-Term Low Emissions Development Strategy
- and the opportunities for industrial innovation to create quality green jobs, increase renewable energy generation and drive sustainable economic growth for a resilient and net zero South African economy.

Through the declaration the parties resolve to:

- establish an ambitious long-term partnership to support South Africa's pathway to low emissions and climate resilient development, to accelerate the just transition and the decarbonisation of the electricity system, and to develop new economic opportunities such as green hydrogen and electric vehicles, among other interventions to support South Africa's shift towards a low carbon future.
- and to establish an inclusive task force involving South Africa and international partners, to enable a successful and sustainable transition.

The Annex to The Declaration sets out the Taskforce Action Plan over a timeline of the next six and 12 months.

For more information visit: www.thepresidency.gov.za

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