FEATURES:

- Industry 4.0 + IIoT
- Energy management + the industrial environment
- PLUS Renewable energy projects in Africa
- Measurement + instrumentation
- Transformers, substations + cables

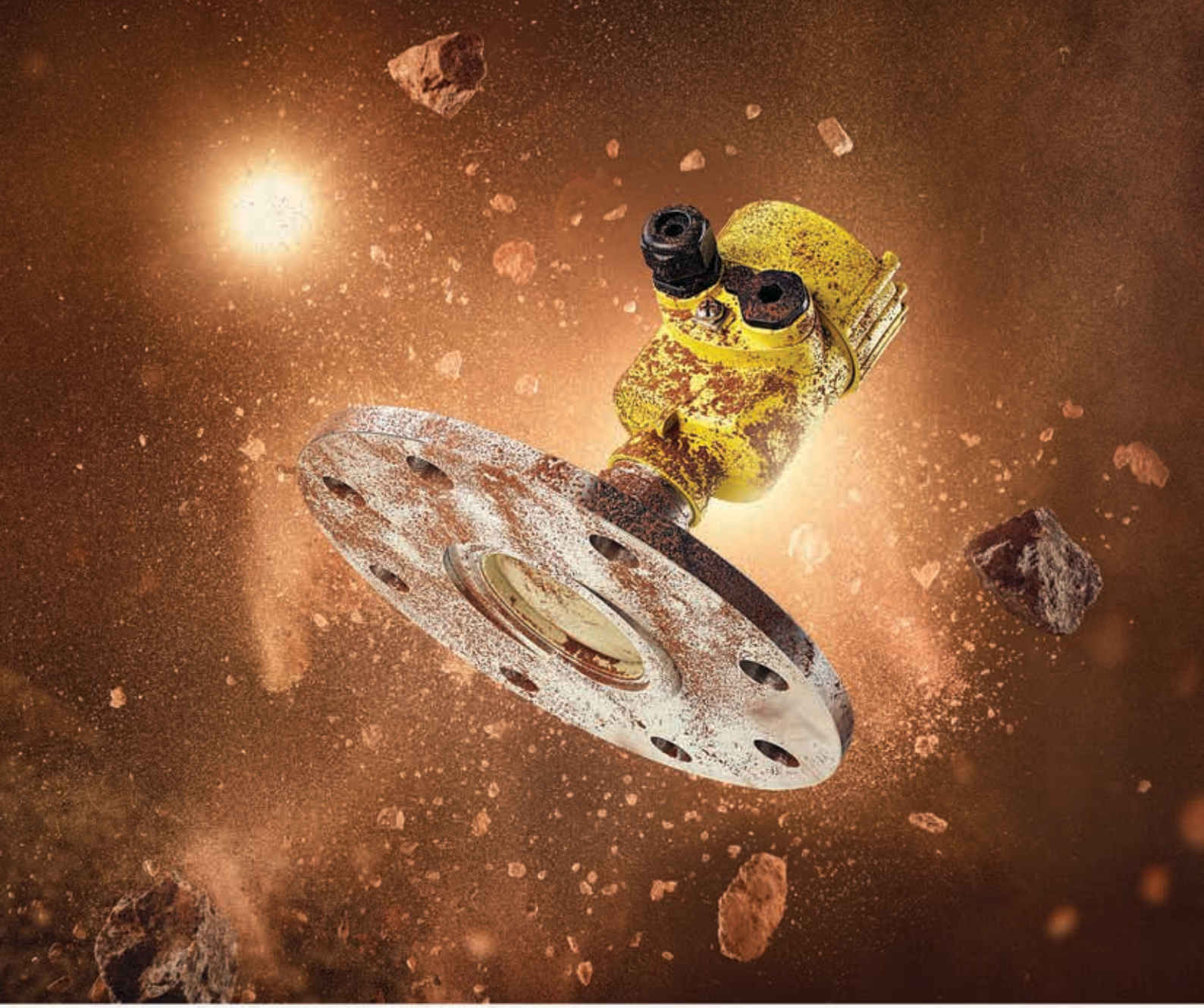
CBI electric
low voltage

Astute "Living a Smart Future"

12/2020

ELECTRICITY + CONTROL

CROWN PUBLICATIONS



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Looking Forward VEGA

CBI-electric: low voltage's new Astute range of Smart IoT products can be used in various applications to remotely switch geysers, lights and other electrical installations via the CBI Home App. *(Read more on page 3.)*

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The year that was 2020

What a peculiar year. A year that went viral much faster than anyone could have predicted

But at least it is almost over.

All of us at Crown Publications, and specifically the team working on *Electricity + Control*, do hope that you, your families and your colleagues have managed to weather the storm.

And what a storm.

But I observed some intriguing things during the course of this year. Let me unpack a few of them for you.

We have often argued that a 21st century magazine is a multi-media platform for sharing information. And so it is. There was a time (I think back to when I was an editor) that a magazine was a collection of pages between covers.

Magazines today are still between covers – but they are much more than that – simultaneously available on multiple platforms. All the magazines in the Crown Publications stable have been available in print for decades, available as electronic editions online for at least a decade, and they are all accompanied by respective websites, electronic newsletters and a presence on LinkedIn or other social media.

In May this year, when Covid-19 was really beginning to take its toll, I pointed out that, at the start of the year, *Electricity + Control* had almost 1 000 online subscribers in the rest of Africa, and a slightly lower number in South Africa (where the magazine is posted to readers).

During the year, the number of online subscribers has risen further, and the total circulation of print and electronic editions has grown to more than 7 500 (as audited for Q3 2020).

As it has done for the past decade and more – *Electricity + Control* continues to serve its readers and advertisers across multiple platforms.

The rapid rise in online readers was really pleasing – and obviously not unexpected under the circumstances. The swing to online readership was one intriguing outcome of this year.

Then, many found the year exceedingly tough. In fact, unless you were rolling out PPE, I cannot imagine the year being anything but tough.

Even under those conditions, I was intrigued that some companies did not reduce their advertising spend. In some ways it was surprising; in others, I now look back and see the strategy they were following. It seems to be paying off, to be frank. Indeed, our thanks go to those advertisers who have maintained their spend and presence in *Electricity + Control*, in print and online. We appreciate their continued support.

So here we are at the end of the year – again!

I wish you and your families all the very best for the end-of-year break and the festive season. May it be safe; may it be a time of reflection; and as we turn to the opportunities that 2021 will bring, may we remind ourselves that we have the good fortune of being in a nation that has everything going for it. And there seems to be just a little more light at the end of the tunnel each day.

We have many heroes in this society – and many are going out on a limb to ensure a better future for everyone.

Thanks to our editor, Leigh Darroll, advertising manager Heidi Jandrell, and our layout artist Darryl James; thanks also to Karen Smith and the admin team who have ensured that *Electricity + Control* continues to operate across a dynamic mix of platforms and reach a growing number of readers; and thanks to our Publisher and Deputy, Karen Grant and Wilhelm Du Plessis. Thanks to the team for continuing to ensure that *Electricity + Control* provides the best information to help you find the best solution to your plant challenges. It remains the best magazine in its field – read it.

Ian Jandrell

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

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REGULARS

CBI launches new Astute range of IoT Smart products

CBI-electric: low voltage's newly launched Astute Range of Smart IoT products can be used in residential, commercial, agricultural and light industrial applications to remotely switch geysers, lights, underfloor heating, pool pumps, and other electrical installations via the CBI Home App.

The Astute Range currently includes the Astute Smart Controller (ASC) and the Astute Smart Isolator (ASI), with more products in the pipeline. The Astute devices are energy monitoring, scheduling and control switches with both load management and automation capabilities.

The new ASC and ASI fulfil the need for a reliable switch that is quickly installed and simple to set up, all within a compact form factor. "The current trend for energy and cost savings, as well as a reduced carbon footprint, calls for load control," states Larry Barnes, Product Manager at CBI-electric. "The consumer also wants a 'set-and-forget' solution easily accessible on their mobile phone."

The CBI Home App enables the user to configure and automate the Astute device to react to any change in current, voltage, time, power and other variables or a combination thereof. The CBI Home App allows the user to set up seven-day scheduling and automation according to time, weather conditions and more. Energy usage can also be monitored on the App. The usage is displayed in daily and monthly graphs. The App is available on the App Store or on Google Play.

Consumers can achieve energy and cost savings by installing the ASI on geysers, air conditioners and underfloor heating, to name a few. Business owners can use the devices to automatically switch billboard/storefront signage off after midnight to save costs and energy. The ASC is perfect for automating lights at home or the office as well as ensuring that driveway or security lights are activated at night. The ASC is also perfect for automating pool pumps and water features.

With the CBI Home App, the user can configure the devices to suit specific applications.

In addition to the standalone scheduling and energy monitoring features, the consumer can set up an energy management scenario through the automation of multiple installed Astute devices. As an example, the user can link automated switching between a pool pump and geyser. When the pool pump is switched on and the current exceeds the user-defined maximum rating of the energy consumption setting, the supply to the hot water geyser will be temporarily interrupted. The geyser will be reconnected when the pool pump current is reduced or the pool pump is switched off.

The only requirements to use the Astute range are a 2.4 GHz Wi-Fi with an internet connection and a smartphone or tablet. The Astute devices allow for multiple ON / OFF programs and also have manual bypass capabilities with ON / OFF control.

The ASC is compact with both DIN and mini rail mount options. Both the ASC and ASI are rated for single phase, 50 Hz at 230 V with a maximum resistive load of 30 A for geysers, underfloor heating and lights, and a maximum inductive load of 10 A for pool pumps and air conditioners. They can be combined with a contactor to switch higher currents or three-phase loads if required. The ASI has a fluorescent strip on the lever for easy, manual switching when installed at the geyser. The ASC is certified to SANS 60730-2-7 and the ASI to IEC 60947-3; and both devices are ICASA approved. Both the ASC and ASI have one output channel per device. □

The Astute range of Smart IoT products includes the ASC and the ASI, which enable energy monitoring, scheduling and control switching.

For more information contact CBI-electric.
Email: astute@cbi-electric.com
Visit: www.cbi-lowvoltage.com/astute

Digital technologies in pharmaceutical production

Michael Suer, Director Life Science EMEA, Factory Automation, Mitsubishi Electric Europe

Like many other industries, the pharmaceutical industry is constantly adapting to market requirements that change often and quickly. These changes are being influenced by factors such as regulation, skills availability and digital transformation. To turn these challenges into opportunities, companies are increasingly relying on solutions such as human-robot collaboration and the use of artificial intelligence to manage intensive data processing.

In this article Michael Suer looks at four key technology trends showing a steadily growing impact in the pharmaceutical industry: collaborative robots, cooperative robots, artificial intelligence and edge computing.

One clear trend in the pharmaceutical sector is the increased demand for collaborative robots (cobots) for use next to people, doing everything from dosing, mixing, counting, dispensing, inspecting and marking medications in pharmaceutical laboratories. The cost-effectiveness and ease of programming of cobots mean they are not restricted solely to use in large facilities but are equally suitable for use in small labs or multi-labs.

A clear trend in the pharmaceutical sector is the increased demand for collaborative robots to work next to people.

Working alongside people, cobots present opportunities: they can relieve people of monotonous, tiring and physically stressful tasks, and so increase the efficiency and quality of human work. They can bring greater reliability, consistency and precision to the pharmaceutical laboratory, completing repetitive tasks with great accuracy and helping to protect sterile environments from contamination.

As an example, Mitsubishi Electric's MEFLA ASSISTA cobot has a surface that is easy to clean, prevents dirt traps forming and can eliminate the risk of injury from crushing edges. It also achieves a repeat accuracy of ±0.03 mm, close to that of the company's industrial robots (±0.02 mm).

A further feature of the cobots is their simple control and programming functionality, which can be carried out easily by operators in the pharmaceutical business. In addition, they can be deployed quickly and flexibly in many application areas within the laboratory.

Cooperative robots without barriers

With their inherent safety features, cobots can work alongside human operators without presenting any danger. In contrast, industrial robots have traditionally needed to be operated behind physical barriers to ensure workers' safety. This requirement can have an impact on productivity, as the robot has to be stopped before it can be approached. In addition, there are complex restart procedures required after an emergency stop or if protective barriers have been opened.

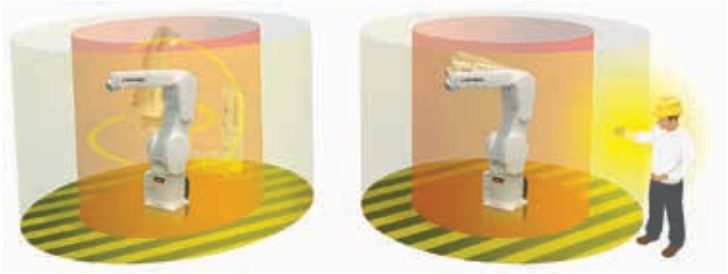
Manufacturers are looking to address this limitation through the use of optical safety systems in place of physical barriers. Laser scanners are increasingly being used to monitor defined zones around the robot: as a person enters

At a glance

- Cost-effectiveness and ease of programming make cobots suitable for use in large production facilities as well as smaller labs or multi-labs.
- In robotics, artificial intelligence can provide the ability to react appropriately to unforeseen and un-programmed situations.
- Edge computing has the the capacity to monitor production performance, inform predictive maintenance strategies, and boost production efficiencies.

the outer zone, a speed reduction function slows the robot down. If that person continues on into the area where there is a danger of direct contact with the robot, the robot stops immediately. Once the area is clear, the robot resumes operation quickly and automatically.

Mitsubishi Electric offers such a solution in its MELFA SafePlus technology. This limits the speed, range of movement or torque of the robot when safety sensors are activated, allowing operators to work safely, close to a moving robot.



For safety, laser scanners can be used to monitor defined zones around industrial robots, allowing for the robots to work alongside human operators without physical protection barriers.

Artificial intelligence

Artificial intelligence is another trend impacting on the pharmaceutical sector. In robotics, artificial intelligence can provide the ability to react appropriately to unforeseen and un-programmed situations.

AI technology is available in Mitsubishi Electric's MELIPC edge computing solution which provides a gateway between the plant floor and higher-level systems as well as offering additional functions for monitoring and analysis of data extracted from the shop floor level.

Edge computing

With the aim of increasing overall equipment effectiveness (OEE) by means of digitalisation, there is a high demand for data mining from production. This is real-time data that needs to be acted on, but it is also often sensitive data which needs to be handled securely. Here, edge computing offers a solution, enabling internal evaluation of sensitive recipe, batch and production data in pharmaceutical manufacturing.

OEE is also impacted by the efficiency of the production line itself, which is reliant on the condition and operating profile of devices. Edge computing solutions like the MELIPC provide valuable information on the status of wear parts, for example, that can be extracted to enable predictive maintenance which has significant potential to reduce service costs.

There are a number of technologies, already available, that will benefit the pharmaceutical manufacturing sector, boosting production capabilities and efficiency and enabling operations such as the efficient production of individual medicines. □

[Source: Optimal Industrial Automation]

Robots can bring greater reliability, consistency and precision to the pharmaceutical laboratory.

[Source: Robotronics AG]

For more information visit: eu3a.mitsubishielectric.com

[All images courtesy of Mitsubishi Electric Europe B.V. unless otherwise noted.]

Enabling IT/OT convergence for industry value

To simplify and accelerate IT/OT convergence, Rockwell Automation has introduced Factory Talk® Edge Gateway™, the first capability of its edge strategy.

Many industrial enterprises struggle to aggregate operational data from heterogeneous sources and add relevant context from the source – such as process conditions, time stamps, machine states and other production states – to the IT layer. This prevents them from uncovering potentially valuable insights at the enterprise level. While traditional gateway solutions fail to address these challenges, FactoryTalk Edge Gateway enriches OT data with critical context where it matters – at the edge – and delivers it in a flexible, common information model to IT applications. This enables industrial enterprises to derive operational insights for a competitive edge.

FactoryTalk Edge Gateway is the foundation of a broader edge platform that will include elements of pre-built data analytics models, machine learning, tailored applications, and scalable computing. It is the latest addition to the widely adopted FactoryTalk® Analytics suite that serves diverse industries and Industrial Internet of Things (IIoT) use cases. It is also a key element in Rockwell Automation's strategy to accelerate digital agility across industrial devices to cloud spectrum, with partnerships including PTC and Microsoft.

Today, many industrial facilities use heterogeneous systems and devices that generate volumes of data at high speeds – resulting in significant data silos. Connecting the dots across these data silos by building relevant OT context is key to generating higher value actionable insights. Furthermore, unless the industrial OT data is packaged into a logical data model that both IT and OT applications can understand, IT/OT convergence remains a farfetched prospect. FactoryTalk Edge Gateway automatically stitches the data together and packages it using a pre-configured information model hierarchy. It provides one solution to collect and organise the relevant data.

FactoryTalk Edge Gateway collates the operational data and packages it into a logical model that IT and OT applications can understand.

The system's data management capabilities reduce analytics data preparation efforts for data scientists or analysts by up to 70%, and provide high value OT data. The underlying common information data model

Digitalising minerals processing

The mining industry's accelerated move towards digital solutions since the outbreak of the Covid-19 pandemic is supported by FLSmidth with solutions that result from its long-established research and development focus.

Terence Osborn, FLSmidth Director of Product and Account Management for sub-Saharan Africa and the Middle East, highlights that R&D is the lifeblood of the company's new technologies. It currently has some 80 projects underway to improve its mining-related offerings.

FLSmidth's SiteConnect™ app can visualise the performance of equipment and process plants in real time on any smart device.

"The power of digital technology is certainly a key element of these efforts," says Osborn. "Together with our Blue Box digital concept, based on our ECS/ControlCenter™, which is a cybersecure interface between our equipment and cloud data storage, we use our SiteConnect™ mobile app to monitor the performance of equipment and process plants in real time. The ECS/ControlCenter™ V8 process control platform sits at the heart of our digital vision, a key component in our growing portfolio of digital solutions and services that we call ENABLR."

An example of this applied capability is an FLSmidth REFLUX® Classifier modular plant operating on a South African mine. Using SiteConnect, operations managers have real-time access to over a hundred operational parameters on the plant. Data analytics linked to the cloud data can also generate time-based trends for instant viewing on the app.

Osborn adds, "We have developed SmartCyclone™ technology for our hydrocyclones. This innovation uses sensors to detect wear and roping, a condition that reduces separation efficiency. By sending an alert when certain operating parameters are breached, the system ensures optimal efficiency is maintained, even as slurry conditions in the circuit vary."

He highlights that the company's machine-level solutions are offered as part of plant and process

is orchestrated by Rockwell Automation's FactoryTalk® Smart Object™ capability and can be efficiently mapped to on-premises or cloud applications to generate predictive insights across the enterprise. FactoryTalk Edge Gateway is designed to integrate with best-in-class ecosystem solutions like Microsoft Azure and FactoryTalk® InnovationSuite™, powered by PTC, as well as big data, IIoT and cloud applications.

Arvind Rao, Director, Product Management for Information Systems at Rockwell Automation said, "Industrial businesses need actionable enterprise-level insights to achieve their goals. As customers continue to drive IT/OT integration and leverage operational data to gain insights, they are realising that having the right OT data context is critical to scale their digital transformation initiatives. With FactoryTalk Edge Gateway, we are significantly reducing the time and effort required to build, maintain and enrich this critical OT context. This provides our customers with the opportunity to realise double-digit operational improvements through analytics."

For more information contact Rockwell Automation.
Email: mjunius@ra.rockwell.com
Visit: www.rockwellautomation.com

packages. At both plant and process level FLSmidth's advanced ECS/ProcessExpert® solutions facilitate monitoring and control, and advanced optimisation enabled by state-of-the-art AI technologies.

"It is important to remember that control systems need to be flexible, so they adapt to customers' needs and to their existing systems," Osborn says. "With FLSmidth's depth of expertise in software engineering and machine control, we can ensure our machine-level systems connect with all market-leading control systems – to seamlessly deliver the data that mines need for effective decision-making."

The company's R&D pushes the boundaries of performance in a range of minerals processing fields. These include advancing its lamella plate technology in mineral separation applications, adapting its vertical roller mill for dry grinding in mining, and extending the wear life of pumps with new polymers.

For more information contact FLSmidth.
Tel: +27 (0)10 210 4000
Email: flsm-za@flsmidth.com
Visit: www.flsmidth.com

Standard-setting industrial single pair Ethernet

Mouser Electronics, Inc., authorised global distributor offering the newest semiconductors and electronic components, is now stocking T1 Industrial single pair Ethernet (SPE) products from HARTING. Selected by the International Electrotechnical Commission (IEC) as the standardised SPE mating face (IEC 63171-6), HARTING's innovative T1 Industrial products enable transmission of data via Ethernet using just two wires, and also offer simultaneous power supply for terminals using Power over Data Line (PoDL).

HARTING T1 Industrial SPE products allow barrier-free connection of sensors, equipment and actuator technology into the field level using end-to-end IP-based communications, delivering new space and power efficiencies for a range of industrial and communications applications. The products boast a robust industrial design with locking lever protection, high mating cycles, and 360-degree shielding. In addition to the IEC 63171-6 standardised mating face, the T1 Industrial products meet cabling standards according to ISO/IEC 11801 and TIA 42.

The new devices support the construction of future-proof SPE communication networks while also offering remote power supply for all PoDL classes. T1 Industrial SPE products simplify parameter setting, initialisation, and programming of communication networks, improving the efficiency of equipment set-up, operation and maintenance.

As an authorised global distributor, Mouser offers a wide selection of semiconductors and electronic components. Its customers can expect 100% certified, genuine products that are fully traceable from each of its manufacturer partners. To facilitate customers' designs, Mouser hosts a library of technical resources on its website, including a Technical Resource Centre, product data sheets, supplier-specific reference designs, application notes, technical design information, engineering tools and other information.

HARTING develops, manufactures and sells electrical and electronic connectors, device terminations, backplanes, and network components as well as cable harnesses for networks or machinery, or for power and data application in factories. HARTING products are used in mechanical and plant engineering, factory automation, power generation and distribution as well as industrial electronics and telecommunication.

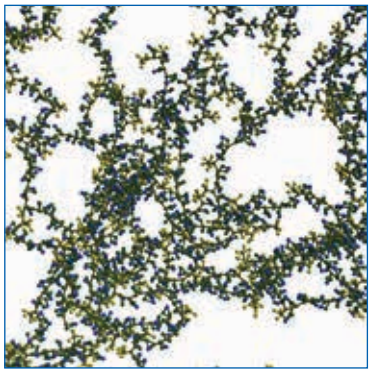
For more information visit: www.mouser.co.za

HARTING's T1 Industrial single pair Ethernet products are now available from Mouser.

A new dimension in simulation software

Siemens has signed an agreement to acquire Culgi, a computational chemistry software company with a focus on multiscale simulations in the process industries. Culgi will join Siemens Digital Industries Software where its solutions will expand the simulation capabilities of the Xcelerator™ portfolio with quantum and molecular chemistry models that couple with the continuum approach in Simcenter™ STAR-CCM+™ software. This unique engineering workflow can deliver significant cost savings and accelerate innovation in the materials and process industries, increasing the potential for product and process transformation.

"Innovations in soft materials engineering begin at the quantum and molecular levels," said Jan Leuridan, Senior Vice President, Simulation and Test Solutions, Siemens Digital Industries Software. "With Culgi technology as part of the Simcenter portfolio, process engineers will gain access to a comprehensive digital twin that combines micro-scale, meso-scale and macro-scale modelling. This tightly integrated workflow enables the design exploration of advanced materials in the context of product performance objectives, and we welcome the team to Siemens."



Chemistry modelling in Siemens' Xcelerator portfolio will facilitate innovation in the materials and process industries.

The acquisition of Culgi builds on Siemens' November 2019 acquisition of MultiMechanics, which added efficient prediction of solid material properties and behaviour to the Simcenter™ portfolio. With Culgi's soft materials simulation, Simcenter can offer an integrated CAE solution that enables performance-driven optimisation of advanced materials.

Johannes Fraaije, Professor at Leiden University and CEO of Culgi, said, "We are excited to join Siemens and help create the future of simulation software. Virtual screening of novel materials in an early stage of development is a key enabler of digitalisation in the chemical industries. With the integration of Culgi molecular simulation software and services in the Simcenter portfolio, engineers have an extra handle to design materials efficiently and effectively, with desired properties all along the value chain from inception, to process development, to logistics and market analysis."

Founded in 1999 in Leiden, The Netherlands, Culgi develops software solutions for multiscale chemistry simulation, from quantum chemistry to molecular dynamics. Its products are used by companies to design and analyse new materials in domains such as speciality chemicals, batteries, pharmaceuticals and cosmetics. The transaction is expected to close in calendar year 2020.

Siemens Digital Industries Software is driving transformation to enable the digital enterprise encompassing engineering, manufacturing and electronics design. The Xcelerator portfolio helps create and leverage digital twins that provide organisations with new insights, opportunities and levels of automation to drive innovation.

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

Ethernet communication for Ex areas

As an addition to excom, the Zone 2 Ethernet gateway enables safe and fast Ethernet communication in Ex areas.

Facilitating digitalisation and Industry 4.0 in process industries Turck has introduced the first Zone 2 Ethernet gateway for the excom I/O system. All process data can now reach IT systems for analysis and evaluation at sufficient speed via a parallel data channel – a fast and easy way to enable condition monitoring and predictive maintenance. Controllers and control systems are protected from access attempts. The new GEN-3G multiprotocol device operates at high data rates in Profinet, Ethernet/IP or Modbus TCP networks without the need for manual intervention.

The integrated gateway switch enables the implementation of linear topologies which can be connected easily in the network to form a ring. Besides the hardware redundancies for power supply units and gateways, excom also supports redundancy concepts such as S2 system redundancy to ensure maximum availability. In addition, it can provide special solutions for protocols that do not specify any native standards for redundancy. The I/O system thus offers a standard redundancy landscape for operators, irrespective of the protocol used at a particular site or plant section.

excom can be used for Zones 1, 2 or the safe area and users can always rely on the same DTM, EDS or GSDML, and the same operator logic. This reduces training required and allows for flexible use by specialist personnel in different plant sections.

Turck's cloud components and edge devices, such as the TX700, are ideal solutions for calling up and routing the parallel process data. The tailored graphical user interfaces for industrial applications simplify the selection of the relevant information. The analysis systems can be hosted in the Turck cloud, by other cloud suppliers, or in the local network. Turck's encrypted Kolibri cloud protocol as well as MQTT and OPC UA are available as protocols.

For more information contact Brandon Topham at Turck Banner.
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Visit: www.turckbanner.co.za

Improved storage technology key to renewables market

Improving access to reliable and sustainable energy will be critical for economic and social development on the African continent. This is the view of Daniel Goldstuck, Head of Energy Storage Services at the SOLA Group who spoke at the solar and energy storage event in November, Solar Power Africa.

According to the International Energy Agency, renewable energy will make up almost half of sub-Saharan Africa's power generation growth by 2040. The uptake is largely a result of improved technologies, adjusted regulations promoting access to electricity and particularly renewable energy, and substantial reductions in cost.

Most national grids are designed in a way that requires a consistent and equal balance between electricity supply and demand to function properly. Goldstuck says that among the biggest challenges utilities face are when the electricity system cannot carry enough energy to meet the demands of consumers, or cannot distribute the excess energy across constrained networks.

"The integration of bulk energy storage into an electricity grid can help utilities mitigate costs and reduce the chance of outages, particularly during periods of high demand or intermittency, which may become a concern with mass integration of solar and wind power," he adds.

Utilities are also making use of bulk energy storage to reduce costs. The provision of large-scale energy storage on site obviates the need to build or expand large transmission lines from areas where electricity is generated, enabling power to be dispatched consistently to meet demand.

Goldstuck explains that, in addition to grid stability and cost reductions, energy storage provides an essential technology intervention in African countries where grid access might be limited or weak. "Energy storage can, for example, be used to serve additional power requirements where there are only nominal household grid services supplied via small energy devices – enabling economic development in previously underdeveloped areas.

"Energy storage can enable the broader use of renewable energy, and energy services in general, in very remote areas," he points out.

In the energy storage market currently, lithium-ion batteries dominate, largely driven by the uptake of electric vehicles. Lithium-ion batteries are now emerging as a suitable technology for stationary energy storage with improved round trip efficiency, cycle life, decreased storage capacity degradation and black-start capability to restart grids that have experienced outages.

Some of the new technologies that are expanding the energy storage market further include electrochemical energy storage systems, such as flow batteries and some non-lithium battery chemistries that boast improved long-duration capabilities. Flow batteries, for example, circulate a liquid electrolyte through stacks of electrochemical cells and have long held the promise of 10-hour durations, tens of thousands of cycles and minimal degradation.

Reliable sustainable energy is critical to social and economic development in Africa.

Goldstuck says that at current costs, multiple forms of energy storage are now economically viable and offer improved duration capabilities that can accelerate solar and wind penetration and grid resilience, and serve to stabilise volatile energy prices if regulation and policy are improved.

In South Africa, this has been recognised with Eskom calling for bids for the design and construction of a battery energy storage system (BESS) for the Skaapvlei substation at Vredendal, in the Western Cape. The aim is that the BESS will improve the export of energy from the Sere wind farm to the grid, while further BESS procurement under the same programme is intended to address voltage and capacity constraints, support the integration of renewable energy onto the grid, and reduce the need to expand some distribution substations and power lines.

For the continent, the biggest challenge in this regard is that there has been a lack of policy commitment to fully integrate these new technologies. Goldstuck says this is imperative to ensure investment into large storage projects in Africa and smooth regulations around local storage assets within the distribution networks.

Storage delivers benefits at all nodes of the network: as a transmission asset within a distribution substation yard to defer power line construction, or

Continued on page 11

Innovation in solar storage technologies

According to the International Energy Agency's World Energy Outlook, published in October 2020, solar power is now cheaper than electricity generated by coal and natural gas in most countries. This is contributing to the profound global shift from fossil-fuel based power generation to the use of renewable energy sources.

The IEA further states that about 275 GW of coal-fired capacity worldwide, 13% of the 2019 total, will be discontinued by 2025, mostly in the US and the European Union. It is estimated that renewable energy will supply 80% of total global power generation by 2030, supported by many government post-pandemic stimuli packages aiming at renewable transformation.

Executive director of the IEA, Fatih Birol says, "I see solar becoming the new king of the world's electricity markets."

The coronavirus pandemic has put the green energy sector in focus. With economies disrupted globally, governments around the world are launching significant investment programmes in renewable energy. One major catalyst in this journey is the development of new energy storage technologies which have started to reach industrial production volumes leading to competitive levels of investment.

Azelio has developed an energy storage solution using recycled aluminium to store energy generated from solar and wind power as heat and supply electricity on demand.

According to Goldman Sachs, spending on renewable energy will surpass that on oil and gas for the first time in 2021, with the total investment anticipated to reach US$16 trillion over the next decade.

World leaders continue to pledge carbon neutrality over the coming decades.

- China for example, has recently declared its commitment to carbon neutrality by 2060.
- The European Parliament has voted for all EU countries to be climate neutral by 2050 and, at the same time, has raised interim targets for 2030 and 2040.
- California, regarded as the world's fifth largest economy, has decided to phase out petrol cars by 2035 as a step towards climate neutrality.

One of the key factors in achieving these ambitious targets is sustainable energy storage, as neither wind nor solar power offers secure 24/7 year-round supply. Diesel is still the default option as a backup for solar power, but it is suggested that diesel generators may soon become obsolete. This consideration, together with the debate around lack of lifecycle sustainability in energy storage batteries, has placed renewable energy storage innovation in the spotlight.

Swedish company Azelio's energy storage technology is designed to store energy from solar and wind power as heat in recycled aluminium modules and generates electricity and heat on demand at any hour of the day. The system does not degrade over time and is fully recyclable at end-of-life. It is modular, offering installations from 0.1 MW up to 100 MW.

Jonas Eklind, CEO of Azelio says, "In order for us, as a global community, to make this massive change towards renewable energy, there are two things we need to focus on: the digitalisation of the power grid and the development of energy storage. Here Azelio, with an affordable, flexible and sustainable solution for long-term energy storage, has a great opportunity to make a difference. We recently received a third-party lifecycle analysis report that shows

One of the technology verification projects under way is sited at the world's largest solar park, in Morocco.

At a glance

- With the green energy sector in focus and world leaders pledging carbon neutrality over the coming decades, sustainable energy storage for renewables becomes a key factor.
- Azelio's energy storage technology is designed to store energy from solar and wind power as heat in recycled aluminium modules.
- The system presents an alternative to diesel-generated power and batteries as today's standard backup and storage solutions.

the Azelio storage system has a 29 percent lower carbon footprint than lithium-ion batteries and a 97 percent lower carbon footprint than diesel generators.

"We are often told that we are competing with batteries – or other types of renewable energy storage products – but we really don't see it that way," Eklind says. "I prefer to look at us as partners in the battle against climate change. We have specific areas and markets where our solution is more effective and efficient than batteries and vice versa. In that way, we are complementing each other. Furthermore, the energy demands of society are so huge that there is not going to be one silver bullet to solve the climate change problem – rather we must all come together to collaborate to overcome climate change. There is more than enough room in the market for Azelio's aluminium storage modules to coexist together with lithium-ion batteries and many other types of renewable energy storage systems, and I'm very happy that we can work with them towards this common goal."

Azelio presents an alternative to diesel-generated power and batteries as today's standard backup and storage solutions in the solar energy sector. Following the completion of verification projects currently in progress, production is scheduled to start in Q3 2021 and clients in Asia, the Americas, Africa and Middle East are already committing to implement Azelio's thermal storage technology.

"We are meeting with clients involved in significant renewable energy projects. A few weeks ago we signed an MoU on 85 MWh over five years with project developer ATRIA in India. We are also signing an MoU with the state-owned ISETT SETA (the Information Systems, Electronics and Telecommunications Technologies Sector Education and Training Authority) in South Africa. This project alone has the potential to provide clean energy to 400 schools in South Africa," says Eklind.

Azelio is running three verification projects: one in Sweden, one with Masen (Moroccan Agency for Sustainable Energy) in Morocco, and one with Masdar in Abu Dhabi in the United Arab Emirates (see *Electricity + Control* April 2020). To date all results data are as predicted and running according to plan; in Morocco the installed system delivers a maximum amount of energy during the dark hours.

"The Azelio solution, using recycled aluminium as the storage medium, is enabling clean electricity to be supplied when and where it is needed, all hours of the day. The combination of high energy density without degradation in capacity over time makes the system cost competitive and clean compared to diesel power and batteries," Eklind says. □

For more information visit: www.azelio.com

Improved storage technology key to renewables market

Continued from page 9

behind the meter within a distribution network to provide multiple stacked and synergistic services to the end customer and distribution network service provider.

"Improved storage technology enables the integration of renewable energy from utility to embedded generation scale, bringing energy innovation to address the challenges that many countries face," Goldstuck says. "Storage is fundamental to ensuring the reliability of a high-penetration renewable energy grid for greater economic and operational benefit and to reducing the cost of electricity across the continent," he says.

"There is no doubt that improvements in energy storage technology will play a central role in providing Africa with reliable, cost-effective clean energy, enabling further economic activity and growth," Goldstuck adds. □

For more information visit: https://sola.africa/

Stabilising power supply at Dube AgriZone

Dube AgriZone in Dube Tradeport near Durban is a large-scale producer of short shelf-life vegetables for retail markets in South Africa and for export. The facility is the largest climate-controlled agricultural facility in Africa, growing crops hydroponically using advanced, soil-free processes that require significantly less water than conventional farming methods.

The site covers some 16 hectares – the area of about 30 football pitches – where greenhouses, plant nurseries and laboratories are equipped with sensitive electronic instruments, pumps and fans regulating the hydroponic process.

Faced with frequent voltage dips and variations in the site's power network causing damage to expensive process control equipment and, in turn, plant outages and production losses, Dube AgriZone appointed Hamsa Consulting Engineers to solve the problem. A power quality study identified the need for voltage conditioning and ABB's high speed PCS100 AVC-20 Active Voltage Conditioner provided the solution.

Sashlin Govender, Project Engineer for Hamsa Consulting Engineers, which is an authorised partner of ABB South Africa, said: "Our benchmarking work identified the PCS100 AVC-20 as having the speed needed to give the facility the stable power its processes require. Over the first six months since installation, the AVC-20 has reduced equipment failure and process disruptions at Dube AgriZone to zero, protecting production, equipment and profits, and benefitting production efficiency."

The PCS100 AVC-20 is ABB's proven inverter-based system for use where an unstable network or utility voltage

Dube AgriZone is the largest climate-controlled agricultural facility in Africa, growing crops hydroponically.

affects productivity. The system's advanced control software continuously regulates the voltage, detecting and regulating even major voltage dips in less than 20 milliseconds, to ensure clean, constant power for sensitive equipment. The system allows facilities to use utility power, without the need to install battery systems or captive power plants.

Ivor Becks, UPS and PCS100 Sales Specialist at ABB in Southern Africa, said: "ABB holds a leading role in power protection, providing efficient solutions that ensure industrial processes receive the continuous, high-quality power they need. Our fast, accurate voltage regulation devices protect sensitive equipment to secure productivity, and are backed by local teams of experts who help projects run smoothly, keeping the cost of ownership low."

At the Dube AgriZone Hamsa Consulting Engineers had to install the AVC quickly and efficiently to keep the plant shutdown to a strict minimum and protect the hydroponic process. Having attended technical training at ABB's New Zealand factory, which qualified the firm to become an ABB Authorised Systems Integrator for the PCS100 range,

Knowledge sharing and best practice in solar power

Unlocking the potential of solar power and ensuring South Africa reaps the economic and societal benefits of renewable energy took a positive step forward recently as the South African Photovoltaic Industry Association, (SAPVIA) and SolarPower Europe, the European association for solar power, formed a partnership.

Both SolarPower Europe and SAPVIA have been at the forefront of shaping the regulatory environment in their respective territories. By joining forces, they will drive innovation through knowledge sharing, adopting best practice and the exchange of information. The partnership will serve to elevate the sector and enable it to deliver on its potential to reach nearly 1 TW of global generation capacity in 2021.

The partnership between SAPVIA and SolarPower Europe will open new opportunities for growth in the solar power industry.

SAPVIA COO, Niveshen Govender says, "This partnership will allow SAPVIA to help our members capitalise on the significant opportunities solar PV offers. We need to create the right framework for growth, establish the right governance and renewable energy regulations and ensure industry is ready to make the step change and accelerate the growth of solar PV.

"Working with SolarPower Europe we will share knowledge and global best practices with our members to develop and grow the solar PV value chain in South Africa. We will also help create new business opportunities in the European and South African solar PV markets by cooperating across a number of key areas that we believe will deliver immediate and sustainable results."

Over the next 12 months, SAPVIA and SolarPower

its planning, engineering and electrical design teams had the skills to carry out the seamless, efficient installation and commissioning of the PCS100 AVC-20 at the client's facility.

The turnkey solution comprised a 500 kVA PCS100 AVC-20, with ABB Tmax moulded case circuit breakers, and an ABB surge protection device. Power quality analysis of the PCS100 AVC-20's performance has shown the solution is exceeding expectations in solving the power quality issues at the site. Following the success of this project, Dube AgriZone has called for the installation of a second PCS100 AVC unit for the laboratories at the site.

The PCS100 AVC-20 removes voltage fluctuations of about 20% from the power network, preventing equipment malfunctions to stabilise productivity and improve operational consistency.

ABB's solution uses an injection transformer in series with the load, enabling the two converters not on the current path between the load and the utility to either add or subtract voltage as required, and provide continuous, efficient and precise regulation. In the event of an overload or internal fault condition, a redundant internal bypass ensures the load is continually supplied from the utility.

For more information contact ABB.
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Email: Busisiwe.molefe@za.abb.com
Visit: https://new.abb.com/africa

Europe members will gain access to webinars and events, starting with knowledge sharing and the development of best practice guidelines for solar PV operation and maintenance.

The partnership will allow South African and European players to access knowledge on digitalisation and energy storage, policy advocacy, regulatory frameworks, and sustainability and recycling, to develop solar power's global potential.

In announcing the partnership, Walburga Hemetsberger, CEO of SolarPower Europe said: "South Africa is the largest solar market in Africa and the potential for growth is extraordinary. We look forward to exchanging knowledge and best practices to benefit both the European and South African solar sectors. Together, we can accelerate the growth of solar power, bring significant economic and social opportunities to both continents, and pave the way to a climate-neutral future."

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

Customised genset for platinum mine

Craig Bouwer, Projects and Product Manager for generator sets at Zest WEG.

Zest WEG is constructing a 2 500 kVA diesel-powered generator set to be delivered later this year to provide standby power to a customer in the South African platinum mining sector.

At this capacity, it will be the largest unit yet to be fully load-tested at the company's genset manufacturing facility in Cape Town, according to Craig Bouwer, Projects and Product Manager at Zest WEG.

"In addition to functional testing, we will be equipping ourselves to conduct load testing to 11 kV on this unit," says Bouwer. "With load-banks in-house, we will be stepping the voltage down to 400 V during the testing, and drawing on MV specialists to ensure a safe and reliable process."

The genset has been designed to fit given space constraints and is housed within a 12 metre ISO shipping container with the electrically driven radiator mounted on the roof. In terms of engineering design, Bouwer says it is a highly technical solution to match the customer's specific needs, prime-rated at 11 kV and powered by an MTU diesel engine. He highlighted the detailed and time-consuming nature of engineering design for a project of this magnitude and complexity.

"Stringent technical requirements demanded lengthy and ongoing collaboration with the customer over several months, and between our engineering team and production operations," he says. "The customer was particularly pleased with our flexibility and the extra effort we applied to ensure the optimal technical returnables for the project."

As one of the few original equipment manufacturers that can undertake the design and construction of a customised genset of this capacity in-house, Zest WEG will also be supplying the control and protection panel from its extensive range of electrical equipment and products.

"To enhance safety and ergonomics, the control panel is in its own compartment within the ISO container," Bouwer says. "A 1 000 litre bunded day tank has also been installed inside a separate compartment within the container, including a fuel cooler and filtration system."

He notes that the Covid-19 lockdown has had minimal impact on the work schedule as planning and communication with the customer could continue anyway, dealing with various technical clarifications. To facilitate the transportation of this large unit to site, it will be shipped as three separate components: the genset, radiator and exhaust system. Once installation is complete – a process that Zest WEG specialists will supervise – the company's experts will conduct the cold and hot commissioning, and hand over to the customer.

In construction, the 2 500 kVA genset after the engine has been positioned within the container and silencer mounted on the roof.

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

Digital transformation key to energy efficiency

Digital transformation in the power and energy sector is a key step in national and regional plans to improve energy efficiency throughout sub-Saharan Africa. As economies across the region power up and organisations focus on how they resume operations, research by Schneider Electric underlines the importance that digital transformation has with regard to energy efficiency, cost savings, and sustainability.

The findings of the Global Digital Transformation Benefits Report, initially released in 2019, have been validated by Schneider Electric's customers in the Middle East and Africa through 2020. The initial report was developed from a repository of 230 customer projects Schneider Electric had completed in the preceding five years across 41 countries The results confirm that there are four principal outcomes of any successful digital transformation: remote capabilities, resilience, efficiency, and sustainability. These four elements are providing digitally-focused companies with a base for growth, even during this time of crisis.

In a panel discussion hosted by Schneider Electric in South Africa as part of the run up to the annual Innovation Summit Middle East and Africa held in October 2020, Barry Bredenkamp, General Manager Energy Efficiency at the South African National Energy Development Institute (SANEDI), spoke of the role energy efficiency should play in getting economies up and running to their full capacity.

One advantage of digital transformation is that it enables ongoing energy management, optimising energy efficiencies.

"Energy efficiency is a key enabler of economic growth; it will create jobs, get the economy moving faster, and reduce costs. Long term, it will help create greener and more sustainable industry. Digital technologies have the potential to optimise energy usage in many areas – from making an industrial product to cooling a home. Each

Wärtsilä's Modular Internal Combustion Engine (ICE) power plants offer a reliable backup option for industry and utilities.

The need for flexible technologies

With South Africa's power generation capacity constrained as it is, there is a need for fast and cost-effective ways to address the electricity supply gap. This is possible through more flexible technologies such as renewable power technologies and flexible generators. Wärtsilä suggests that a flexible generator is one that can address power system supply and demand variations quickly and efficiently to maintain an acceptable quality of supply. As a leader in energy storage solutions, smart technologies and lifecycle solutions for the energy market, the company highlights that generators must have fast-starting capabilities with low starting costs, provide a high degree of availability and reliability, and must be able to generate efficient power at all output levels.

Wärtsilä introduced its modular internal combustion engine (ICE) power plants to offer system operators – such as Eskom, in South Africa – a limitless number of fast starts and stops at no operational cost. With under-five-minutes starting times (from idle to full load), ICE power plants, of any scale, provide operating reserves without the operator having to be concerned about incurring start-up fuel or additional maintenance expenses.

Using ICE plants, system operators like Eskom have the freedom to optimise the entire power system by backing up failing coal units cost-effectively and meeting peak demand energy requirements, minimising the risk of load

represents an increase in energy efficiency. Increasing end-use efficiency continues to be a critical factor in the energy transition in South Africa and globally, with benefits in both developed and emerging economies," Bredenkamp said.

Taru Madangombe, VP Energy Business, Schneider Electric Anglophone Africa said, "The pandemic is transforming every business and this year is a reminder of why agility, efficiency, and resilience matter so much. Organisations are looking to save costs while working towards becoming more responsive to customer needs. The single solution we have found to both is digitalisation. Those organisations that have been digital pioneers have had a substantial edge over the competition. Covid-19 has accelerated digital transformation and every organisation that has invested in it is now benefiting from increased resilience, efficiency, and sustainability, and being able to operate remotely."

Energy efficiency has always been important for industry and this has been re-emphasised during the pandemic. Organisations are always looking to reduce costs, speed up response times and improve efficiencies. Madangombe referred to the case study of South Africa's RCL Foods, a producer of private label food products, which implemented a modern, reliable automated control system with remote access capabilities. For the company, this has resulted in greater visibility into the plant's operations, reduced downtime, and a 20% increase in throughput.

For more information contact Schneider Electric.
Tel: +27 (0)11 254 6400
Visit: www.se.com

shedding. It would also enable the introduction of more cost-effective and sustainable renewable energy sources which will lower the cost of energy for South Africa. As the country tries to meet the electricity demand of businesses and consumers, a plant that can operate across technologies and run optimally in a cost-effective way will bring further benefits to the market.

An accelerated and up-scaled deployment of renewable energy supply technologies, as outlined in the IRP2019, will contribute to stabilising electricity price increases, offering relief to consumers, and potentially deliver significant employment opportunities, environmental benefits and cost savings.

Wärtsilä Modular Block is available for three engine types: Wärtsilä 34SG spark-ignited gas engines, Wärtsilä 32 (HFO and LFO) and Wärtsilä 34DF (dual-fuel) engines, all in 12 V, 16 V and 20 V configurations.

With regard to reducing greenhouse gas emissions, Wärtsilä gas engines can operate on combustible gases of different origin, including biogases. The engines also allow for a future switch to renewable fuel. For maximum fuel flexibility, the solution can be configured to a gas, liquid fuel or even dual- or tri-fuel configuration, making it a suitable companion to intermittent renewable energy sources such as wind or solar power plants. Such a multi-fuel-plus-renewable combination offers a highly available low-emission power source, which helps maximise the use of locally available energy resources.

For more information contact Wärtsilä.
Visit: www.wartsila.com/zaf

Renewable energy projects in Africa

With its home base in South Africa and a clear focus on the African continent, engineering, design and advisory company Zutari has been involved in a substantial share of the utility-scale projects undertaken in SA's REIPPP programme to date and is involved with a number of projects and regional initiatives in other African countries. Leigh Darroll put some questions to Paul Nel, Expertise Leader: Generation and Storage at Zutari, about projects currently in progress, and the benefits emerging from the wider implementation of renewable energy across Africa.

Paul Nel, Expertise Leader: Generation and Storage at Zutari.

Zutari has a strong engineering presence in Cape Town and Pretoria. The energy division operates along four business lines: generation, transmission and distribution, industrial energy solutions, and power system studies.

Nel explains that these four operational lines provide a comprehensive energy service, including detailed design, owner's engineer, construction supervision, O&M (operations and maintenance) support, EPCM (engineering, procurement, and contract management), technical reviews, and due diligence and advisory work.

In the electricity generation space, the Generation team is particularly strong in hydro, solar, wind, and gas as well as hybrid and storage technologies. The Transmission and Distribution team is a leader in transmission and distribution substation and line design, and has been involved with numerous grid connection projects for the REIPPP (Renewable Energy Independent Power Producer Procurement) Programme, as well as elsewhere in Africa.

The Power Systems and Planning team adds an advantageous ability to undertake complex network and planning studies required not only for local grid connections, but also for the planning of large regional and cross-border transmission interconnections.

The Industrial and Automation team operates mainly with large power users such as water and power utilities as well as resources industries, providing services pertaining to medium voltage (MV) system design, control systems and automation, and IoT implementation.

Current projects

In South Africa, Zutari is currently involved in supporting its clients in the RMIPPP (Risk Mitigation Independent Power Producer Programme) and in preparing for the long upcoming REIPPPP Round 5. Elsewhere in Africa the company is engaged in several interesting projects, such as the Toliara hybrid project in Madagascar where it is supporting a client with the development of a large solar, HFO (heavy fuel oil) and battery storage solution. It is also supporting a client in Malawi with the development and construction of two solar facilities. In Rwanda it is assisting with the design of the Natruka hydropower plant, and in Burundi, Zutari is the contractor's engineer for the Jiji and Mulembwe hydropower plants. More locally, the company is supporting Red

Zutari has been involved in a number of the REIPPP projects completed in South Africa to date, including wind and solar power projects.

Rocket with the design, construction and commissioning of the Kruisvallei hydro plant.

The industrial team is working on a number or wastewater treatment works in South Africa, assisting with automation and MV designs.

Looking forward

Considering the impact of the Covid-19 pandemic and looking ahead, Nel says, "We have found the impact of the pandemic has been limited mostly to the projects that were under construction at the time lockdowns came into force. None of the projects that we are currently working on has been cancelled and most are in full swing again.

"Looking forward, our view is that energy development will be driven primarily through renewable energy projects. It appears that the pandemic has moved the energy focus even more towards renewables."

Benefits emerging

"Access to electricity changes everything in communities," Nel says. "We see this impact in every project that we are involved with in areas where electricity has been lacking. There is still much to do in Africa but we are moving in the right direction and we are very privileged to be part of this African journey. Our focus is to ensure that the best possible infrastructure is built wherever we may be involved. It has to be sustainable. This will ensure our impact is not just immediate but will be there for generations to come."

Advances in energy technologies

With regard to new technologies in renewable energy generation and energy management systems, Nel notes, "We are constantly seeing advances in solar PV technology. Manufacturers are pushing higher efficiency products into the market, enabling designers to produce better optimised designs. One of the recent developments is the use of bi-facial PV modules. These are capable of collecting energy from direct sunlight as well as from the light reflected onto the back of the panels. Two years ago this was quite niche, but more of our clients are asking for this technology.

"In operations and maintenance we are definitely seeing increased use of data and data analytics to optimise production outputs, increased use of IoT devices, and the implementation of advanced monitoring systems. The use of drones for inspection of, for example, wind turbine blades, or the condition of solar panels is becoming standard too.

"Zutari is a leader in the digital space with regard to energy and our clients recognise this, notably in our use of digital solutions, 3D design and visualisations.

"We make use of 3D design tools such as 3D CAD and we have an advanced in-house visualisation team that can produce interactive and immersive visual experiences through VR (virtual reality), AR (augmented reality) and 3D gaming interfaces.

"In addition to this we have already made significant progress with some ground-breaking computation design solutions in the solar PV space, and we have been doing remote monitoring of construction using drones with integrated 3D gaming visualisations. We are also building a strong offering in data analytics and machine learning to assist our clients in gaining the most out of their facilities."

At a glance

- "Access to electricity changes everything in communities," Nel says. "We see this impact in every project that we are involved with."
- Ongoing advances in solar PV technology see manufacturers constantly bringing higher efficiency products onto the market.
- There is also increasing use of new technologies in operations and maintenance, data and data analytics, IoT devices, and monitoring systems.

New opportunities

In South Africa, it certainly seems that progress is being made to re-activate the rollout of new generation capacity and build a stronger, cleaner and more resilient energy supply system. The IRP2019 opens the way to the energy transition with new build renewables constituting an increasing proportion of energy supply through the coming years. We have seen NERSA's approval for government to procure more than 11 000 MW of new energy within the short-term; the bid window for Round 5 of the REIPPP programme is anticipated to open in December 2020; and most recently we have seen the gazetting of amended regulations which allow for municipalities to procure additional generation capacity from independent power producers, subject to certain conditions.

Nel highlights that there has indeed been a huge change in the 'energy' around energy in South Africa. "We are all super excited about the momentum that has been building around this through 2020. The new projects we are seeing will not only ensure less reliance on a central utility to supply all the country's electricity needs, but will also create numerous job opportunities and drive innovations around how electricity is generated, distributed and traded."

The restructuring of Eskom into separate transmission, distribution and generation businesses is moving ahead and there seems to be strong commitment from all parties to establish an Independent Transmission System and Market Operator.

"The industry has been hoping and waiting for this change for many years," Nel says. "What an unbundling of the national utility will eventually mean is that private developers will be able to develop projects and contract with clients directly through power purchase agreements (PPAs). This will unlock substantial international and private sector investment. For Zutari, with our diverse services in this market, we see many opportunities to assist clients in these unfolding projects."

In conclusion Nel adds, "We are very proud to be an African born and raised company capable of delivering world-class service and engineering, ground-breaking technological solutions and strong, committed relationships for our clients and in turn, the people affected by them." □

For more information visit: www.zutari.com

Sahofika hydropower project, Madagascar

The African Development Fund earlier this year approved a 4.02 million euro loan with a grant component to finance the government of Madagascar's 30 million euro equity investment in the Sahofika hydropower project, which will generate affordable, clean energy benefitting some 8 million people.

The Sahofika project is located on the Onive River, 100 km southeast of the capital Antananarivo. It entails the construction of a 205 MW hydroelectric power plant on a Build-Own-Operate-Transfer basis and includes the construction and rehabilitation of 110 km of access roads and construction of a 75 km, 220 kV transmission line. Once commissioned, the Sahofika project is expected to contribute to avoiding emissions of some 900 000 tonnes of CO_2 equivalent annually.

The government has committed to plough back the returns from the project to reduce electricity tariffs for the people of Madagascar.

Additional funding for the project was expected to come from the European Union and the Arab Bank for Economic Development in Africa.

"The support to the Sahofika project exemplifies the African Development Bank's commitment to delivering quality, affordable energy access across the continent for sustainable and inclusive growth, and helping member countries to harness their underdeveloped renewable energy resources responsibly. As the largest hydropower project under development in the country, the Sahofika project will unlock Madagascar's hydropower potential and diversify its energy mix in favour of renewables at 90%," said Dr Kevin Kariuki, the bank's Vice-President for Power, Energy, Climate Change & Green Growth.

In December 2019, acting as Mandated Lead Arranger, the bank approved a partial risk guarantee of $100 million towards the Sahofika project to mitigate liquidity risk. The

Sahofika hydropower project, Onive River, Madagascar

bank is also supporting the Power Transmission Network Reinforcement and Interconnection Project, aimed at reinforcing and expanding Madagascar's transmission network in order to carry the additional power generated by this large hydro project.

"The Sahofika project is a cornerstone of the bank's strong support to the power sector in Madagascar. The commissioning of Sahofika will enable national utility (JIRAMA) to save around 100 million euros annually in fuel costs, while phasing out the need for state subsidies," said Mohamed Cherif, the African Development Bank's Country Manager for Madagascar.

The Sahofika project is aligned with the bank's New Deal on Energy for Africa, and its Climate Change Action Plan, which share the collective goals of expanding green energy infrastructure for sustainable and inclusive growth. It is also in line with the government of Madagascar's energy policy.

The African Development Fund (ADF) is the concessional financing window of the Bank Group that provides low-income Regional Member Countries (RMCs) with concessional loans and grants in support of projects that spur poverty reduction and promote economic growth.

For more information visit: www.AfDB.org

SA energy storage system wins Namibian export

South African energy storage company, BlueNova Energy (Pty) Ltd., achieved a significant milestone in the energy sector with the first export of its intelligent Energy Storage System (iESS). The containerised energy solution is the result of years of development in the lithium-battery sector. The 1 MWh battery unit being exported to Namibia is to be installed at Timbila Nature Reserve, as the heart of an off-grid, solar-powered system.

The 1 MWh energy storage system on its way to Timbila Nature Reserve in Namibia.

BlueNova CEO James Verster says, "We are very excited to achieve this landmark export and support a growing industry in renewable and off-grid technologies in Africa. Many countries suffer from unstable grid supplies and high electricity costs.

"We competed against three of the world's leading energy companies for this bid – being a local supplier with local support is what won it for us. The local energy storage sector is increasingly cost-effective, innovative and competitive – benefits to the environment and consumers will only increase."

The Timbila Nature Reserve iESS is fitted with a 250 kW inverter and 1 000 kWh lithium battery, the equivalent of power required to serve almost 80 standard homes for more than 12 hours. The export of the iESS marks a milestone for BlueNova Energy. The company will be producing further units over the next year to combat load-shedding and increasingly onerous electricity tariffs in South Africa, as well as for the export market. Recently partnered with the JSE-listed Reunert Group, BlueNova Energy is a leading South African energy storage solutions company.

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

Nxuba wind farm ready for energy generation

With the commissioning of its final wind turbine at the 140 MW Nxuba Wind Farm in South Africa's Eastern Cape, Enel Green Power (EGP) recently began generation and delivery of energy from the facility, despite challenges resulting from Covid-19 containment measures and national lockdown.

The Nxuba Wind Farm is one of five projects awarded to EGP South Africa in the fourth round of the country's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). Once the commissioning of all the wind turbines is complete, the projects will reach full production of 460 GWh per year to the grid.

"Nxuba Wind Farm is another example of EGP's commitment to renewables and sustainability in South Africa and globally. We are particularly excited about unlocking the potential of the abundant renewable energy sources in South Africa and supporting the local economy," said William Price, Head of EGP in South Africa.

Price explained that the pre-assembly stage involves the installation of as many as 17 concrete tower keystones. This is followed by the erection of the main structure that includes the installation of the five pre-assembled tower sections and other related operations (horizontal joints and tensioning cables), which can take up to two weeks to complete in optimal weather conditions.

The completion of the project amounted to 2 million manhours with zero incidents, and involved significant skills transfer. Enel Green Power enlisted the services of individuals and small to medium enterprises from the Blue Crane Route and Raymond Mhlaba Local Municipalities, which comprise Adelaide, Cookhouse, Somerset East and Bedford, to help construct the plant.

The 140 MW Nxuba Wind Farm in the Eastern Cape recently began generation and delivery of energy.

For more information contact Enel Green Power. Visit: www.enelgreenpower.com

The renewAfrica Initiative, the response from Europe

Enel Green Power is one of the 27 European organisations supporting the renewAfrica Initiative which was launched in June 2019 and aims to provide universal access to energy on the African continent through the growth of renewables. The initiative was recently presented to Frans Timmermans, Executive Vice-President of the European Commission for the European Green Deal.

It is in harmony with the Green Deal, Europe's ambitious project to accelerate the energy transition and make Europe climate neutral by 2050, and can contribute to the broader European project to support sustainable development on the African continent.

The organisations involved in the initiative are active across the European value chain for renewable energy. All of them are committed to supporting Africa in its efforts to extend access to energy. During the meeting with the CEOs of 18 companies and the representatives of associations, Timmermans acknowledged the relevance of the initiative to the European commitment to create a solid green economy and welcomed the work carried out so far by renewAfrica as a positive contribution to the Comprehensive Strategy with Africa.

"There is enormous potential for growth in Africa, and access to energy will be an important factor in determining the speed and the fairness of this growth. Today, wind and solar technologies can generate electricity at contained costs and often these can be implemented at local level, without the need for extensive electricity grids covering huge distances. It's fantastic to see the private sector embrace opportunities for investment, innovation and development in Africa," Timmermans said.

Renewable energy can play a valuable role in extending access to electricity and put African economic development on course towards sustainability and resilience. The economic input required to achieve this is calculated at an increase of 120 billion euros of investment a year up to 2040 – a target difficult to achieve in view of the limited capacity to attract private investment and the fragmentation of European initiatives to support investments.

Francesco Starace, CEO of Enel and Chair of SEforALL says, "What's required is a shared pathway to work towards SDG#7, and renewAfrica represents a step forward on this front."

The renewAfrica initiative proposes the creation of a single European programme that can direct investments, cover risks and follow the development of projects from start to finish, from the technical point of view and in terms of assistance to the countries concerned.

For more information visit: www.renew-africa.org

Achieving low emissions goals on Mozambique's LNG development

CCS JV (a joint venture between Saipem and McDermott) recently selected Siemens Energy to supply emissions-reducing power generation equipment and boil-off gas compressors for the Mozambique LNG project in the country's Cabo Delgado province on Africa's east coast. The project, led by Total E&P Mozambique Area 1, includes the development of offshore gas fields in Mozambique's Area 1 and a liquefaction plant with a capacity of more than 12 million tons per year.

As part of the contract, Siemens Energy will supply six SGT-800 industrial gas turbines that will be used for low-emissions onsite power generation.

With more than 400 units sold and more than eight million total fleet operating hours, the SGT-800 turbine is well proven for power generation, particularly in LNG applications, where reliability and efficiency are critical. The 54 MW turbine rating selected for this project has a gross efficiency of 39%. The SGT-800 is equipped with a robust, dry low-emission (DLE) combustion system that enables world-class emissions performance over a wide load range.

"This is Mozambique's first LNG development project and will play a key role in meeting the increasing demand for energy in Africa as well as the Asia-Pacific, Middle East and Indian sub-continent markets," said Thorbjoern Fors, Executive Vice President for Siemens Energy Industrial Applications. "We look forward to helping Total drive towards the lowest possible plant emissions profile and contributing to its goal of delivering clean, reliable energy to customers around the globe."

Siemens Energy will also supply four centrifugal compressors for boil-off gas (BOG) service. A key feature of the compressors is the inlet guide vane (IGV) system that allows for optimisation of power consumption according to changes in operational parameters such as inlet temperature and outlet pressure.

The SGT-800 gas turbines on order for the Mozambique LNG project are equipped with a robust, dry low-emission combustion system that enables world-class emissions performance over a wide load range.

The gas turbines are slated for delivery in the second half of 2021 and the first half of 2022. The delivery of the compressors is scheduled for 2021.

"We're proud to be part of this important project as a supplier of reliable, field-proven rotating equipment that will help contribute to the long-term economic growth of Mozambique and the prosperity of its citizens," said Arja Talakar, Senior Vice President, Industrial Applications Products for Siemens Energy.

The equipment order for the Mozambique LNG project comes on the heels of a recent agreement between Total and Siemens Energy to advance new concepts for low-emissions LNG production. As part of the contract, Siemens Energy is conducting studies to explore various possible liquefaction and power generation plant designs, with the goal of decarbonising LNG facilities in development and operation.

For more information visit: www.siemens-energy.com

Integrating solar power to Angola's national grid

What is described as the biggest solar project in sub-Saharan Africa is being developed in Angola.

Hitachi ABB Power Grids has been appointed by M Couto Alves S.A., part of the EPC conglomerate, MCA Group, on behalf of Angola's Ministry of Energy and Water, to supply the main electrical infrastructure to connect what is referred to as sub-Saharan Africa's largest solar project, to Angola's transmission network.

The contract includes the design, main power equipment supply, and testing and commissioning services. It is based on an in-depth grid impact study into the customer's particular requirements to determine, in advance, the best way to achieve the ambitious integration of the Government of Angola's renewable energy programme.

"This is one of the largest and most significant photovoltaic projects ever delivered," says Niklas Persson, Managing Director of Hitachi ABB Power Grids' Grid Integration business unit. "We are contributing pioneering technology to enable MCA to integrate more renewables and electrify rural areas, while maintaining a stable network. Our role is to develop the project from idea to energisation – ultimately shaping a reliable and sustainable energy future for Angola," he says.

Manuel Couto Alves, President and CEO of the MCA Group adds, "This project will have a hugely positive impact on Angola and its economy, as more people are guaranteed access to affordable and clean energy. It will

also significantly increase the renewable energy share in the country's energy mix."

Angola is Africa's seventh largest nation, with a population of about 30 million and a rapidly growing economy. The solar PV initiative is financed under the Swedish Export Credit System (the Swedish Export Credit Corporation and Swedish Export Credit Agency) that works to raise investments in Swedish sustainable technology globally.

The project supports the UN's Sustainable Development Goal 7 – aimed at ensuring that all people have access to affordable, reliable, sustainable and modern energy. It is being developed by a consortium comprising the developer Sun Africa LLC, a US renewable energy company based in Chicago, Illinois, and MCA.

For more information visit:
www.hitachiabb-powergrids.com

Seven off-grid solar PV systems for Lesotho

OnePower Lesotho (1PWR), a mini-grid developer working in Lesotho to supply electricity to underserved communities, was one of the winners of Power Africa's Beyond the Grid initiative to electrify primary healthcare facilities in sub-Saharan Africa with off-grid solar PV solutions. OnePower consequently placed an order with Cape Town based manufacturer of containerised, off-grid solar systems, SustainSolar, to deliver seven modular, turnkey, high quality Sustain Compact™ solutions to Lesotho before the end of the year.

Founded in 2015, OnePower is a fast-growing start-up which aims to attract investment to the renewable energy sector in Lesotho to make access to energy a reality for communities that are otherwise without it. As a social enterprise, OnePower reinvests a major portion of its surplus revenue into growing its ability to provide quality services to off-grid communities at affordable costs.

Using the grant awarded to it by Power Africa, OnePower will supply clean electricity to seven rural healthcare facilities across the country. The facilities will serve as anchor loads for mini-grids which will also supply electricity to a number of other connections, including five health centre staff houses at each site.

SustainSolar's Sustain Compact™ product range, pre-commissioned and packaged in a 20 ft container for rapid deployment and equipped with leading high-performance solar panels, Solar MD lithium-ion batteries, SMA inverters and a lightweight mounting structure, is an ideal solution for OnePower's needs. Each system has an initial PV capacity of 20 kWp and 51 kWh of storage and can be extended to more than double the initial size as electricity demand grows. Enabling quick installation of a modular, off-grid solar power system, these mobile solutions are well suited for remote locations, rural electrification and temporary installations.

SustainSolar is supplying seven containerised solar PV systems to power off-grid healthcare facilities in Lesotho.

SustainSolar's systems are in use in remote regions of Malawi, South Sudan, Uganda and soon, the Democratic Republic of Congo. The company strives to respond to the needs of emerging markets with turnkey solar PV technology suitable for various applications that require a decentralised, clean and dependable power supply. Its containerised, pre-installed solar systems are equipped with high-quality solar PV modules, electronics and batteries, and are supplied in three standardised, adjustable product configurations, from small to large.

OnePower is one of nine companies that were awarded grants through Power Africa's Beyond the Grid initiative. This is a US government-led initiative that brings together government agencies, development partners and private sector companies with the goal of doubling current levels of access to electricity in sub-Saharan Africa. Totalling more than US$ 2.6 million to be distributed across nine countries, the grants will benefit close to 300 healthcare facilities in the region.

According to Power Africa, nearly 60% of all healthcare facilities in sub-Saharan Africa have no access to electricity and, of those that do, only 34% of hospitals and 28% of health clinics have reliable, 24-hour access. Energy is critical for powering essential devices, medical and sterilisation equipment, diagnostics, cold storage for vaccines and medication, information technology, and lights to enable delivery of continuous healthcare services. Efficient health services and responses to diseases – including Covid-19 – depend to a large degree on reliable access to electricity.

Mark Carrato, Acting Coordinator for Power Africa says, "Solar energy holds great potential to expand and improve healthcare delivery in sub-Saharan Africa, and off-grid solar technology offers a clean, affordable and smart solution to electrify healthcare facilities located beyond the reach of national electricity grids. Power Africa's experience shows that off-grid solar energy systems can be rapidly deployed to even the most remote rural facilities."

For more information contact SustainSolar.
Visit: https://sustainsolar.co.za

Maintaining battery backup systems

Although most batteries used in UPS systems today are described as 'maintenance-free', they are nonetheless susceptible to deterioration from corrosion, internal short circuits, sulphuration, dry-out, and seal failure. Fluke, which is represented by Comtest in South Africa, supplies a battery analyser that facilitates battery testing and maintenance. Here Fluke, outlines a guide to best practice for testing battery banks to keep performance at optimum levels, so if a power outage does occur, the backup is ready.

Standby battery backup systems play a critical role in keeping essential operations functional in the event of a utility outage. Facilities such as data centres, hospitals, airports, utilities, oil and gas production, and railways need 100% backup power reliability to maintain operations. Many other commercial and manufacturing facilities also count on backup power for emergency systems, alarms and emergency lighting, steam and control systems.

Most backup power systems use an uninterruptible power supply (UPS) and a string of batteries. The UPS typically backs up the digital control system to maintain control of plant operations until systems can be safely shut down, or until an auxiliary generator kicks on.

Testing battery health

Testing internal resistance and discharge testing provide the top two indicators of battery health.

The Fluke BT521 Battery Analyser is a useful tool to ensure battery backup systems are maintained at optimum operating level.

- Internal battery resistance

Internal resistance is a life-span test, not a capacity test. Battery resistance stays relatively flat until the battery is nearing its end of life. At that point, internal resistance increases and battery capacity decreases. Measuring and tracking this value helps identify when a battery needs replacing.

It is important to use only a specialised battery tester designed to measure battery resistance while the battery is in service. The maintenance technician should read the voltage drop on the load current (conductance) or the ac impedance. Both results will be in ohmic values.

A single ohmic measurement is of little value without context. Best practice requires measuring ohmic values over months and years, each time comparing them to previous values on record to create a baseline.

- Discharge testing

Discharge testing is the best way to discover the true available capacity of a battery but it can be complicated to perform. In discharge testing, a battery is connected to a load and discharged over a specified period. During this test period, current is regulated and a constant known current is drawn, and voltage is measured periodically. Details of the discharge current, the specified time period for discharge testing, and the capacity of the battery in Ampere hours can be calculated and compared to the manufacturer's specification. For example, a 12 V, 100 Amp hour battery may require a discharge current of 12 A for an eight-hour period. A 12 V battery would be discharged when the terminal voltage is 10.5 V.

Batteries cannot support critical loads during and immediately after a discharge test. Critical loads must therefore be transferred to a different battery bank until well after the test is complete and a temporary, comparably sized load must be connected to the batteries under test.

In addition, before conducting the test, a cooling system should be prepared to compensate for a rise in ambient temperature. When large batteries discharge, they release a significant amount of energy which is expended as heat.

Healthy batteries should maintain a capacity above 90% of the manufacturer's rating; most manufacturers recommend replacing the battery if it falls below 80%. When conducting battery tests, the following factors are indicators of failure:

- A drop in capacity of more than 10% compared to the baseline or previous measurement
- 20% or more increase in impedance compared to baseline or previous measurement
- Sustained high temperatures, compared to baseline and manufacturer's specifications
- Degradation in plate condition.

Standard battery testing

- Float voltage
  - Isolate the battery or batteries from the charging system and the load.
  - Measure the individual cell voltage or string using a digital multimeter or battery analyser such as the Fluke 500 Series battery analyser. This should be done on a monthly basis.
- Charger output
  - Measure the charger output voltage at the charger output terminals using a digital multimeter or battery analyser.
  - Observe the output current shown on the charger current meter, or use an appropriate dc current clamp meter. These measurements also should be done on a monthly basis.
- DC float current
  - Refer to manufacturer's specifications for approximate values for expected float currents.
  - Use an appropriate dc current clamp meter to measure expected float current, again on a monthly basis.
- Internal ohmic values
  - Use a battery analyser such as the Fluke 500 Series to measure the individual battery ohmic values. This can be done on a quarterly basis.
  - Establish reference values and maintain in the battery database. □

At a glance

- Only a specialised battery tester designed to measure battery resistance should be used while the battery is in service.
- A baseline of recorded measurements should be established to provide a reference of measured values over time.
- Different tests must be done to assess life-span and measure true available capacity of a battery.

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

Temperature measurement on ultra-thin glass

Touch displays, such as for smartphones and tablets, use ultra-thin glass, which brings particular challenges for temperature measurement technology in the manufacturing process. For such applications, Instrotech, local representative for Optris which is a leading manufacturer of non-contact temperature measurement devices, has brought to market the new CT laser G7 infrared thermometer.

The CT laser G7 can precisely measure the surface temperatures of glass components in the range of 100°C up to 1 200°C. The optimum spectral range, which for flat glass is normally 5 µm, cannot be used for extremely thin glass components due to the higher transmissivity of the material. This was the specific design criteria for developing the CT laser G7, which works at a special wavelength of 7.9 µm. This spectral range is optimised for low-reflection measurement on ultra-thin flat glass. Measurement errors, which are caused by the transmission of radiation, are therefore virtually eliminated. The measurement error is only 1% of the measuring value – or 1.5°C at low temperatures.

The new infrared thermometer has an integrated double laser, which marks the exact measurement location, making setup of the application easier. The smallest size of the measurement spot at a measurement distance of 70 mm is just 1.6 mm, so the temperature can be measured even on very small objects. With a standardised two-wire interface, the measurement values can be transferred to a supervisory control system, a PLC for example. The output can be adjusted to the specific requirements of the application. Available functions include averaging, logging of minimum or maximum values, and an extended hold function with threshold value and hysteresis.

The Optris CT laser G7 infrared thermometer can accurately measure surface temperatures of glass components in the range 100°C up to 1 200°C.

The CT laser G7 is ideally suited to the environmental conditions which prevail during the glass manufacturing. So, for example, with ambient temperatures up to 85°C, it works without additional cooling. For even higher temperatures, a matching cooling housing is available.

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

Transformers for Africa's mega LNG project

David Claassen, Managing Director, Trafo Power Solutions.

One of Africa's most exciting energy projects is procuring dry-type transformers from Johannesburg-based specialists Trafo Power Solutions. The $23-billion Mozambique liquified natural gas (LNG) project in the far-north Cabo Delgado province represents the largest private, foreign direct investment in Africa to date. It is also one of the largest LNG projects in the world, with the potential to transform the fortunes of its home country and bring economic benefits to the region.

Trafo Power Solutions has already delivered 18 dry-type transformers to site, where they will be employed in the project's first construction camp which will house about 9 500 contractors. Perhaps the most significant aspect of its contribution, however, is a consignment of 20 highly specialised dry-type transformers for the project's gas plant, delivering features that only a few players in the global transformer sector could deliver.

David Claassen, Managing Director of Trafo Power Solutions highlights some key factors. "Housed in IP56 enclosures, the 20 transformers for the plant – ranging from 400 kVA to 1 600 kVA in capacity – are equipped with very high levels of ingress protection. The enclosures prevent dust particles from entering and provide water protection even from strong water jets."

This specialised solution – achieved in collaboration with Italian technology partner TMC Transformers – is particularly remarkable given the fact that dry-type transformers are cooled by air rather than oil.

"The design of these transformers, in terms of elements such as temperature rise, losses and insulation systems, demonstrates the application of world-class technology and expertise," says Claassen. "They will be expected to operate reliably in humid and dusty outdoor conditions, providing continuous rated power without the use of any forced cooling."

A modular substation containing a cast resin transformer and associated switchgear.

Each transformer has been individually designed to suit the application and the load it will supply, including different impedances, voltages and K-factors for non-linear loading. They will step down voltages from the medium voltage (MV) network, from 6 600 V to 420 V, and will supply motor control centres which are located in different parts of the plant.

Trafo Power Solutions will also be supplying dry-type transformers for a Zone 2 hazardous area of the plant. This means the transformers and their enclosures must be designed strictly according to stringent global classifications, and will need to be signed off by an independent professional before being authorised to operate.

In the transformer contract for the construction camp, the dry-type transformers from Trafo Power Solutions are included in South African-built modular substations and range in size from 500 kVA to 1250 kVA.

"These units have been specially designed for the high ambient temperatures in northern Mozambique," says Claassen. "While a standard dry-type transformer would typically feature a temperature rise of 100°C, these will rise to a maximum of only 80°C when under full load."

Class-H insulation is used on both the medium voltage and low voltage windings, he says. The insulation will withstand a temperature of 180°C, which is considerably higher than the potential 40°C ambient temperature in the tropics plus the 80°C temperature rise of the transformers. In addition, the transformers are designed for levels of humidity up to 95%.

He also points out that the modular system in which the transformers are incorporated makes for a simpler and more reliable solution, as all componentry can be assembled and tested under workshop conditions rather than on site. "The 20-foot marine container is then readily transported by road to the port at Durban, and shipped to site for installation and commissioning."

1 250 kVA cast resin transformer installed in a modular substation.

Claassen emphasises the safety advantages of dry-type transformers, which allow them to be used in these applications. Being air-cooled, they do not contain oil like conventional transformers do, and therefore pose no hazard in terms of fire, explosion or environmental damage.

"Oil would present a significant risk in an application like a construction camp, where there will be thousands of people living close to each other. The safety level of dry-type transformers means that they can be used in enclosed spaces like modular substations."

Another advantage is that the transformers need minimal maintenance, which is also an important consideration for their use on such a remote site. For all the units provided by Trafo Power Solutions a specialised paint is used to withstand the chemical processing environment and the corrosive sea air.

Claassen highlights the intense global competition to supply this mammoth project, and the value of the partnership between Trafo Power Solutions with its local knowledge and experience, and TMC Transformers' technology and expertise. With decades of experience in dry-type transformers and inductors, TMC Transformers is a world leader with the latest technologies in windings and coil processing. It also boasts modern in-house facilities for routine testing, type testing and special testing.

"We are proud to be working with an accomplished global player like TMC on such an important project for the southern African region's future, and indeed for Africa's stature as a whole," he says. "This venture is going to create a large number of job opportunities on the sub-continent and will undoubtedly be a game-changer for Mozambique."

At a glance

- Trafo Power Solutions has already delivered 18 dry-type transformers to the first construction camp at Mozambique's LNG development.
- It will also provide 20 specialised dry-type transformers for the plant, each individually designed to suit the application and load it will supply.
- These specialised transformers have been developed in collaboration with Italian technology partner TMC Transformers.

500 kVA cast resin transformer, with sealed terminations, installed in a modular substation.

Claassen notes this contract as a significant landmark for Trafo Power Solutions in the African marketplace, demonstrating the success of the company's experience and customer-focused approach.

"We have always placed our focus firmly on understanding our customers' requirements, and leveraging world-class expertise and technology to meet their expectations," he says. "Building on the many advantages of dry-type transformers, we have seen enthusiastic uptake of this technology in applications around Africa."

Recent projects have included complete substations for a tin mine in the Democratic Republic of Congo and transformers for mobile mining units at a rutile mine in Sierra Leone. In South Africa the company has supplied projects across diverse industries from mining to brewing, and from commercial buildings to data centres. □

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

Gary Bradshaw, Director at Omniflex.

Use existing cabling to create a new industrial LAN

You wouldn't build a new railway or motorway every time you needed to travel somewhere, so why install new cable? You probably already have spare cores in your existing multi-core cable network or, better yet, an old telephone network that's lying unused. Gary Bradshaw, Director at network specialist Omniflex, explains how the company's Conet technology allows businesses to repurpose existing cabling to create a new industrial local area network (LAN).

Token passing, peer-to-peer network? Check. High system redundancy? Check. Ten-kilometre transmission distance? Check. Data integrity and security? Check. Low latency? Check. These aren't features you would typically think of when you repurpose existing infrastructure to create a new, high-performance industrial network. And it's usually more profitable for most suppliers to sell you a new network.

But there's another way of looking at it. In an age where we need to consider the circular economy, when we must consider costs and reduce wasted resources, it's about elegant engineering. It's about using what you already have to deliver performance that's equal to, or better than, a bespoke new system.

This is exactly what we've done at Omniflex with Conet, a true token-passing peer-to-peer LAN. Conet was developed and launched in 1981 in response to a need from plant operators who wanted to bring field data back to the control room or supervisor's office in the most cost-effective way.

The only solutions that existed at the time were expensive and beyond the reach of smaller operators. This is why one of the most important features of Conet is its ability to operate on low cost cabling which, in many instances, is already available as a free pair in an existing multi-core or telephone cable.

Conet was developed to offer plant operators a way of bringing field data back to the control room or supervisor's office cost-effectively.

This type of network design was inspired by the requirements of the mining industry where the nature of the job means a reliable network is needed to run from the surface to the underground levels in the mine, often with power cables. These are applications where wireless networking is simply not possible, or is too unreliable given the mission-critical nature of the operations.

This is also the case for nuclear sites, where new cable installation, soil excavation and building work must adhere to strict construction rules specific to the nuclear industry. On these sites especially, it's not only cheaper but also operationally beneficial to make use of the existing cable infrastructure on site.

Key benefits

Conet offers two key benefits: multidrop telemetry and data acquisition. The first means Conet can be used to transmit digital and analogue signals from one or many nodes without a central host computer. The second means multiple host computers can connect to the network to communicate with field devices such as PLCs (programmable logic controllers), RTUs (remote terminal units) and other digital devices.

As well as this capability, at its heart Conet is still based on the ISO OSI 7-layer model, so it meets networking standards the world over. It is on this foundation that Omniflex engineers have built high-performance features that make Conet a resilient technology. These include a robust token-passing protocol, allowing users to add or remove up to 127 nodes on the network without reprogramming the system.

It is also a deterministic network, making it ideal for real-time applications where low data-loss rates and low jitter are required. Here, the throughput and access times are recorded between 0 and 100 milliseconds. The system also offers high data integrity and electrical noise suppression; each node is transformer isolated to block voltage fluctuations.

Conet incorporates high-performance features that make it a resilient technology.

These features, combined with a 16-bit Cyclic Redundancy Checksum (CRC), automatic error detection and retransmission, mean Conet can be used to transmit data securely over a distance of 10 km in noisy electrical environments with a high degree of integrity.

What's more, it will work regardless of the existing cabling setup because it is not reliant on any particular topology. It can work in any configuration, from bus and star networks to redundant-link and ring topologies.

At a glance

- Conet is an LAN network developed to enable plant operators to bring field data back to the control room or supervisor's office most cost-effectively.
- A primary feature of the technology is its ability to operate on low cost cabling which, in many instances, is already available as a free pair in an existing multi-core or telephone cable.
- The versatility of the network means it can be used to link any combination of supported hardware and software for data acquisition and control.

This versatility means the network can be used to link any combination of supported hardware and software for data acquisition and control purposes, as well as critical event-monitoring and remote field devices, in utility metering applications, for example.

Whatever the application, using existing cabling and network infrastructure to build a high performance, secure, low-cost local area network is a viable prospect for many businesses. □

For more information visit: www.omniflex.com

Faster turnaround on transformer oil analyses

Condition monitoring specialist, WearCheck, recently invested several million rand in four new laboratory instruments for its transformer division laboratories in Johannesburg, Durban and Cape Town.

WearCheck Managing Director Neil Robinson says the company's investment in the equipment has relieved some of the current sample volume pressure and reduced turnaround times in line with customers' expectations, ensuring that transformer oil samples are processed and analysed even faster than before.

The company's transformer division now has an additional two new high-speed gas chromatographs (GCs) in the company's Johannesburg and Durban laboratories, an additional new PCB (polychlorinated biphenyl) chromatograph in the Cape Town laboratory, and an additional new HPLC (high performance liquid chromatography) instrument in the Durban laboratory.

"Getting the analytical test results and diagnoses to our customers as fast as possible is a priority for us," says Robinson, "and our investment in the new instruments has enabled us to more than double our transformer sample testing capacity. Our transformer division also recently moved to a new, larger laboratory in Westville, where we offer a wide range of specialist transformer monitoring techniques."

The new Perkin Elmer GCs – designed and manufactured in The Netherlands – each have a carousel that can hold 120 prepared samples and standards. Added to the 80-sample capacity of the two existing GCs in the Durban laboratory, this means more samples are being processed

Transformer Laboratory Technician, Zamaswazi Dlamini, operates the new high-speed gas chromatograph (GC) at the Durban laboratory.

at any given time, and the sample turnaround time has been significantly reduced.

"One of the great advantages of the new GCs is that they can be pre-loaded with samples before a weekend, and they will continue operating for 48 hours. Our older models require reloading every 24 hours," says Transformer Division Manager, Gert Nel.

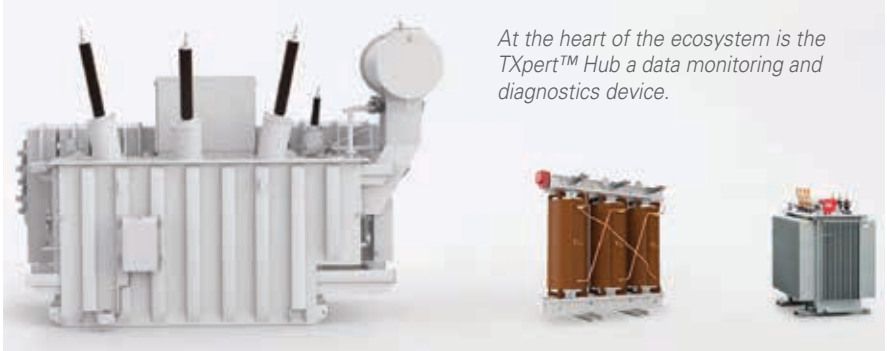
"The primary function of the GC is to perform dissolved gas analysis (DGA) – a highly effective preventive maintenance tool which has formed part of WearCheck's condition monitoring programmes for more than 10 years," says Nel.

He explains further, "The new PCB instrument determines the presence of PCB in electrical equipment containing insulating oil, which must be tested at least once and after every maintenance event to determine the PCB level. According to the latest version of SANS 290:2017, the current maximum allowed PCB level in oil is 50 ppm (parts per million or mg/kg). If the PCB level

Digitalisation of transformers

Hitachi ABB Power Grids has launched the TXpert™ Ecosystem for digitalisation of transformers. The manufacturer-agnostic ecosystem is designed to support greater flexibility, efficiency and resilience in electricity networks by enabling data-driven intelligence and decision-making in the operations and maintenance of transformers and power grids. It is a complete suite of products, software, services and solutions that work together and can integrate with new and existing digital equipment from other manufacturers.

"Building on deep experience, we have pioneered the scalable TXpert™ Ecosystem to bring together customers, partners and industry peers on an open platform developed on strict cybersecurity standards, enabling simple steps in their digitalisation journey," said Bruno Melles, Managing Director, Transformers business unit at Hitachi ABB Power Grids. "By giving transformers the knowledge and intelligence derived from designing and servicing thousands of transformers, the system will help to reduce costs and risks, optimise operations, extend life expectancy and enhance environmental performance, contributing to a sustainable energy future."



At the heart of the ecosystem is the TXpert™ Hub a data monitoring and diagnostics device.

Faults in transformers are usually in the windings, tap-changers and bushings. The TXpert™ Ecosystem provides options to mitigate all of these. For example, failure of bushings can lead to transformer tank rupture and explosions, requiring millions of dollars in repairs and settlement costs for a utility, while the cost of replacing a high-voltage bushing would be a few percentage points of this. Using TXpert™ Ecosystem solutions for digital asset management of bushings, the real-time status of the bushings' health can be monitored and corrective action taken before failure probability becomes high.

exceeds this limit, the oil must be drained and disposed of in an approved manner. As PCB molecules are highly toxic, this is an important test in transformer maintenance and management.

"The additional HPLC separates mixtures of compounds in transformer oil to identify and quantify the individual furanic compound concentrations of the oil. The results enable our diagnosticians to predict the remaining useful life of the paper insulation of the transformer with high accuracy, giving a very good indication of the remaining useful life of the transformer itself."

Nel notes that the new instruments have already reduced sample processing time. "Our transformer customers in various business sectors – such as mining, power generation, transport, manufacturing, industrial and marine maintenance – are receiving their results fast, which enables them to make critical maintenance-related decisions in good time and reduce the risk of unplanned transformer failure."

WearCheck operates a network of 16 world-class laboratories around Africa and beyond. Each laboratory is fully equipped with the latest available condition monitoring technology in line with global trends. The company has evolved into a condition monitoring hub, specialising in used oil and fluid analysis, reliability solutions services, transformer monitoring and advanced field services.

For more information contact WearCheck.
Tel: +27 (0)31 700 5460
Email: marketing@wearcheck.co.za
Visit: www.wearcheck.co.za

At the heart of the ecosystem is the TXpert™ Hub from Hitachi ABB Power Grids – a data monitoring and diagnostics device that also provides connectivity. Designed as an open platform, it can integrate multiple sets of data from TXpert™ Ready sensors from diverse manufacturers, simplifying the digitalisation of transformers in compliance with modern communication and stringent cybersecurity standards. Data and intelligence from the TXpert™ Hub can be accessed locally and, if required, from cloud-based solutions.

TXpert™ enabled transformers can be augmented with asset performance management (APM) solutions from Hitachi ABB Power Grids. As an enterprise-level software solution, APM can be used for individual, multiple or large fleets of transformers.

Supporting customers in using the data generated from TXpert™ for smart decision-making, associated remote and advanced services can provide virtual site management, life assessments, robotic inspections and transformer care service agreements.

For more information contact
Hitachi ABB Power Grids.
Visit: www.hitachiabb-powergrids.com

Eskom's TDP opens new opportunities

Eskom recently shared its Transmission Development Plan (TDP) for the period 2021 to 2030 with various stakeholders during a public forum hosted online. This is one of Eskom's Transmission licence requirements as issued by the National Energy Regulator of South Africa (NERSA), which calls for Eskom to publish a TDP annually.

The forum is 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 for the transmission system.

Segomoco Scheppers, Group Executive for Transmission, says, "As set out in the TDP, we aim to increase the transmission infrastructure by about 5 650 km of high-voltage lines and 41 595 MVA of transformer capacity over the next 10 years. Significant investments are required to strengthen the transmission grid to accommodate the new generation capacity in accordance with the IRP2019.

"Some adjustments have been made to the TDP since the 2019 publication. These include the re-phasing of capital investment in transmission projects to align them with the project execution timelines that are associated with servitude acquisitions and current available funding."

Since the publication of the 2019 TDP, a number of transmission substations and transformer capacity enhancement projects were commissioned in support of the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. This was done in conjunction with network strengthening for the commissioning of Eskom generation, network reliability and the integration of committed customers.

"There is a clear case for significant transmission network expansion. This is critical for the connection of utility-scale renewable generation projects, mainly wind and solar, in line with the policy direction in the IRP2019 and the Grid Code, that is, to diversify the country's energy mix and to provide non-discriminatory access to the grid," said Scheppers.

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

Significant investment in transmission infrastructure will open new opportunities for high voltage lines and transformers.

Equipping young South Africans with engineering skills

Tokelo Ramasodi is one of the interns who has benefitted from Atlas Copco's internship programme.

Atlas Copco, a multinational industrial company which specialises in the manufacture of industrial tools and equipment, recognises the need to grow the engineering sector in South Africa. True to its 'people first' foundational pillar, the company creates opportunities for young professionals to gain exposure in various environments within the industry. This allows them to expand their scope of experience and identify where their interests lie with a view to specialisation.

"Humanity depends on engineering as a critical function to advance into the future. Engineers design the tools needed (or the infrastructure, or the systems), informed by science and combined with innovative thinking, to solve problems and new designs are manufactured for daily use," says Glynnis Surrall, HR Systems Academy Manager at Atlas Copco. "We offer an internship programme tailored to suit the needs of previously disadvantaged youth. We have developed this with Atlas Copco's core vision in mind. This encompasses innovation, diversity and a dynamic approach to projects," Surrall explains. "It is crucial that we grow the country's skills in the industry in order to compete with countries such as Germany and Sweden. It is essential for the success of the nation from an economic viewpoint and simply in terms of growing skilled capacity."

Tokelo Ramasodi, or TK as he is known among his colleagues, currently works as a service technician having previously graduated from the Atlas Copco Belgium campus, class of 2018. TK has spent four years at Atlas Copco Industrial Technique. He started out as an intern, when he was given the opportunity to travel to East London to gain experience working at a large global car manufacturing plant there.

"I will never forget my early days as an intern. Something as basic as creating a unique VIN number for a motor vehicle is complex and as fascinating as the unique design of a human thumb print. I also learned that something as small as a bolt or screw isn't given much thought until you learn the science behind its design," says TK.

He learned about the automotive industry and its workings during his time at the company. "I've picked up electrical and mechanical skills along the way and I am most intrigued by these two specialised engineering fields," he says.

TK sees his career path moving into software development and is grateful that Atlas Copco, through its internship programme, affords learners the opportunity to create their own career path that is not dictated by a rigid management structure. "I enjoy working for a company that guides and supports me along my career path; historically micromanagement has never grown anybody's talent. The leadership style displayed by the company has enabled me to become the captain of my career," he says.

At present, TK is stationed at a prominent German car manufacturing plant in Rosslyn outside Pretoria, which means that, thanks to the global agreement, he has the chance for further learning and growth through short-term assignments working at different branches globally.

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

Mentorship platform for women in business in Africa

Irene Kiwia, Founder of TWAA.

Bureau Veritas, a world leader in testing, inspection and certification, recently launched its BV Women in Africa Mentorship Programme. This is a strategic, collaborative partnership with TWAA, an innovative, professional networking, knowledge-sharing and mentorship platform for women and girls. The platform provides women with digital tools to connect safely, find suitable mentors and mentees, and share and access opportunities to support their continuous progress and development.

At the launch of the programme in Nairobi in November, Marc Roussel, President of Government Services & International Trade & Senior Vice President for Africa commented: "The Bureau Veritas Group operates in several countries in Africa. The organisation has a strong ethos on gender balance and women's empowerment; many of our CSR initiatives focus on the support and development of women inside and outside the organisation. The TWAA initiative is a way for our group to engage women in supporting each other through a BV dedicated mentorship programme. The digital platform creates an opportunity for many of the great women of BV to support other women in business in Africa. It presents a way to reach out to more women, even if they are located remotely. This initiative will contribute positively to the social compact and development on the African continent and it is my hope that other companies will come on board and support it."

For more information visit: www.bureauveritas.com

New braking for airborne wind energy systems

Airborne wind energy systems (AWES) which produce energy as they soar through the sky are among the latest innovations in wind power generation. Such ground-breaking solutions require equally innovative brakes, as their needs are quite different from those of conventional wind turbines. When a leading developer of AWES was looking for braking systems that would meet the specific requirements of its applications, Altra Renewables offered a solution.

Tilman Speer, International Sales Manager/Business Development Manager at Svendborg Brakes explains that AWES use tethered aircrafts, or other flying objects, to harvest high-altitude winds that blow at heights of more than 300 metres above the ground. By exploiting the fast, persistent, and less turbulent speeds of high-altitude winds, AWES can generate power at unprecedented levels.

More precisely, in 1980 the pioneering work of Loyd offered the mathematical demonstration that flying a tethered device across the wind could produce power outputs up to three times greater than comparably sized existing wind systems in similar conditions[1].

Further to their impressive outputs, these innovative wind energy converters also benefit from compact, lightweight and highly adaptive designs that can considerably reduce the financial, environmental and noise impact of generating power. When deployed on floating offshore platforms in deeper waters, AWES do not require a solid foundation or much ballasting to restrict movement as they operate in tension. As a result, they can be used in locations where sea depths reach several hundreds of metres.

Additionally, maintenance activities on key components such as power generators, brakes and control systems are streamlined. These pieces of equipment are generally located at sea level and easily accessible by boat.

Innovative components

In its search for a suitable braking system for its products, the AWES developer contacted Altra Renewables, a division of Altra Industrial Motion Corp. The company was particularly attracted by the Svendborg Brakes and Stromag brands. These products have proven capabilities in providing intelligent braking solutions and power transmission components to the wind energy sector.

Key requirements in the braking system included an extremely compact footprint, and a system that could operate without an external power supply. This would allow the energy converters to maximise the benefits offered in terms of cost, environmental impact and flexibility. In addition, it was crucial for the components to be able to withstand harsh offshore operating conditions.

To address these requirements and design an optimum braking system, the brands within Altra Renewables worked in close collaboration with the AWES manufacturer. They were able to develop a solution based on Stromag's CB90-R ultra energy rotor brakes. These are active, hydraulically actuated systems for high-energy braking installations and therefore suit the AWES' operating conditions. In addition, the CB90-R is designed to be extremely compact, allowing them to fit into limited space applications.

AWES can generate power at unprecedented levels by exploiting fast, persistent high-altitude winds. [Source: AdobeStock_307051269]

The brakes are operated by similarly small hydraulic power units (HPUs) from Svendborg Brakes, allowing the entire system to fit into the AWES body. When braking, the callipers squeeze their pads against brake discs made of stainless steel. While uncommon for conventional braking applications, this material would allow the setup to operate effectively and for long periods of time in offshore environments.

With this brake design, the AWES developer was able to produce a system that uses 90% less material than conventional wind converters, such as wind turbines, while doubling the amount of energy produced. Happy with the results, the company has since adopted the Altra Renewables solution into its product range as standard.

Speer comments: "Initially impressed by our existing portfolio, the customer was satisfied with our ability to design and deliver fully customised solutions as well as offering continuous assistance through the R&D stages of the project. We look forward to developing our relationship further in this new renewables sector."

References:

1 Loyd, M. L. (1980). Crosswind kite power (for large-scale wind power production). Journal of energy, 4(3), 106-111.

For more information visit: www.altramotion.com

Safe disposal of IT assets helps scholars

Xperien, a leading South African IT Asset Disposal (ITAD) company, recently launched a corporate social investment initiative to support what it sees as 'forgotten' students at middle-class independent and private schools in the country. Many of these less established schools are closing down and there was a concern that some scholars would be unable to complete the academic year due to the detrimental impact of the coronavirus pandemic.

The initiative aims to provide struggling learners with refurbished laptops to help them overcome the enormous challenge of switching to learning and studying online. Xperien collects redundant computers from corporate companies around the globe, offering a free 'data-sanitising' service in exchange. Once sanitised, the equipment is refurbished and redistributed to previously disadvantaged communities.

Xperien CEO, Wale Arewa says there is a gap that needs to be filled in assisting scholars from the 'forgotten class'. "We have developed this programme to assist scholars from private schools at the lower end of the market.

"With no support from government, some families who have placed their children in local private schools find it extremely challenging to pay school fees or to purchase laptops to ensure the children can continue their studies. The parents' priority is to feed and provide shelter for the child or children, before they pay school fees or buy a refurbished laptop at a cost that would rather cover a month's worth of groceries," Arewa says.

Through its relationship with corporate companies, Xperien has been able to create value from their used equipment to bridge the digital divide.

However, when disposing of any IT asset, it is essential that Xperien guarantees the data stored on the asset is destroyed according to industry standards and, more importantly, government regulations.

"Our offer to corporate companies is the safe collection of redundant equipment, data erasure and reporting on that, so that they can dispose of their IT equipment knowing they have complied with relevant legislation and have received the best value for their redundant IT equipment," Arewa says.

The need for support has grown exponentially, especially at middle-class independent and private schools, and to meet this need, Xperien has extended its call globally.

Arewa adds that many companies that experienced delivery delays due to disrupted supply chains, have now received their IT equipment upgrades for 2020. This means there may be a lot of redundant electronics equipment ready for disposal.

He says IT asset managers should ensure that all retired IT assets are properly cleaned of company data before being stored, or given away, or disposed of. This can present challenges and potential costs that companies seldom consider, but it must be done professionally.

Wale Arewa, CEO of Xperien.

Arewa urges companies to schedule a year-end asset disposal and data destruction campaign. "This is a good time to clear out storerooms and start 2021 with a clean slate," he says.

Supporting the circular economy

As a well-experienced ITAD company, Xperien (Pty) Ltd supports the circular economy and contributes to reducing the global e-waste problem by optimising and extending the life cycle of IT hardware. "We are a team of professionals who care about our planet, its people and its resources," says Arewa. "Starting out 21 years ago as a used computer dealer, Xperien has grown to redefine the way corporations use IT hardware. We provide our clients with secure ITAD services and have obtained ISO 9001, 14001 and 45001 accreditations specifically for ITAD.

"Our value proposition is to protect our clients' personal information and intellectual property that resides on their computers, through technology changes and at end-of-service. We manage our clients' enterprise and desktop infrastructure in a sustainable way – around the world. Logistical solutions are tailored to accommodate our clients' geographical spread and to negate the ever-present risk of hard-drive theft from disposed computers."

Xperien provides cost-effective solutions to combat the challenges associated with data loss and to mitigate reputational risk. Its compliance standards meet the NIST 800-88, DoD 5220.22-M and CEGS criteria, particularly in terms of data-destruction processes, and adherence to South Africa's Protection of Personal Information Act of 2013 (POPIA) and General Data Protection Regulations (GDPR) is core to the business.

For more information visit: www.xperien.com

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