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Climate trends for high-stakes COP26

Peter Middleton

COMMENT

Postponed in November 2020 due to COVID-19, COP26, the United Nations' next 'annual' conference, will now take place in Glasgow, Scotland, in November 2021. The event is already being described as a 'watershed moment' for the recovery of the planet: to 'lock in ambitious low-carbon transition policy goals across the world'.

Global head of sustainable finance for the HSBC in the UK, Daniel Klier, writes of five trends that are dominating the run-up to this event.

The first is that the US, the European Union and China are now united by a desire to take firm action on climate change. Klier suggests that with former US Secretary of State John Kerry as special climate envoy, improvements to the 2015 Paris Agreement; greater international collaboration on technical development and investment; and action on specific economic sectors and industries has become more likely.

He adds that China is now committed to net-zero emissions by 2060, the EU by 2050 and the UK has renewed its Paris Agreement pledges, which include a 68% reduction in UK emissions by 2030.

The second trend cited by Klier is the accelerating transition to low carbon technologies 'particularly in industries where emissions are high and hard to abate'. He cites an 81% year-to-date rise in electric vehicle (EV) sales, and that more than 350 different EV models are due for launch across the world next year.

In addition, the EU is to renovate 35-million energy-inefficient buildings by 2030. "Buildings account for 40% of energy consumed and 36% of energy-related greenhouse gas emissions in Europe," says Klier, adding that there is also increasing awareness of the need for sustainable infrastructure in the fast-growing Asian economies.

The role of climate finance is Kleir's third trend. In an extremely bumpy year for equities, he points out that climate stocks such as renewable energy, energy storage, agriculture and transport efficiencies made 37% gains, against 11% for the overall market. In addition, US$64.9-billion of green bonds were issued in the third quarter of 2020 – the highest volume in any third quarter period since the market's inception – and total green bond issuance is now at almost US$1-trillion.

Number four is the protection of specific natural environments and ecosystems such as mangroves, seagrass and tidal marshes through blue bond investments, which are reserved for marine conservation capable of taking up carbon dioxide from the atmosphere several times more quickly than forests on dry land. In 2018, the Seychelles became the first country in the world to issue a blue bond, and in 2019, HSBC was the lead manager on the World Bank's €200-million blue bond, a financial tool helping to protect Australia's Great Barrier Reef and many other ecosystems around the world.

With recovery from COVID-19 an ongoing concern, Kleir's fifth trend is the potential to use COP26 as a catalyst for tackling climate change and for rebuilding the global economy on a more resilient, prosperous footing. "COP26 must be a key moment in securing a just transition, one that protects jobs, strengthens local communities and helps out vulnerable economies. It isn't enough merely to lower emissions. Doing so while damaging prosperity across the world would be no kind of victory," he says.

He warns that the stakes are very high. Despite the 2015 attempt in Paris to secure an agreement to limit the global temperature rise to 1.5 °C, "we are currently on track for a catastrophic 3.0 °C increase by 2100".

"Making progress through 2021 on the five trends outlined above – more effective climate diplomacy, faster transition, better climate-finance returns, more nature-based solutions, and prioritising a just transition – would help build momentum for a successful summit," he argues.

This is, no doubt, an argument from a developed-world perspective but Africa and South Africa have much to gain from a successful transition to a less carbon intensive economy. We already know that South Africa's ailing coal-based grid can't cope; that renewable solutions are now cost competitive and that the African continent is primed for industrial and economic growth should energy constraints be overcome.

We have a young population hungry to adopt new ways of doing things, particularly when it comes to new technologies. Most of Africa can leapfrog the developed world with respect to carbon-free power infrastructure; and a strong entrepreneurial spirit has emerged for finding ways of transforming environmentally friendly product and solution ideas into successful, job creating businesses.

Let's stop looking at the climate crisis as someone else's fault for which we bear no responsibility. It is an opportunity. To live in a more sustainable, healthier and more equitable world. ❑

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VEGAFLEX and VEGASWING to ensure LNG production accuracy

Business development manager Sebastian Harbig, who is responsible for Global Projects at VEGA, talks about the use of VEGAFLEX 86 guided-wave radar level sensors and VEGASWING 66 vibrating level switches on the Linde-developed Portovaya LNG Project under construction in Russia's Portovaya Bay.

Compared to pipeline gas, liquefied gases such as LNG or LPG can be transported much more flexibly and they also often have higher commercial value. A good example of this can be found in Russia's Portovaya Bay, the starting point of the Nord Stream Pipeline, where natural gas will be processed and loaded directly onto ships in cryogenic liquid form. Once the new natural gas liquefaction plant is completed, guided radar sensors from VEGA will make a significant contribution to safe and efficient production there.

LNG processes are among the most challenging in the process industry. A single plant can produce anywhere between 40 000 and 8-million tons per year in processing facilities ranging from small-scale to world-scale.

Two trends are becoming apparent in liquefaction plants. First: The future can swim. LNG plants are increasingly being designed as 'floating facilities' (FLNG). Gigantic floating liquefaction plants, sometimes as big as several football pitches, can produce LNG exactly where natural gas is available, without first having to transport the gas ashore through expensive pipelines. The industry is thus achieving an unprecedented level of flexibility and service quality. True to the motto, 'We come to you and deliver to your door.'

Having no mechanical moving parts, VEGAFLEX bypass measuring systems operate wear free and require almost no servicing. (Photo ©The Linde Group)

Second: Large-scale natural gas liquefaction plants need staying power and the willingness to make large investments. Current projects are therefore increasingly moving away from the huge sizes the growth market demanded in the past. Medium-sized projects are becoming more and more the thing. These allow project duration and financial investment to be scaled and closely matched to demand.

Production can thus be profitable, even in regions with smaller gas reserves. Also, such facilities can later be expanded with comparatively little effort to meet increased demand because expanding an existing facility is faster and easier than starting from scratch somewhere else. An additional compressor train or turbine or cold box – the cryogenic chamber where natural gas is cooled down to minus 162 °C – requires relatively little bureaucratic red tape.

The Linde Group delivers comprehensive turnkey solutions for the LNG processes in the plants of its customers. Just as comprehensive are the level measurement solutions VEGA creates for these same processes. A complete measuring system consisting of a bypass tube and sensor offers much more than just the sum of its parts. It includes an instrumentation concept tailored to the process and rounded off by comprehensive engineering and support services.

The ready-to-install sensors, which come with customised features, documentation and the required test certificates –

LNG is the big trend: Linde is building a medium-sized natural gas liquefaction plant with a capacity of 1.5-million tonnes of LNG near the Russian Baltic Sea town of Portovaya. (Photo ©The Linde Group)

all from a single source – are a building block Linde can rely on. Using VEGAFLEX 86 guided radar sensors, most of which come fitted in bypass tubes, and VEGASWING 66 for point level detection, delivers considerable savings, resulting from simplified planning, fast 'plug & play' installation and reduced maintenance requirements, among other things.

Having no mechanical moving parts, VEGAFLEX bypass measuring systems operate wear-free and require almost no servicing. Besides pre-assembly and adaptation to existing plant conditions, the scope of delivery even includes detailed parameterisation, such as false signal suppression. Only SIL safety functionalities, as required by law, have to be calibrated live on site with the original medium that will later be measured.

When designing LNG facilities, the top priority is to make sure all system components have sufficient robustness and performance reserves. Only in this way are the sensors able to reliably monitor the complex processes the media are put through. This core task hasn't changed much in spite of all the technical advances over the past few decades. Yet, in terms of efficiency and process reliability, today's measuring systems are almost unrecognisable.

On their journey to the LNG construction site, the ordered level sensors are accompanied by a thick bundle of papers. The aim is to comply with the strict legal regulations and the often even stricter country-specific requirements of the end customers. Besides production acceptance tests, the focus is on numerous certificates and licenses.

The Portovaya project is a so-called 'short-track' project. "The entire plant is being built in an unusually short time," explains Business Development Manager Sebastian Harbig, who is responsible for Global Projects at VEGA. "Delivery time was therefore a major criterion in awarding the contract," he adds.

This is not the first time VEGA has supported the EPC (Engineering, Procurement & Construction) specialist in medium-sized or large projects. VEGA is responsible for the complete, ready-to-install measuring point, the customer-specific documentation, as well as all necessary certificates.

Especially for international projects, delivery from a single source is an advantage that has multiplication potential, because a project like the one in Portovaya involves Linde teams, locations and suppliers all over the world. The work across borders has to function like a well-oiled machine, with every gear wheel syncing perfectly with all the others. Any delay can cause multiple delays downstream.

Machines in an LNG plant, especially those used in the liquefaction process, are exposed to extreme operating conditions. Between start-up and full operation of the cryogenic processes, the temperature expansion of the equipment is immense. The components are subject to extreme loads and even small changes in the composition of the processed natural gas can significantly reduce the overall service life of a machine.

The mid-scale plant now being built in Russia's Baltic Bay liquefies gas from a compressor station that has been in operation since 2010. The process for converting natural gas into LNG is based on three steps: pre-treatment; compression; and cooling/liquefaction.

Because natural gas contains impurities such as water, mercury or corrosive components that can freeze during the compression phase, it has to be pre-treated. The methane is only allowed to enter the liquefaction trains of the LNG plant in a highly concentrated form. In the various storage and process vessels, only two sensor types monitor the widely different media during the entire production process. These range from dry natural gas, condensed hydrocarbons and cold flare gas to ethane, LNG, hydrocarbons, fuel gas and wastewater.

Consistently high quality is essential for LNG processes. In today's competitive environment, industry must strike a balance between cost pressure and environmental awareness. But when it comes to quality, no compromises can be tolerated.

Efficiency and plant availability, which are significantly improved through standardisation in all areas of the plant, including instrumentation, guarantee high quality and a real cost advantage. Guided radar sensors are especially suitable here, as they can reliably withstand extreme pressure and temperature conditions. And vibrating level switches, with their compact design and millimetre accuracy, are also just the thing for many applications in the LNG plant.

VEGA's Global Projects Team, to which Sebastian Harbig also belongs, has developed into an experienced partner for worldwide plant projects with extensive knowledge of the critically important interfaces. To be able to supply customers in the best possible way, it is always important to provide detailed solutions that are far removed from day-to-day business. Optimal technology, as the project in Portovaya shows, can only be the basis on which to build. The actual task includes much, much more: working out the technical details, making quotations as well as communicating regularly with the client. And it does not end with setup and commissioning, but continues throughout the entire life cycle of the instruments, ensuring their availability and efficiency. ❑

Left: *VEGAFLEX 86 guided radar level sensors are robust and measure independently of the medium. This makes them suitable for almost all substances and level measuring tasks in the LNG process.* ***Right:*** *The VEGASWING 66 universal vibrating level switch reliably detects limit levels with millimetre accuracy.*

Portovaya LNG project

The engineering division of Linde AG in Munich is currently licensing a medium-sized plant complex in Russia's Portovaya Bay for the production, storage and transport of liquefied natural gas (mid-scale LNG) with an annual LNG production capacity of 1.5-million tonnes.

The Portovaya project is an ideal opportunity to further standardise proprietary liquefaction technologies. Linde will again use its patented, multi-stage natural gas liquefaction process to help medium-sized plants achieve world-class performance, especially in terms of energy efficiency,

This plants key features include:

- LNG production capacity of 1.5-million t/year; approximately 0.5% of annual global needs.
- Medium-sized floating facility the size of several football pitches.
- Patented, energy-efficient technology from Linde
- Complete solutions for level measurement with VEGAFLEX 86 guided-wave radar level sensors, mostly in bypass tubes, along with VEGASWING 66 vibrating level switches.

Team Leader for Bearing Steels, Urszula Sachadel.

BRAVE: exploring bearing failure, life and artificial intelligence

An experimental verification facility that will provide unprecedented insights into the mechanisms behind bearing failure and performance prediction is being built by SKF at its Research and Technology Development (RTD) centre in Houten, The Netherlands.

Some ten billion bearings are manufactured each year and, given the harsh conditions to which they are often subjected, they are incredibly reliable. Indeed, approximately 90% of these bearings outlive the equipment to which they are fitted. Only 0.5% of bearings fail in service, but this still means that some 50-million are replaced due to damage or failure every year, and each of these failures will likely have financial implications for their operators in terms of lost production, damage to adjacent parts and the cost of repairs.

There are numerous reasons why bearings can damage or fail. Generally speaking, around one third fail as a result of fatigue, while another third fail because of lubrication issues. Contamination causes a sixth of bearing failures, while the balance is accounted for by factors such as improper handling and mounting, heavier or different loading than was anticipated, and poor fitting.

When attempting to predict how, and perhaps more importantly when, a bearing will fail, a huge number of variables must be taken into account, including the application for which it will be used, the environment in which it will operate, the lubricants used and the loads to which it will be subjected, to name a few. As such, when developing new bearings, verifying their performance and for how long they will last can be a slow, expensive and complex process.

SKF is looking to solve this problem at its Research and Technology Development (RTD) centre in Houten, The Netherlands, which has started work on the construction of an experimental verification facility that it will use to increase its knowledge of the mechanisms that cause bearings to fail. It will also use the facility, which will be called Bearing Rigs for Accelerated Verification Experiments (BRAVE), to develop ways to predict the remaining useful life of these critical components rapidly, accurately and repeatably.

Team Leader for Bearing Steels, Urszula Sachadel; and Edwin Tummers, Team Leader for Experimental Verification at SKF have been running this project. "We needed a flexible testing facility where we could simulate different application conditions and see how a bearing system, including the materials from which it is made, and the lubrication employed, performs when operating under

SKF BRAVE experimental verification facility will provide unprecedented insights into mechanisms behind bearing failure and performance prediction.

different loads and at different speeds. We also needed to be able to do that in a way that allows us to perform investigations on that system, so we can determine how defects are generated, how they progress and how long the bearing will last until maintenance is required," says Tummers.

When completed, BRAVE will feature a number of rigs specifically designed and tailored to meet SKF specifications, which will be used by researchers to develop and experimentally verify bearing failure models. The functions of these rigs will be categorised as 'contaminate', 'initiate' and 'propagate', and they will often be used in sequence.

Sachadel explains: "With the contaminate set-up, for example, we can generate defects, such as dents, abrasion, electrical damage and corrosive damage in the bearings in different ways. We can also apply different lubricants. In the initiate set-up, we can then run the bearings under certain conditions to create some initial damage to them. Finally, in propagate, we can determine how different load and speed conditions influence the rate at which this damage spreads."

Each set-up type can also be used in isolation, or in a 'mix-and-match' approach, enabling a wide range of tests to be performed. In this way, Sachadel says, SKF researchers can screen many different variants of bearings very quickly to determine the best solution for a given application.

Test procedures will be developed, controlled and monitored closely, and all of the data, regarding things such as vibration, temperature and load history will be recorded. This data can then be analysed in detail during or after the experiments.

Sachadel continues: "Using BRAVE, we will be able to quickly evaluate potential bearing solutions, screen them, and understand the impact of different manufacturing processes on their performance. Further, in the future, we can use the data we gather to support our development of artificial intelligence (AI) and machine learning techniques to predict or improve the performance of our bearings."

BRAVE will be of particular benefit to SKF's Rotating Equipment Performance (REP) business and its remanufacturing operations. Sachadel explains: "We plan to look at the bearings after different stages of remanufacturing, to determine how the process affects their performance and how to boost it."

Work on the facility is currently scheduled for completion in early 2021. "We're going to learn a lot of new things through BRAVE, which we look forward to sharing with our customers," Sachadel concludes.

Edwin Tummers, Team Leader for Experimental Verification at SKF.

www.skf.com/africa

Redesigned coupling give new life to old generator

SKF has come up with a practical design and manufacturing solution that now enables customers to purchase standard off-the-shelf replacement parts for their dated diesel generators, ensuring that the machine is ready for operation for sustainable plant uptime in the event of power outages.

As downtime is simply not an option for the leading glass manufacturing company based in Johannesburg's East Rand, the customer relies heavily on the 130 kW diesel generator to ensure uninterrupted production during power failures. "Considered as critical equipment, the generator has been serving the company for many years and, due to old designs and dated technology, some of the machine's replacement parts are now becoming increasingly difficult to source or are simply no longer available," explains SKF product manager for Power Transmission, Frans Odendaal.

When the coupling between the generator's flywheel and motor failed, the customer was unable to find a suitable off-the-shelf replacement. Facing an urgent lead time to prevent plant downtime and potential production losses, the customer immediately contacted SKF Authorised Distributor, Bearing Services (BSA), for assistance. BSA consulted SKF who was able to come up with a practical solution that added great long-term value.

SKF designed and manufactured a new connection for the fly-wheel that is compatible with a standard off-the-shelf coupling. Using a sample of the old coupling to ensure alignment of mounting bolts, etc, a draughtsman from SKF produced the final CAD drawings of the new connection, which is a flanged shaft manufactured as one solid piece. "Also known as a stub shaft adaptor, the new connection suits a standard SKF tyre coupling," explains Odendaal. "In addition to easy replacement of the tyre element, the new maintenance free connection offers additional advantages including the ability to absorb vibration as well as some misalignment."

Now armed with short lead times on standard items, facilitated replacement procedures and maintenance planning going forward, the customer has minimised the generator's downtime in the event of a breakdown. Furthermore, the risk of the machine being inoperable during a power failure with consequent loss of production, is also reduced.

According to Odendaal, the customer has since contacted BSA regarding a chain solution on a different section of the plant which SKF is currently investigating. ❑

SKF offers a wide range of standard couplings to meet diverse application. For older machines, however, shaft, coupling and other adaptors can be engineered to ensure compatibility with SKF's standard range.

Robust planetary gearboxes for long service

The G3 full line of planetary gearboxes from Zest WEG is among the most robust in the world and capable of running for 10 years before major servicing is required. Manufactured in Brazil by WEG company TGM WEG, these units are now successfully operating in sugar mills in Zimbabwe and Angola.

The TGM WEG G3 boasts a bearing designed for over 100 000 hours of operation and a pioneering electronic monitoring system that checks oil temperature, pressure and vibration variables to ensure the gearbox is not subject to over-torque.

The G3 full line of planetary gearboxes from Zest WEG is among the world's most robust and capable of running for 10 years before major servicing is required.

With an output torque range from 400 kNm to 8 750 kNm, the range boasts bearings designed for over 100 000 hours of operation. These gearboxes are popular in central drive applications in diffusers and sugar mills, where they are also used as pinion-less and assist drives.

In addition to their high mechanical efficiency and robust gear and bearing sets, the gearboxes are flexible in their installation. The high performance hydraulic system has quality lubricant oil filtration, with 10 µm absolute filtration elements and an air-oil heat exchanger for optimal cooling.

The pioneering electronic monitoring system checks oil temperature, pressure and vibration variables to ensure the gearbox is not subject to over-torque. This guarantees smooth and reliable operation within the established limits, allowing optimum equipment usage and reduced maintenance costs.

Manufactured in Brazil by WEG company TGM WEG, the leading gearboxes include components that are heat treated in world-class facilities in accordance with API-6 standards. Committed to quality and environmental responsibility, TGM WEG is certified in terms of ISO 9001 and ISO 14001. The company's modern industrial complex features gear machining centres, milling machines, grinding machines, a bearing manufacturing department, a lubricating oil analysis laboratory and an assembly and testing unit for gearboxes and multipliers.

With an extensive footprint in the South American market, these units are now successfully operating in sugars mills in Zimbabwe and Angola.

www.zestweg.com

Manufactured in Brazil, the TGM WEG planetary gearbox is ideal for mill dewatering applications.

BI consolidates motor brands

Following the successful introduction of ABB's high-efficiency IE3 electric motors and the launch of the ALPHA Drive Micro and the ALPHA Drive Plus range of Variable Speed Drives, Bearings International (BI) is excited to announce the rebranding of its BAUER range of Tier 2 motors to ALPHA.

The growth of BI's market share in electric motors is one of the major strategic initiatives it undertook in 2019, culminating in the recent announcement of its partnership with ABB to include high-efficiency IE3 electric motors.

The advantages of the partnership with ABB include dealing with a local supplier versus direct imports and the availability of quick technical back-up and support. BI has extended its motor range in size, with a 400 V and 525 V offering, allowing it to be able to supply projects in the mining industry.

ABB, in turn, will be able to leverage from BI's extensive 42-branch network across South Africa, covering all the major mining and industrial areas where BI has a key footprint. The availability of IE3 high-efficiency motors from ABB will be especially welcomed by these sectors, where cost-effectiveness and total cost of ownership are key in an increasingly difficult trading environment.

"With our premium Tier 1 brand now being ABB, we have decided to consolidate our Tier 2 electrical products into one brand name, namely ALPHA. Therefore the BAUER electric motors will be changing to ALPHA from January," reports BI product manager Andries Barnard.

The part numbers, colour, quality and pricing will all remain the same. The only change will be on the nameplate of the motor itself, from BAUER to ALPHA. "Our ambition is to align the brands of our electrical products, compared to our power and transmission products, with these two clear brands," notes Barnard.

BI has a wide range of aluminium frame electric motors and aluminium housing three-phase asynchronous motors, all with the latest design and selected quality materials that conform to the IEC standard.

The MA range of BAUER motors performs extremely well, even in the toughest environments. This range has been designed to give reliable performance, and is also easy to maintain. With a 0.18 kW to 7.5 kW output, the motors are lightweight and have low noise emission.

www.bearings.co.za

BAUER electric motors from BI are now part of the ALPHA range of products, which also includes ALPHA Drive Micro and ALPHA Drive Plus variable speed drives.

New and improved **NSK SRBs from BMG**

BMG's range of high-performance NSK spherical roller bearings (SRBs) is perfectly suited to operate in demanding environments, including foundries, forges and die-casting applications.

The NSK HPS range, which has a running life nearly double that of conventional bearings of the same size, also ensures reduced maintenance costs, substantial energy savings and downsizing in product design. The maximum limiting running speed of these spherical roller bearings has also improved by 20%.

"During rotation of conventional spherical roller bearings, slip between the raceway and the rollers causes fatigue, which eventually leads to flaking. To counter this, NSK has developed a special treatment on the surface of the outer ring that improves the traction of rollers and better controls their rotational speed," says Wayne Holton, business unit manager for Bearings, Seals and Gaskets at BMG. "This advanced technology, which has extended the service life of these bearings by up to twice that of conventional spherical roller bearings, also increases the bearings' dynamic load rating," he adds.

NSK applies a special nitriding treatment to the surface of the cage so that a finer, harder and more uniform surface is formed compared to conventional bearings. Maximum limiting speed is significantly increased and cage wear in harsh operational applications is reduced.

BMG's NSK HPS range of spherical roller bearings has a running life nearly double that of conventional bearings of the same size, with maximum limiting running speeds improved by 20%.

Robust HPS spherical roller bearings, which are available nationally from BMG, come in bore sizes from 40 mm to 130 mm. These bearings offer extended service life, reduced maintenance and enhanced performance in heavy-duty applications.

BMG's specialist divisions have advanced technical skills to support the company's commitment to applying technical knowledge and depth of experience to maximise efficiency and profitability for every customer. The company has secured distribution and service agreements with some of the world's most respected manufacturers of bearings, including NSK, NTN, Timken, IKO and Rollix.

BMG's extensive bearings portfolio is carefully selected in terms of consistent quality controls, compatibility, standardisation, reliability and extended service life.

The BMG team is committed to working closely with customers in all industries to investigate the source of bearing problems and to provide cost-efficient solutions for optimum productivity of machinery, extended service life of the system, and minimal maintenance requirements.

www.bmgworld.net

Durable scraper chains for boilers and burners

BMG's Power Transmission division supplies a wide range of conveyor chain that ensures efficient and trouble-free transport of slag granulates, ash or smelting residues from beneath boilers, burners and furnaces.

According to BMG specialists, conveying dry or wet ash is one the most challenging applications a chain can be subjected to. "Conventional chains installed in these harsh facilities normally only function effectively for about a year, due to abrasion and the varying temperatures of ash," explains Gavin Kirstein, BMG's Tsubaki product manager "However, BMG's range of high-performance ash conveyor chain, which undergoes a high-tech manufacturing process, ensures extended service life, even in harsh conditions. Special attention is given to dimensional accuracy, constant geometry, high surface quality and lubrication.

"Ash removal systems play a key role in the boiler and burner industry by safely removing the waste. BMG specialists work closely with each customer to install the most suitable conveying method, in terms of reliability, simplicity and efficiency. Regardless of whether dry or wet ash removal is used, BMG's focus is primarily on harmonising the processes, from collecting, extinguishing and cooling down ash, to safe storage in the ash bunker.

"Customisation of ash removal chain is paramount to achieving optimum efficiency of the conveyor chain for every application. The flexibility of BMG's service includes the manufacture of chain to suit exact requirements – with various options, including materials, custom coatings, lubrication and accessories – to create an ideal scraping solution that boosts productivity and minimises abrasion."

BMG's range of robust chain conveyors is optimally tailored to suit the material that needs to be conveyed. Optimum chain quality and reliability of every system are vital to ensuring profitability, high productivity and extended serviced life.

BMG's robust ash removal chain is enhanced by a wide range of sprockets, available in varying grades of steel and other metals. The company also offers split sprockets for ease of disassembly and optional lightening holes to reduce weight, and additional surface hardening is available for rollers and bushes.

BMG's technical support service includes analysis of chains when replacement is required, which involves metrics on chain wear life that further optimises the conveying process. ❑

Locally assembled drive solutions

Henco du Plooy, Managing Director of Bonfiglioli in South Africa, talks about his company's heavy duty bevel helical and parallel shaft gear units.

Based on our products' proven track record and performance on previous installations, we were invited by our clients to tender for the supply of multiple large conveyor and feeder drives for an Eastern European Gold mine expansion project. The delivery timeframe was critical. Each conveyor drive train assembly (power-pack) needed to include a motor, high speed fluid coupling, gearbox, low speed side flange coupling and safety guards, all assembled on a customised fabricated baseplate.

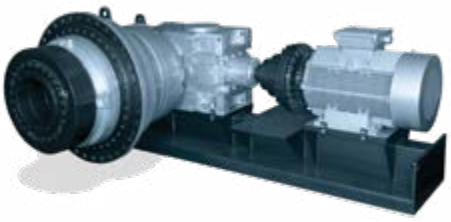
For the high torque, low speed feeder drives, we provided a compact drive solution which consisted of a primary helical-bevel gearbox coupled to a final stage planetary reducer. Site conditions posed some technical challenges that needed to be overcome. The installation site would encounter temperature swings from -35 °C in the winter months, to +35 °C in summer. Our local technical design department was quick to meet the challenge to implement the necessary upgrades required to overcome these conditions. Standard oil seals were replaced with silicon based versions that could handle the extremes in temperature, while oil heaters were installed on all units to pre-heat the gear reducer prior to start-up in the cold conditions.

As a result of this success, we were awarded eight projects for six different mines in the area.

Due to our extensive local stock holding of components, all fifteen conveyor power packs and five feeder drive units could be built from stock, which enabled our local assembly centre to meet the necessary deadline as required by the client. We are accredited by our parent company to assemble up to the HDP/HDO 140 size in South Africa. The same strict build and quality standards applied at the factory have to be adhered to. This means that all branches accredited to assemble gearboxes do so to European factory standard.

Since 2008, we have been building our project capability. This includes access to a global technical platform. Through this communication portal, our local engineering department has access to a worldwide database of applications, which enables us to offer technically proven solutions with very quick turnaround times. Our local capability can tailor our product offering to suit most environmental conditions.

Bonfiglioli has organised its market support and customer assistance functions along clear 'customer- first' guidelines. Aware that our direct presence in local markets is the key to long-lasting success, we guarantee the same high standards of Bonfiglioli quality anywhere in the world at any given time. ❑



Grindex: for long lasting pumping solutions

Jordan Marsh, the recently appointed national sales manager for Integrated Pump Technology, talks about the company's geographic footprint, the operating philosophy of its distributor base and some of the reasons why Grindex Pumps have become a preferred solution for mining applications across South and sub-Saharan Africa.

Originally established as the official distributor for Grindex Pumps in sub-Saharan Africa in 2014, Integrated Pump Technology now has a large installed base across all of the mining regions of sub-Saharan Africa. "On the Grindex range, our focus is on mine drainage and slurry applications, in South Africa as well as north of our borders," begins the company's new national sales manager, Jordan Marsh, who was appointed to the role on January 1, 2021. A key aspect to this growth is the company's distribution philosophy, which strives to maximise the local support available to operators of its pumps: "Since 2014, we have been developing a skills-based distributor network. This involves putting pumping specialists into all major mining areas, people who are able to support our mining customers via a local and accessible hub," Marsh explains.

"Technically trained sales representatives with knowledge of the local people, problems and needs are chosen to deliver our offering on a best fit for purpose basis," he continues.

A Grindex Bravo being installed on a mine.

"From our premises in Jet Park, near the OR Tambo Airport in South Africa, we then offer higher-level support to ensure that each local distributor is able to deliver local backup, maintenance and technical service support at the levels needed by mine operators. We strive to empower each distributor to provide a rapid after sales service response so as to keep our Grindex pumps delivering as required and preferred by everyone who uses them," he adds.

Members of the distributor network sign agreements with Integrated Pump Technology year on year which specify the services that will be offered locally and the support each distributor can expect from the Jet Park facility. "We prefer our pumps to be serviced and repaired locally, so we strive to find distributors with repair workshops and a test bay, so the pumps can be looked after properly, repaired and refurbished to the original specifications and tested to maintain the high standards expected of the Grindex brand.

"We also keep exceptionally high stocking levels of all wear parts and spares for every pump in our range, which usually enables us to deliver to our distributors on a next day basis," Marsh tells MechChem Africa.

"There are always some repairs that are too large or complex to be handled in smaller workshops, though, so we make our large workshop here in Jet Park available for any repair that cannot be completed locally. As well as being able to repair the full Grindex range, we can service almost any other pump brands, including all other high-end Swedish pumps.

Marsh assures that Integrated Pump Technology's Grindex distributors are compliant with B-BBEE initiatives and committed to conforming with the current localisation requirements of the Mining Charter. "We have also initiated onsite pump and technical training for our distributors and for end users. This includes routine operation and maintenance requirements as well as the local refurbishment of worn pumps.

"We see this as part of our responsibility to transfer skills to local people and to raise their employment prospects. Many of the pumps in mines are not being used very effectively, and by pointing out how this can be improved

and upskilling local pump operators to realise how a pump's performance can be optimised, mines can become a little more sustainable, which enables them to support more jobs," he says, adding that basic pump knowledge can go a long way in this regard.

Best fit for purpose solutions

"Grindex pumps are the Rolls Royce of the industry," Marsh believes, as is evident from the 30-month warranty offered with every new Grindex purchase. "This, we find, gives a high level of confidence to mining engineers with respect to quality and value for money," he notes.

He says that Integrated Pump Technology is able to identify a pump solution for almost every mining application it encounters. "For dewatering, we can offer pumps with twin impellers that offer very high heads – up to 200 m – for pumping water from deep underground. Our biggest is a 90 kW and we go down to 0.75 kW units. For below ground use from multiple mine stopes, 5.5 to 37 kW pumps with high head H-impellers are preferred, while closer to the surface, we can use the 90 kW Grindex high flow pump units with N-impellers to transport the water out of the mine and into surface storage facilities," he explains.

Adding to the suitability of the submersible pump range for the harsh conditions of African mines, he says Grindex pumps in the power range of up to 18 kW have their own built-in smart device for self-monitoring, which protects against phase rotation, dry running and overheating. "This is a huge advantage in remote underground situations where access is difficult," notes Marsh.

Every mine, however, requires a different solution with respect to dewatering, water transfer or slurry. "We see our role as developing pumping solutions that are perfectly tailored to a mine's needs," he assures. "We then present mine managers with the cost effectiveness of the solution we have identified, typically breaking down the total lifecycle or ownership costs based on efficiency, performance, life and reliability gains. This enables users to do a like-for-like comparison of our Grindex solutions compared to an existing installation or to a less well engineered, and therefore cheaper, alternative.

"We recently compared one of our Grindex submersible pumps to a vertical spindle solution for a dewatering application, for example. Mostly due to the significantly longer life and a much lower installation cost of using a Grindex submersible pump, the total cost of ownership of the Grindex solution was 51% lower than the vertical spindle option, making it easy for us to present a convincing argument," Marsh relates.

A good fit Grindex solution in many mining applications will usually deliver significantly better energy efficiency and, because energy costs of pumps outweigh initial purchase costs, this rapidly reduces the total cost of ownership. "For a recent application in Polokwane, for example, we looked at our Grindex Bravo 600 22 kW pump as a replacement for a currently installed 30 kW submersible. Our 22 kW pump performs at the same duty as the current pump, but it draws over 25% less power, so it is much more energy efficient. Adding to this, as with all Grindex Bravo pumps from 400 up, this pump has a built-in cooling jacket, which means that the Bravo 600 does not need to be fully submerged for the pump to be effectively cooled.

"In this operation, the operator cannot keep an eye on it 24/7, so the water level often drops below the safe level for keeping the pump cool. We think our pump, being more rugged and better cooled, can solve a whole lot of the problems they are experiencing. Most importantly, though, the improved energy efficiency will reduce electricity consumption, which will result in a TCO saving of 51% over a five year operational period of the pump

"Two of our Bravo 600 units are currently on trial and performing as expected, so we expect this to lead to the steady replacement of the existing fleet with Grindex Bravos over the next few years," Marsh predicts. "Through our sister company Integrated Pump Rental, we also have a substantial rental fleet, which we can use for demonstrations in situations such as those on a trial basis. This helps to allay purchasing risk concerns and to assure operators that our solutions will deliver as promised," he adds.

In addition, Integrated Pump Technology has a dedicated engineering team that provides custom-designed solutions for the challenges facing customers. "We pride ourselves on being able to fix problems where others have failed. We are so much more than a pump in a box reseller.

"Going forward, our strategically placed account managers are seeing a lot of potential. Mines still have to operate and many are now looking at performance efficiency opportunities as well as expansion projects and new developments. Our distribution network is ready and waiting to support them in all of these areas," Marsh concludes. ❑

The Grindex Bravo pump has its own built-in smart device for self-monitoring offering optimum protection.

Every new Grindex Bravo submersible pump carries a 30-month warranty.

Sustainability vision for Africa and the Middle East

Grant Ramsden, regional managing director of Weir Minerals Africa and Middle East, talks about how the company's successful 150-year evolution is continuing, with a strong forward looking sustainability vision.

According to Grant Ramsden, Weir Minerals Africa is focused on partnering with customers to drive efficiencies using its proven technology-driven solutions, with a strong sustainability vision for the modern mining, minerals processing and cement industries.

"As our mining sector customers look to reduce their carbon footprint, we are engineering solutions for a future that prioritises energy efficiency and raises productivity," says Ramsden, who stepped into his new role during the economic lockdown in 2020. "With leading brands all the way from ground-engaging tools to processing equipment across the mill circuit, we have an exciting year ahead with our continuously expanding equipment range.

Among the solutions that will raise most interest, he says, are the company's high pressure grinding rolls (HPGRs), which are more energy efficient than traditional ball mills and utilise dry processing. With most of the global mining sector having readily embraced this technology, there is still plenty of scope for its adoption in Africa.

"Another exciting area of opportunity for us remains our high-pressure GEHO positive displacement pump range, where we continue to see substantial interest," he says. "These pumps represent the latest advances in hydro-transport, and will also add to the efficiencies we can bring to mining across Africa." GEHO pumps can handle slurry concentrations of up to 85% and temperatures exceeding 200 °C, making them ideal for transporting thick, hot and very abrasive slurries.

In the context of the COVID-19 pandemic, Ramsden says that Weir's Synertrex® condition monitoring and smart analytics platform will attract more attention in 2021. Developed by Weir Minerals to complement its portfolio of mining equipment, Synertrex® monitors product operation and feeds data automatically to the cloud and control systems. This also allows for remote monitoring where employees or management may not have regular physical access to plant operations. "With our service-focused approach, we are able to become directly integrated into the customer's operation, through having one of our own experts in the mine's control room helping to monitor equipment and possibly even procuring the necessary spares," he says. "Synertrex has already proved itself in South Africa's minerals sands segment, and similar interest has been expressed from other commodity miners in our region. This system can also streamline procurement by alerting customers when new spares may be needed."

Ramsden emphasises the value in Weir Minerals' wear resistant technology (WRT), which has demonstrated increases in the life of impellers and throat bushes of Warman® slurry pumps by up to 30%. These improvements significantly extend pump life and reduce total cost of ownership for the company's customers.

As an established original equipment manufacturer (OEM) in South Africa, Weir Minerals Africa is planning further investment in upgrades and process improvements at its Isando foundry. It will also be directing resources for a technology upgrade at its Isando rubber plant, one of two local facilities contributing to the company's range of IP-protected rubber products.

"After a difficult 2020 for everyone, it will be exciting to be investing and expand-

The foundry at Weir Minerals Africa's Isando facility where further upgrades and process improvements are planned.

ing to assist our customers meet their production targets," he says. "We also look forward to continuing our investment in local skills, which includes supporting 22 graduates – 90% of whom are drawn into our business after qualifying from their university studies."

Ramsden highlights the importance of the Weir Minerals' Mill Circuit University in providing essential training to staff – helping to keep the company and the broader mining industry operating at the highest levels of performance. "The technical experts in our business constantly leverage new technology, applying it to our products to the benefit of our customers," he says. "The use of 3D scanners, for instance, enhances the capability of our process engineers when they visit customer sites. This enables them to quickly generate the measurements they need to develop quality proposals for productivity solutions."

He is also confident about the prospects for the Middle East, where comminution is the main focus of the company's offerings – serving the considerable demand for infrastructure works in that region. Its local capacity has been further enhanced by the recent unveiling of a new world class service centre in Dubai in the United Arab Emirates.

"This aligns with our mission to be available wherever and whenever our customers need us," Ramsden concludes.

www.minerals.weir

An Enduron high-pressure grinding roll (HPGR) installed at a sand and aggregate plant. HPGRs are more energy efficient than traditional ball mills and dry processing reduces plant water requirements.

A GEHO positive displacement pump operating at a platinum mine. GEHO pumps can handle slurry concentrations of up to 85% and temperatures exceeding 200 °C.

Contactless and precise volumetric flow measurement

GEMÜ, a manufacturer of valves, measurement and control systems, is introducing its new GEMÜ 3040 ultrasonic flowmeter, which can be used to determine conductive and non-conductive volumetric flows of liquids in a contactless process.

The GEMÜ 3040 ultrasonic flowmeter is distinguished by its suitability for a wide range of nominal sizes (DN 10 to 50), its lack of moving parts in the media-wetted area and its increased accuracy and reproducibility of measurement results. The device can be used to measure both conductive and non-conductive media within a pressure range of 0 to 16 bar with an accuracy of 2% of the value measured. The flowmeter can be used in a temperature range of between -10 °C and 80 °C.

Its high-quality plastic body means that the GEMÜ 3040 can be used for corrosive media, such as acids and alkalis. Its use in cooling circuits, chemical processes and water supply projects makes up just a small part of the flowmeter's diverse areas of application.

The illuminated display, which is installed as standard, means that programming can be carried out directly on site. In addition, all the important operating parameters can be read directly on the flowmeter and it comes with integrated empty pipe monitoring and a quantity measuring device as standard. In order to optimise integration into different applications, all of the standard electrical and mechanical connections are also provided.

As sensor systems are also often used in control circuits as part of process automation and monitoring, the GEMÜ 3040 measurement device can be combined with a GEMÜ valve and GEMÜ positioner or process controller to form a complete pressure control system.

With the launch of this ultrasonic flowmeter, GEMÜ is further expanding its product range of measurement systems. In addition, the GEMÜ C38 SonicLine ultrasonic flowmeter remains available for ultra-pure applications.

www.gemu-group.com

GEMÜ 3040 ultrasonic flowmeters can be used to measure both conductive and non-conductive media within a pressure range of 0 to 16 bar within an accuracy of 2% of the value measured.

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Intelligent water treatment solution cuts bacteria growth

Pump solutions leader Grundfos offers industry intelligent systems for minimising the risks associated with biological contamination in water treatment systems, which can lead to Legionnaire's disease. Dean Naidoo, lead key account manager for OEM Industries at Grundfos South Africa, explains.

A lack of prevention measures and self-monitoring in cooling towers and hot water systems is one of the main reasons for the increased risk of biological contamination which, if left uncontrolled, can cause the deadly Legionnaire's disease.

Explaining the problem, Grundfos' Dean Naidoo says that cooling towers dissipate unwanted heat into the atmosphere through water evaporation. Water is sprayed into the cooling tower through spray nozzles and tiny airborne droplets are formed. While falling through the tower, some of the water evaporates but some droplets, known as drift, are carried out of the tower by the air stream produced by the fans. Legionella bacteria can grow in the water and are easily dispersed with this drift.

"Water conditioning in these systems is therefore important for health and safety purposes," says Naidoo. "This maintains safe water quality and supports the overall efficiency of the system."

However, such water treatment requires extremely accurate dosing of chemical additives. When carried out manually, chemical preparation and dosing are fraught with human error. Overdosing, for instance, can lead to safety risks and higher than necessary chemical costs.

The concentration of salt in a cooling tower system is another potential challenge. It can lead to fouling and the build-up of concentrated solids in the form of scaling. This causes corrosion, blockages and reduced efficiency.

When the concentration reaches a certain level, solids must be released in a process called 'blowdown' and new water added to retain water balance. Once again, manual operation can lead to costly results as too much blowdown uses excessive amounts of water while too little blowdown might damage the cooling tower equipment. "Human error can also expose a company to the risk of non-compliance, as chemical use is often subject to environmental regulations," says Naidoo. "Complicated tracking and reporting procedures can make compliance difficult when companies rely on manual systems."

The solution from Grundfos is an intelligent disinfection solution, facilitating easy and efficient reduction of health risks in industrial water treatment.

The solution combines several components including intelligent digital dosing pumps such as the Grundfos SMART digital dosing advanced (DDA) range, a measuring and control device, a dosing instrumentation digital (DID) System and a cloud-based remote monitoring system that connects the components.

"The Grundfos measuring and control device can measure the conductivity in the cooling water, which can trigger a response when a critical dissolved solids content level is reached," he says. "The system can then react automatically to blowdown, keeping water quality within optimal parameters and maintaining water balance – all without any manual intervention by an employee."

The Grundfos device will also ensure that the chemical dosing pump releases the exact amount of biocide required to keep the bacteria growth under control, thereby avoiding overdosing or under-dosing. Programmed with an integrated intelligent algorithm, the Grundfos SMART DDA pump will prevent discrepancies in the system, triggering an alarm if any issues occur.

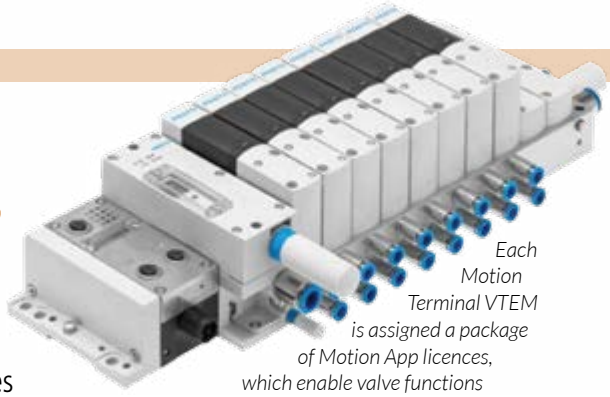
"To enhance this system's ease of use, all the operational parameters are consolidated in the Grundfos chemical management app," he says. "All relevant parameters are stored in the cloud and the app can then produce compliance reports on request."

"The result is a fully connected solution; the measuring and control device, the digital dosing pump, the remote management system and the chemical management app all work together to deliver safer, more cost-efficient water conditioning and blowdown control," Naidoo concludes.

www.grundfos.com

A Grundfos SMART digital dosing advanced pump installation with a DID (Dosing Instrumentation Digital) system.

Pick and place systems with digitised pneumatics



Each Motion Terminal VTEM is assigned a package of Motion App licences, which enable valve functions available within the Motion Terminal to be freely assigned to each individual valve.

Festo's new valve technology and Motion Terminal VTEM system enables pneumatic valves and positioners to be digitally programmed and controlled via Motion Apps, a system combination that replaces over 50 individual components. This article describes how this modern technology is revolutionising and simplifying pick and place positioning applications.

A wide range of products, functions and complete solution packages are integrated into the Festo Motion Terminal. Among these are the Motion Apps, which herald a new Industry 4.0 era. Motion Apps are revolutionising pneumatics by increasing flexibility, energy efficiency and accelerating production processes. This also has benefits for handling technology, as the automation platform VTEM opens the door for positioning using pneumatics.

Users can execute different tasks with just one valve and operate 16 pressure regulation channels with eight valves. This significantly reduces the amount of work required, from engineering to format change-overs. For this reason, experts recognise the Festo Motion Terminal VTEM as a revolution in automation technology.

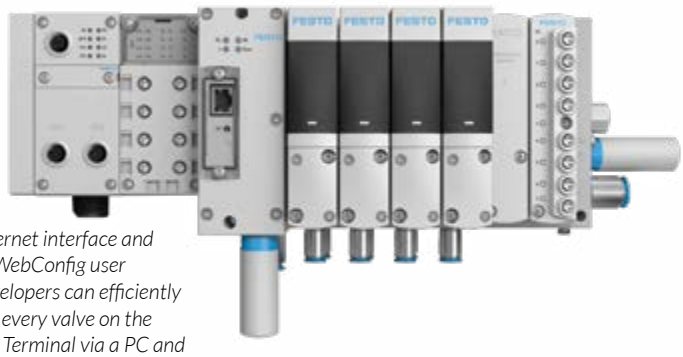
Simplifying pick and place applications

With the Motion Terminal VTEM, users can realise all the functions in their pick and place application in just one system. There is no need for components such as shock absorbers or flow control valves. Since Motion Apps now take over many tasks and replace complicated mechanical structures, the design process is much easier. The process data can be read out at any time, enabling users to respond quickly to deviations and guarantee consistent quality.

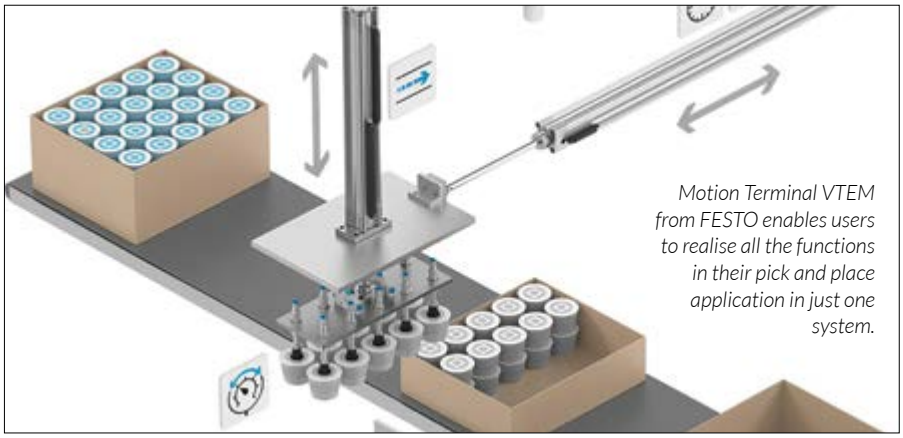
Positioning using pneumatics

Festo's Positioning Motion App gives handling experts flexibility when positioning workpieces of different sizes. They can optimise the end-to-end motions for every possible workpiece size, for example, by precisely defining the variables such as the motion speed and impact energy in the end position.

With the Positioning App, pneumatic actuators can be freely positioned along the entire working stroke, and the cylinder movement can be controlled using limit values for the speed, acceleration and jerk parameters. Gentle positioning is possible for selected series with strokes of up to 300 mm by specifying the limit values.



With the Ethernet interface and the intuitive WebConfig user interface, developers can efficiently parameterise every valve on the Festo Motion Terminal via a PC and a web server.



Motion Terminal VTEM from FESTO enables users to realise all the functions in their pick and place application in just one system.

Pressure and vacuum control

The Proportional Pressure Regulation Motion App ensures safe transport with vacuum, with the vacuum level being adapted to the weight that needs to be moved. This enables plant manufacturers to increase the energy efficiency of their application. Changeover times or manual format changes are a thing of the past because users can easily switch over to the parameters they need. In addition, the virtual vibration-free travel into the end position with Festo's Soft Stop Motion App minimises wear and shortens the cycle times.

Software instead of hardware

Thanks to the fast activation of new functions via Motion Apps, machine developers can create a basic machine type using the Festo Motion Terminal and then select the relevant Motion Apps to equip it with different functions and features as per customer requirements. The ability to copy and transfer parameter sets makes planning easier and saves time. Assigning functions via software has the added benefit of preventing tampering since it is not possible to tell from the outside which functions the valves are executing.

Maintenance is simplified, as leaks are automatically monitored. Also, long lists of spare and wearing parts are a thing of the past. With the Leakage Diagnostics Motion App, malfunctions can be detected via diagnostic cycle and pinpointed to a specific actuator and defined threshold values. This enables predictive maintenance.

Festo Motion Apps are the key to limitless function integration for valve terminals. Combined with software, Festo Apps simplify the entire value chain, since only one piece of hardware required.

www.festo.com/cms/en-za_za

Nifty nitrogen from Rand-Air generators

To support the growing need for nitrogen, Rand-Air, a division of Atlas Copco Specialty Rental, is able to supply a safe, high-quality solution. Rand-Air Sales and Marketing Manager Byrone Thorne explains.

Atlas Copco nitrogen generators are mobile or stationary production units that convert compressed dry air into nitrogen by separating the oxygen molecules from the nitrogen molecules. These units therefore enable companies to control the amount, pressure and purity of the nitrogen they produce, according to their needs.

"By supplying Atlas Copco's range of nitrogen generators, Rand-Air focuses on meeting these needs, enabling clients to have their required supply of nitrogen while optimising their production process at the same time, says Thorne. "Our nitrogen generators can be adapted to meet a customer's specific applications and they offer an excellent return-on-investment due to their lower operating costs," he adds.

"For customers, there are no additional costs regarding the supply of nitrogen, such as order processing, refills or delivery charges. In addition, maintenance costs are minimal and companies are no longer subject to gas market volatility and price fluctuations. In addition, the potential safety hazards associated with the handling of high-pressure cylinders are also removed," Thorne points out.

To support efficient and safe manufacturing and maintenance, Rand-Air's range of nitrogen generators includes membrane nitrogen generators, such as the NGM, and NGM+ models that use a proprietary membrane separation technology; as well as the PSA, NGP and NGP+ nitrogen generators, which are based on Pressure Swing Adsorption (PSA) technology.

"Membrane nitrogen generators are ready for immediate use, as they only require a supply of dry compressed air. They are also fitted with a pre-filtration pressure gauge and flow meter, to ensure accurate system monitoring at all times," says Thorne.

A focus on quality is also evident in the nitrogen generator range. The NGM and NGM+ models and the mobile NGM280, for example, deliver nitrogen of between 90% and 99% purity, with production flow reducing with increased purity, depending on needs.

An Atlas Copco NGM280 membrane nitrogen generator available for rental from Rand Air.

"The membrane nitrogen generators, which offer high-flow capacity, are ideal for applications such as fire prevention, tyre inflation, oil and gas, maritime and others. Conversely, the NGMs are suitable and efficient for low-flow nitrogen generation.

"The PSA nitrogen generators (NGP and NGP+), offer the required purity with a high-flow capacity, making them suitable for a wider range of applications," reiterates Thorne.

As oil refineries and industrial sectors cannot afford inefficient shutdowns and unforeseen operational downtime, a key advantage of nitrogen generators is their continuous availability. "Nitrogen can be produced 24 hours a day, seven days a week on site. This availability ensures that the risk of production breakdown due to gas running out is eliminated," Thorne points out.

With companies also focusing on energy savings and sustainable production, the new-generation NGP+ nitrogen generators feature premium energy efficiency, with an automatic start-up, and are the ultimate energy saver: "The generators also include self-protective monitoring of feed-air quality, back-flow pressurisation, and other features," he says.

"Rand-Air constantly seeks ways to help customers make agility count. By this we mean we help them to meet their industry challenges, while also optimising efficiency, quality, health and safety. We also seek to incorporate environmentally sustainable technology and practices into our offerings. The use of the nitrogen generators fulfils all these objectives," Thorne concludes.

randair.co.za

Scalping screen designs for extended panel life and better material stratification

MechChem Africa talks to Kenny Mayhew-Ridgers, chief operating officer (COO) of Kwatani, about the company's design philosophy for large scalping screens, which has resulted in a more than threefold extension of screen panel life, from eight weeks to more than six months.

"Scalping screens typically sit between the primary and secondary crushers of iron-ore, manganese or platinum mines," begins Mayhew-Ridgers. "Run-of-mine (ROM) ore delivered from a pit to a primary crusher has a size mix from massive boulders down to very small particles. Typically, using a gyratory crusher, the primary crusher breaks up the larger pieces of ore to a thickness of around 200 mm, ready for further processing in the secondary crusher," he explains.

Before being passed on to the secondary crusher, however, the mixed size feed is instead diverted to a scalping screen. "Scalping screens relieve the secondary crusher by removing (scalping) the particles that do not need secondary crushing. Only the 'overs' that are still sized above the secondary's size setting, typically 50 to 100 mm, are crushed a second time, while undersized material is removed by scalping screen and diverted further down the line," Mayhew-Ridgers tells *MechChem Africa*.

"This immediately increases the capacity of the secondary crusher circuit because less material is being passed through. Also, fines tend to fill voids between course particles, reducing crushing pressures on larger particles. Fines also increase wear rates, reducing crusher life," he adds. While mines used to take a modular approach using two or three smaller scalper units running in parallel, Mayhew-Ridgers says that today's trend is to adopt a single line stream using one large screen to do all of the work. "This means that a large storage bin to store several hours of production is needed to cover for any downtime on the scalper. It might take eight hours to replace an exciter and a few worn screen panels, for example, so if the mine has a weekly halt to production, then we have regular opportunities for maintenance – but many mines don't like halting production at all," he continues.

"South African operators typically keep at least one spare unit that can be lifted in and out of the line with cranes, but the longer a scalper can continue to operate before it needs to be shut down and/or removed for maintenance, the better," he tells *MechChem Africa*

Better designs for a longer life

According to Mayhew-Ridgers, scalping screens are exciter gearbox driven and they operate on a decline that can vary from traditionally quite steep to the gentler declines of modern units. "The steeper the decline, the more momentum the rocks have as they move across the deck and, while this improves throughput, from a screening perspective faster tends to be harder to control, so the stratification efficiency drops and the risk of blinding increases when the stroke of the screen eventually has to be set down in order to control the material flow," he explains.

Broadly speaking, there are two schools of thought, he continues. Smaller screens use wire mesh screening media, which require steeper angles of decline. This presents the largest open screening area, which makes the scalper size efficient, that is, a smaller unit can theoretically deliver the same throughput.

The second option is to use rubber or polyurethane screen panels, which present less open area, but deliver a range of other advantages. "We at Kwatani have spent a lot of time and energy looking at integrated designs that include the screen panel, because panel design has to be closely matched to the design philosophy of the scalping screen

A large Kwatani scalping screen being transported to the customer.

itself in order to find the best balance between screening area, aperture layout and screen panel life," he explains, adding that an understanding of the screen dynamics comes first. "Only then can one design a screen panel to best suits these dynamics," he advises.

If using wire mesh, an elliptical motion on the screen surface is created using an unbalanced 'swinging' load on the exciter. This suits wire mesh because of its rigid aperture size, preventing most particle from blinding. The elliptical motion tends to throw any stuck particle back onto the deck, deblinding the screen, but a steeper angle of decline is required to make sure that the bottom edges of the mesh are lower than the top edges so particles can tumble over the apertures instead of becoming wedged.

A Kwatani scalper screen for the iron ore sector on the test bench undergoing vigorous testing.

"With larger scalpers such as single-line 7 500 t/h units, circular drives are not able to provide enough elliptical movement on the deck to create this effect, so linear motion exciters have to be used. The benefit here is the direction of vibration can be precisely chosen simply by adjusting the mounting angle of the exciter gearbox. But linear exciters cannot produce the elliptical tumbling motion needed to minimise blinding on wire mesh screens," explains Mayhew-Ridgers.

"Abrasive materials also cause rapid wear of the wire mesh, while protecting the deck beams and runners underneath the mesh becomes complicated," he adds.

"So for bigger screens, especially those being used with abrasive materials, we prefer to use bolt in rubber or polyurethane panels. Although these offer less open area, the panels put more material in direct contact with the ore, which can significantly slow the wear rate," he says.

"A scalping screen with 7 500 t/h of ore being 'bounced' over its screens is being subjected to massive loads: over 40 t of material can be on the screen deck at any time. So, a very strong supporting structure is needed, not only to support the weight of 40 t of material, but also to accelerate it to between 4 and 5 Gs so enough energy is transferred to give stratification. And without stratification, the fines will not be removed and the machine will not function as a scalper, especially if the material is being moved through too fast.

"With rubber or polyurethane screens, a decline is still needed, but this must be gentler to prevent the material simply flowing over the screen. Very important, though, is the stiffness of the screen bed."

A Kwatani engineer overseeing the final testing of the scalper screen.

Explaining, Mayhew-Ridgers says the linear exciters used for dry applications operate at lower speed with a bigger stroke, about 750 rpm with a 15 mm stroke. "A 15 mm stroke is small compared to a particle size of 150 mm. If the panel bed is too flexible, and it could sag up to 10 mm when accelerated, then a stuck particle would only experience 5.0 mm of the applied stroke, preventing material on the deck from being stratified.

"So, the stiffness of the supporting structure and the design of screen panels have to go hand in hand to get the results we need," he informs *MechChem Africa*.

While polyurethane designed panels are strong and lightweight, he says the screening apertures in the panel tend to be too stiff for the heavy-duty scalping applications, so blinding becomes a bigger problem. "Rubber overcomes this problem, while also delivering improved wear life. Over the past eight years, we have come from a scalping design that used to have its screen panels replaced every six to eight weeks, to a custom rubber panel design that is lasting up to six months.

"A meticulously designed steel support structure aligns with our rubber screen panels to maximise the stiffness and the support area, while maximising the open area on our large scalping screens. Careful positioning and spacing of the deck beams also prevents under structure wear from the fines passing through," he says, adding that since 2012, throughput of Kwatani's scalper designs has been increased up to 1 500 t/h for the same size screens.

"We have also simplified panel replacement by incorporating a fastening mechanism on the underframe that enables the screen panels to be bolted in and removed from the top, without having to secure nuts underneath. This drastically improves safety and reduces panel replacement times – from two days to half a day for large screens – and it enables individual panels to be replaced quickly and in-situ when the need arises – within 10 minutes per panel, in some instances, taking into account that these panels weigh around 100 kg each and are bolted down with eight bolts to ensure the panel becomes part of the structural deck frame."

As with all screen designs, it is important to ensure that scalping solutions are suited to the ore coming out of the mine. "Each ore has a different density, stickiness, wear, abrasion properties and much more, all of which need to be taken into account.

"We adopt a triangle approach that strives to bring together the ore properties, the screening media and the screen design parameters. It is by accommodating the parameters in all three of these areas that we are able to deliver optimised screening solutions that perform as efficiently as expected while delivering substantially improved wear life and lower operating costs," concludes Mayhew-Ridgers. ❑

E+H's IIoT ecosystem for the process industry

For a long time, Industry 4.0 was little more than a vision. Now applications are beginning to breathe life into the concept. The benefits of digital services are becoming apparent in real environments and solutions based completely on internet technologies are opening up brand new fields of applications. Julia Grether, business development manager at Endress+Hauser Digital Solutions, talks about some real applications for the IIoT ecosystem, Netilion.

"My smartphone has been serving as a sort of control centre for my daily life for a long time," says Julia Grether. The 29-year-old uses her smart companion to communicate with others, check the weather, book train tickets, track the number of steps she takes and control the lights at home. After studying international management, she has her eye on the benefits of digital connectivity in her professional life as well. In her role as a business development manager, she has been working for the past year on Netilion, the IIoT ecosystem from Endress+Hauser.

"My goal is to use Netilion to bring the convenience and simplicity that digitalisation provides our private lives to the process industry as well," explains Grether. "That makes processes more efficient and reliable," she says.

The heart of the platform is Netilion services, a collection web-based applications that make all field instruments and their data accessible from anywhere. The apps help users carry out tasks such as capturing and managing all instruments in a plant, organising device documentation or monitoring their instrument status and responding correctly in the case of a malfunction.

Keeping an eye on all instruments

"Netilion apps are easy to use and immediately provide added value," says Grether. And sometimes they prove to be real eye-openers, such as at Salzgitter Flachstahl GmbH, a Netilion pilot customer located in Germany. While digitally capturing the installed base of measurement devices at the steel mill, more instruments surfaced than the plant had anticipated. Furthermore, some of these devices were found to be in need of replacement.

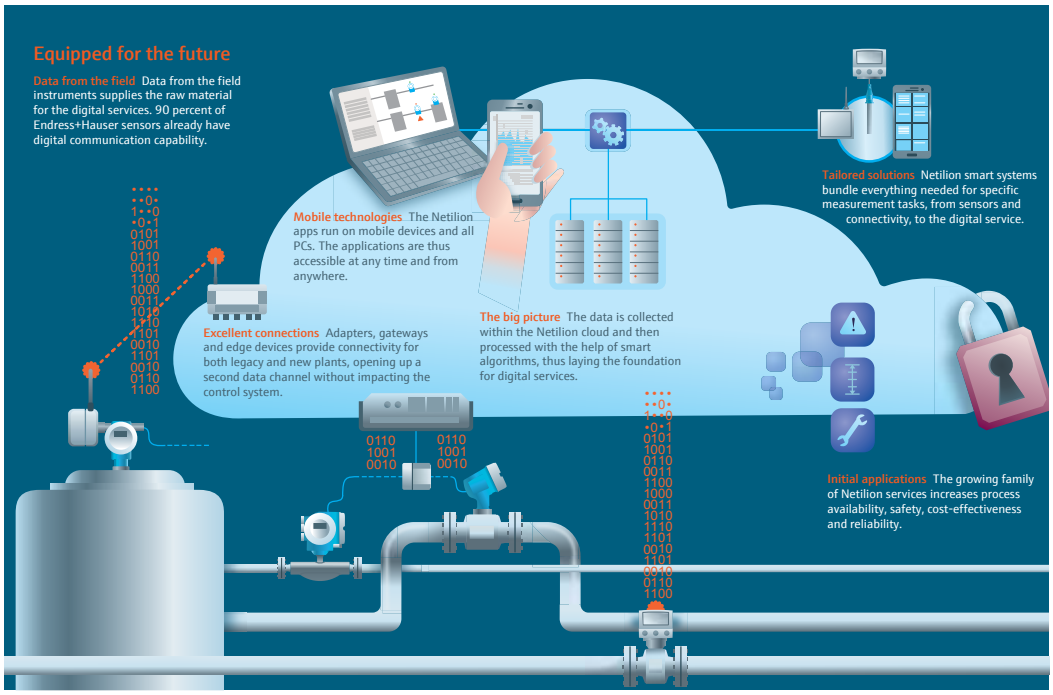
With Netilion, there is a complete overview of the installed base at hand. Digital twins of the actual field instruments, which are often difficult to access, are made available in the cloud where they can be seen from various devices – from the office PC, an industrial tablet and even from the techni-

Endress+Hauser is accelerating the digitalisation of industrial production. The cloud-based IIoT ecosystem Netilion forms the basis for capturing and managing instruments in a plant, organising device documentation or monitoring instrument status and responding correctly in case of a malfunction.

cian's smartphone. Prior to the service call, the technician already has the troubleshooting guide at hand. "The plant operator can save costs with the knowledge generated by the Netilion system, such as through streamlined maintenance and higher system availability," Grether says.

Security around-the-clock

Netilion also opens up access to new applications beyond conventional process engineering. Endress+Hauser offers cost-effective packages that include IIoT-enabled measurement technology and digital applications designed to solve simple measurement tasks. Set-up is uncomplicated. The complete preconfigured packages contain the sensors, including installation material and the transmitter, plus a subscription to the digital service. One example is Netilion Smart Systems for analysing bodies of water, which are currently in pilot operation in two communities in Switzerland.



An infographic unravelling the role that Netilion can play in bringing convenience and simplicity to the process industry.

In Giebenach, near Basel, Netilion is being used to monitor a salmon farm. In the past, the water was checked intermittently. Now it is possible to continuously monitor the oxygen, nitrate and ammonia values. The community of Baltschiederbach in Switzerland uses a similar system to analyse the quality of the water in a stream by measuring turbidity, conductivity and pH.

Employees have constant access to the measurement values on their smartphones. If the values deviate from the target, the system sends out an alarm notification. In addition, it provides information regarding the status of the sensor. "The smart system gives us a sense of security in our daily activities," says Daniel Zopfi, who oversees the fishery. "We're always aware of the breeding conditions and can improve them with targeted interventions."

Endress+Hauser offers an additional bundled solution for remotely monitoring the levels in portable or remotely located plastic tanks with wireless technology. The solution comes with the new battery-operated, radar-based Micropilot FWR30 level instrument, which transmits measurement results via an integrated mobile wireless interface. The data is displayed and monitored with Netilion Value, a cloud-based monitoring system. "With the FWR30, we have finally created a process engineering solution based totally on IIoT technology," Grether reveals.

On the path to predictive maintenance

Additional new applications will also be available for conventional process plants. The Netilion Predict App, which is currently under development, is being engineered to continuously analyse process and instrument parameters to optimise calibration and maintenance intervals and increase plant availability. "Our goal is to be able to tell the plant operator, in plain language, how much longer the measurement point is expected to operate reliably," she adds.

Technical development is also progressing. "We plan on expanding the communications capability of the field instruments in parallel," Grether continues. In order to cover the wide range of common fieldbus standards, further data interfaces will be added to the field instruments and a new adapter will make HART devices Bluetooth capable. Further sensors are being planned, modelled after the Micropilot FWR30, which will be 'Netilion-ready' straight from the factory – in other words, capable of sending data direct to the Netilion cloud without the need for separate interface modules. ❑

New DELKOR BQR flotation cell with 'MAXGen'

TAKRAF Group, with its well-known DELKOR brand for liquid/solid separation and beneficiation equipment, has developed new-generation BQR flotation cells with the proprietary MAXGen mechanism for best-in-class metallurgical performance.

Maximising the sustainable recovery of minerals has become a critical success factor at a time when the efficient recovery from less rich ores, aging or secondary deposits is one of the mining industry's key challenges. In response, TAKRAF Group has developed a new-generation BQR flotation cell that use the company's exceptional MAXGen mechanism for better than ever separation efficiency.

MAXGen is the result of extensive research and development from bench scale tests, 3D prototyping, pilot scale studies and plant scale trials. It delivers superior recoveries with higher mineral grade, along with faster flotation kinetics by generating favourable bubble size distribution and energy efficient hydrodynamics. The distinctive configuration of the rotor and stator enables the rotor to operate at a lower tip speed, thereby reducing operational cost because of lower power consumption and less wear.

The new DELKOR BQR MAXGen flotation cell also boasts more elegant features that address practical challenges with respect to improved installation, maintenance and operation of flotation circuits, particularly in existing concentrators. For example, the bypass ready tank design of the DELKOR BQR MAXGen allows for an installation and upgrade with cell bypass systems at any stage of the project, without compromising the original layout and without any modification to the tank shell. This flexibility makes adjustments faster and less costly, enabling operators to maintain the best flotation bank set up over time. The new DELKOR BQR MAXGen flotation cell incorporates deeper launders with a higher slope to assist the froth to evacuate quickly. The launders can also be customised with various options for the external, internal and radial launders to suit specific froth transport parameters, depending on the application.

New generation DELKOR BQR flotation cells with MAXGen mechanism installed for a fluorite application.

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Cyclone evolution improves coal fines recovery

Continuous improvement of Multotec classification cyclones is helping customers meet both commercial and environmental imperatives in the coal sector. Ernst Bekker, product specialist for cyclones at Multotec explains why.

Ongoing design evolution and continuous improvement initiatives of Multotec's classification cyclones is helping customers in the coal mining sector to meet commercial and environmental imperatives, according to Ernst Bekker, product specialist for cyclones at Multotec. "Today, there is an intense focus on the beneficiation of coal fines, which in the past were generally discarded," says Bekker. "There is greater awareness of the environmental impact, and it also makes good economic sense to recover more."

He highlights, however, that dewatering of fines can be costly. Multotec's efforts to make the process more cost effective have included the investigation of alternative inlet designs, which achieve more efficient separation, especially with fine coal. Also important has been the incorporation of alternative wear materials to extend the lifespan of these cyclones.

"Our focus is on the mechanical life of our units and their physical ability to last, but we also want to extend their efficiency across the lifecycle, so they perform well for longer," he says. Ongoing wear creates undulations on the inner surface of a cyclone, for instance, and this causes separation inefficiencies.

"Ceramic tiles tend to last longer, but other materials can retain a smoother surface for better separation," he says. "Using these alternative materials, we can design custom solutions to suit the application, thus ensuring the customer is always getting optimal value throughout a Multotec cyclones' entire lifespan."

He also notes that the company's overall sensor development programme is giving attention to monitoring wear lining thickness and performance conditions in classification cyclones. "With sensor technology, we will be able to pick up roping conditions in the spigot, for example," he says. "We believe there is even scope, with these units, to leverage artificial intelligence to help us achieve optimal operating conditions," Bekker concludes.

www.multotec.com

All-steel flexible screw conveyor resists abrasion

Flexicon has introduced a wear-resistant flexible screw conveyor with a carbon steel conveyor tube, a heavy-duty flexible screw, and a heavy-gauge floor hopper and discharge housing, which is capable of moving crushed glass, garnet, aluminium oxide, silica sand, aggregate, cement and many other abrasive materials.

The screw is available in lengths of up to 12 m in round, square, flat or bevelled profiles to optimise conveying efficiency for each application. The 115 mm diameter conveyor tube is available curved to vertical, to horizontal or at any angle. The screw is the only moving part contacting material. Its lower end has no bearing, while its upper end is driven beyond the material discharge point, preventing material contact with the upper seal or bearing.

This configuration facilitates simple maintenance in harsh environments since the single moving component can quickly be replaced if necessary. As it rotates, the screw self-centres, providing ample space between itself and the tube wall to minimise or eliminate grinding. The gentle rolling action imparted by the screw prevents the separation of blends, while the enclosed conveyor tube prevents product and plant contamination.

Supplied as standard with a durable industrial coating, the unit is available with an optional start-stop control panel and a range of flow-promotion devices.

Flexicon also manufactures other flexible screw conveyors, as well as pneumatic conveying systems, tubular cable conveyors, bulk bag dischargers, bulk bag conditioners, bulk bag fillers, manual dumping stations, drum/box/container tippers, weigh batching systems and automated plant-wide systems integrated with new or existing process equipment.

www.flexicon.co.za

Flexicon's all-steel flexible screw conveyor conveys crushed glass, garnet, aluminium oxide, silica sand, aggregate, cement and other abrasive materials – dust-free.

SA's safer and greener heavy industrial demolition contractor

MechChem Africa talks to Kate Bester, the contracts manager for Jet Demolition, about new equipment and methodologies being pioneered by the company for improved safety, reduced environmental impact, maximised material reuse and minimised site contamination.

Established in 1994, Kate Bester says that Jet Demolition's first project arose due to a sales pitch gone awry. "Our MD, Joe Brinkmann, had developed a range of shaped charges for blasting. But when he went to see some mining clients with the objective of selling charges and blasting services, he was informed that what they really wanted was someone to come in and take the entire plant away.

"So, after looking at what was required and making some plans, he decided to give it a go, putting us on the path towards the demolition specialist we are today," she tells *MechChem Africa*.

"This first project was the industrial demolition of a plant on a mine and our expertise in this area has mushroomed ever since," she continues. "We continuously develop new methods and add new techniques to our operations to keep up with local demand but also to ensure that we meet global requirements in terms of safety and the environment. There is a significant gap between what is acceptable locally and what is required internationally. We have decided that our business will be underpinned by the best of international standards and we steer everything we do towards this goal," she adds.

Personnel safety, she says, is the overarching imperative, which can only be achieved by consistently using innovative techniques and focusing on mechanisation. "We keep people as far away as possible from potential harm by using modern mechanised equipment with specialised attachment and tools.

"Historically, demolition was seen as a wrecking ball and cutting torch profession, and while both of these are still needed, we do demolition differently. We strive to have as few people as possible in the demolition area by putting them inside more remotely operated machines. This significantly lowers risks and increases the safety profile of our projects," Bester explains.

The company has mastered a cold-cutting technique that uses hydraulic shears attached to an excavator to cut the steel on plants being demolished.

Dust control, environmental impact, contamination mitigations, recycling and the safe disposal of all materials, including potentially hazardous ones, are other essential responsibilities offered as part and parcel of Jet Demolition's turnkey project offering.

"It's a moving goal post, but we feel very strongly about all of these aspects and we are continuously looking for better ways of implementing demolition projects to world-class standards," she says.

Unlike many demolitions companies, Jet Demolition started in steel and diversified into brick and mortar. "Today, we are well known as the heavy industrial demolition specialist. We come to mines, petrochemical plants, power stations and processing facilities to remove redundant sections, usually to make way for modernisation. When we come in it is seldom the ending of a plant's life. We are often working inside a fully functional plant, getting rid of the old to make way for the new. This adds another dimension with respect to risk and safety. We often need to accommodate ongoing plant operations and new plant construction, so proper interaction is required so that we don't shut down any of the services that are or will be needed."

Modern equipment and methodology pioneered by Jet Demolition adds to the benefits of its turnkey approach. "We have mastered a cold-cutting technique that uses hydraulic shears attached to an excavator to cut the steel on plants being demolished. They work just like scissors but with an exceptionally high bite force from the 15 t shear, which can quicky cut through steel beams and sheets. This shear is able to piece 32 mm steel, and

can accommodate up to 1.0 m sections in its jaw," Bester informs *MechChem Africa*.

As well as the mechanisation aspect, the key advantage of this cutting technique is that it is flame-free, so it is much safer when it comes to flammable areas on chemical plants; refineries; and fuel, oil or lubricant storage tanks. "We do still use flame cutting in some areas, mostly in restricted spaces where it becomes impossible to get a machine close enough. We have a team of highly skilled and experienced flame cutting specialists who make sure the area is safe before lighting their cutting torches," she notes.

Modern equipment coupled with high levels of expertise makes Jet Demolition's services ideal for petrochemical demolition: oil and gas facilities, hexane plants, chemical plants, fuel tanks and storage facilities. "Our modern techniques also limit incidental contamination, which used to be almost unavoidable. If flame cutting, for example, all of the tanks and piping on a petrochemical site would have to be thoroughly purged before flame cutting could begin. If cold cutting using a hydraulic shear, decontamination can be completed after demolition.

"For the big petrochemical tanks, for example, we use the shear attachment as a giant can opener, removing sections of the shell and transporting them to suitable space for decontamination. As well as preventing fire, this avoids having to clean out the tank before dismantling it and ensures that contaminants can be properly be controlled and managed," she says, adding that recycling the clean tank material, which is typically sold on to local foundries, also becomes easier.

"On quoting any project, we offset any expected recycling or scrap resale value. We take on the full responsibility, which takes away the logistical, theft and commercial risks from our clients. Sometimes we use clean building rubble to fill voids to rehabilitate a site, for soil stability or landscaping. We are constantly on the lookout for opportunities to save our clients money and reduce the burden on landfill," Kate Bester assures *MechChem Africa*.

Heritage plants often have hazardous waste materials, and Jet Demolition has the competence and licences to dispose of these substances according to legislation and to the highest international standards. "We are at our best doing whole turnkey site rehabilitation management so that the demolition site is fully restored and made ideally suited to its future use," she adds.

Jet Demolition continuously develops new methods and adds new techniques to keep up with local demand and to meet global requirements in terms of safety and the environment.

Jet Demolition has over 60 specialised demolition machines in its fleet.

This proactive approach has resulted in the Jet Demolition completing over 100 projects for South Africa's leading local petrochemical producer, as well as undertaking work in the mining, power and process industries across South Africa and the African continent. "We have worked throughout Africa: in Ghana, Guinea, Zambia, Zimbabwe and all the way up to Algeria.

"We believe that Africa is a magical place. It has many old and run down mines, so there is always a role for structural demolition work. In addition, international mining houses in Africa tend to have a very strong commitment to safety and the environment, so there are many opportunities out there for a company willing to diligently deliver to the standards required," Bester advises.

Testament to Jet Demolition's commitment to high delivery standards is its considerable success at the World Demolition Awards. "These awards are the highest international accolade in our industry. We started submitting entries in 2017 and have since won twice in the explosive category, once in the environmental and recycling category, and once in the heavy industrial category. And at last year's 2020 Awards, we won the Global Best Demolition Project Award for the November 2019 Bank of Lisbon implosion in downtown Johannesburg.

"This success opens up more and more global collaboration opportunities with companies needing a local presence or seeking our expertise where they have a footprint, opportunities that we would not necessarily have heard about had we not been successful at the World Demolition Awards.

"While we are very proud to be one of South Africa's globally recognised companies, we also know of many other companies in South Africa that are global leaders. South Africa and its industries have many positives to be proud of. By focusing on these and building our industries around them, we can become globally competitive and an important hub for African growth," Bester concludes. ❑

SA Manufacturing base a springboard for Africa growth

Juliano Vargas, CEO of Zest WEG, talks about the strong South African manufacturing base that has driven Zest WEG's success over the past decade, and its role as a springboard into Africa.

Establishing a strong local manufacturing base in South Africa has been integral to Zest WEG's success over the past decade, building the economy and providing an important springboard into Africa.

This process has aligned closely with the strategic approach of Brazil-based parent organisation WEG, which prioritises its member companies' capabilities, efficiencies and innovations on a local level, according to Juliano Vargas, CEO of Zest WEG. "This has required considerable investment in our local production capacity and skills base," says Vargas. "The outcome to date has been very successful, with Zest WEG developing its local structure and supply chain, while working to world class standards and being supported by WEG innovation."

As an example, he notes that Zest WEG today achieves almost 90% local content capability for its transformers and more than 70% local content capability for other products such as E-houses and panels. These products form part of the company's wide range of solutions, including electric motors, drives, switchgear, energy generation, electrical infrastructure and generator sets, all with different levels of localisation.

This locally developed supply chain delivers various benefits to customers, says Vargas. These include short lead times, as there is little reliance on Europe, China or the US for parts and components.

"The impacts to our market are considerable, and we have more predictability and control of our supply chain," he says. The company has embraced South Africa's commitment to transformation, achieving Level 1 B-BBEE status and investing heavily in training and enterprise development. It helped that WEG is a member of the BRICS Business Council (representing Brazil), so it has over the years been able to engage with South African authorities about local content requirements and industry development opportunities. "Our business – both in Brazil and South Africa – has put its weight behind economic empowerment and transformation, focusing heavily on local suppliers and local skills," he says. Zest WEG's investment in human capital exceeds the portion of payroll demanded by B-BBEE in local training. Among other initiatives is a bursary programme, and it will shortly employ its third electrical engineer from this scheme.

Vargas highlights the powerful launchpad that this groundwork has created for growing the company's footprint in Africa, where it also applies its local development philosophy by partnering with in-country Value Added Resellers (VARs).

www.zestweg.com

The E-House assembly facility, which Zest WEG operates in Heidelberg, South Africa.

The Zest WEG panel manufacturing facility in Robertsham. The company is achieving 70% local content capability for products such as E-houses and panels.

The Zest WEG transformer manufacturing facility in Heidelberg achieves almost 90% local content.

Integrated solutions address energy security

Increasing electricity tariffs and ongoing load shedding has resulted in a lot of interest from private-sector clients in guaranteeing their energy security becomes independent of electricity utility, Eskom. Newly-appointed Zutari Energy Unit Leader, Janice Foster, explains.

South Africa's private sector need for energy security, coupled with the global move towards 'green' energy, is driving significant interest in renewable energy. An example of this trend is the recent announcement by Stellenbosch of an investigation into adopting alternate energy sources to mitigate the impact of load shedding in the city.

Foster highlights that the national procurement of new generation, especially as emergency or back-up power, was re-initiated by a Request for Proposals issued by the Department of Mineral Resources and Energy to procure 2 000 MW under the Risk Mitigation Independent Power Producers Procurement (RMIPPP) Programme by June 2022.

"Zutari's pre-eminence in the energy space as a co-creator of integrated solutions is evident by the company's involvement in 50% of the submitted RMIPPP project bids," reveals Foster, who was appointed to the role of Energy Unit Leader in November 2020. A direct response to the short-term electricity supply gap identified in the Integrated Resource Plan of 2019, the RMIPPP aims to alleviate the current electricity supply constraints facing South Africa.

Similar to the Renewable Energy Independent Power Producer Procurement Programme, Foster points out that it is the first programme of its kind to be technology-agnostic. This means that hybrid plants are an option, and may comprise multiple technologies such as gas, renewables and battery energy storage.

"Our client base extends from public-sector clients on a municipal and provincial level to private-sector clients such as project lenders and investors, owners and developers," explains Foster. As a multi-disciplinary engineering firm, Zutari has delivery units providing services across energy, water, infrastructure, transport, resources and manufacturing and advisory.

The energy unit comprises four teams, namely generation, transmission and distribution, industrial power and automation, and systems studies and network planning. Hence the team provides services across the full spectrum of energy projects from small scale individual projects to regional-level modelling. The industrial team focuses on design delivery of electrical power and automation systems in the energy, mining, oil and gas, water, wastewater and renewable energy industries.

"One of our major competitive advantages in the energy space is that we are a one-stop shop. Working closely with Zutari's other delivery units, we can do everything from providing environmental assessments to detailed geotechnical investigations and structural design and, of course, all of the detail in terms of the electrical engineering," explains Foster. "We are one of the best energy teams on the continent, encompassing end-to-end services and some highly experienced individuals."

Another advantage for Zutari is that its expertise largely resides in South Africa, providing quicker and easier access to client challenges. With the company focusing on engineered solutions, mainly in sub-Saharan and Eastern Africa, it is very active in the energy space in the region. The energy unit works closely with other Zutari teams to deliver integrated solutions. "We have developed a number of innovative digital tools around solar photovoltaic design automation and performance-monitoring tools. We also have an in-house 3D visualisation team that allows us to present all of these solutions to our clients in that space," Foster points out.

In terms of challenges, she argues that technological change tends to outpace policy or legislation. "At the moment, this is probably one of the biggest limiting factors to opening up the energy market. If you look at the sheer pace of change, energy-storage battery systems were considered financially unviable not even two years ago. Now almost every new generation project looks to consider this. Meanwhile, hydrogen is being flagged as the next big thing in energy."

With a background in both nuclear and wind energy, Foster says that her remit as the Energy Unit Lead is to capitalise on the growth opportunities on the continent over the next couple of years. "The current global interest in energy and energy security, in particular, keeps things interesting. What I really love about the sector is that every client and project is unique and presents their own unique challenges. It definitely keeps all of us on our toes," concludes Foster.

www.zutari.com

Cookhouse Wind Farm Development, South Africa. Zutari's pre-eminence in the energy space as a co-creator of integrated solutions is evident by the company's involvement in 50% of the submitted RMIPPP project bids.

OMRON robot streamlines food deliveries

An autonomous mobile robot has been seen moving around the corridors of the REDI shopping centre in Kalasatama, a suburb of Helsinki in Finland. Operated by OMRON's solution partner Dimalog, the robot was taking part in a month-long trial of a 'Home-on Demand' automated courier service.

OMRON, Dimalog and Muotohiomo worked closely together to enable the OMRON autonomous mobile robot (AMR) to navigate the supermarket and tower block corridors as well as using elevators and service tunnels.

A month-long trial of a 'Home-on Demand' automated courier service in Helsinki is exploring the potential for using autonomous robots for deliveries to urban homes. The trial is part of a larger experiment called the Six City Strategy: New solutions in city logistics project, which is looking at possible options for last-mile deliveries in Finnish cities. It's looking for solutions that will organise urban logistics as lightly, sustainably and efficiently as possible.

The trial was arranged by Forum Virium, the City of Helsinki's development company, in conjunction with construction company SRV. Other organisations involved in the project include elevator company Kone; the K-Supermarket in the REDI shopping centre; Asumi, a digital resident service platform; and the design studio, Muotohiomo. For the trial, the OMRON mobile robot was programmed to deliver items of food from the shopping centre to apartments in the nearby Majakka tower block.

OMRON, Dimalog and Muotohiomo worked closely together to refine the operation and design of the robot so they met the specific needs of the project. To move around successfully, the robot had to navigate the supermarket and tower block corridors as well as using elevators and service tunnels. As it moved, the robot whistled and talked in Finnish via a speech synthesiser.

Lotta Toivonen, development manager for Housing Services at SRV, which built both the shopping centre and the Majakka tower block, comments: "The idea of whistling is that it's a funny thing. On the other hand, people realise that the robot is coming. It speaks a bit, and people greet it. It is treated as if it were a person."

Kaisa Spilling of Forum Virium adds: "It's been fun to see how people along the way feel like it's human. It might say in the elevator: 'I'm sorry I would like to get out here' or 'Oops, the elevator is full, I'll ask to use another elevator'."

Each delivery started with the receipt of an online order from a customer using the Asumi platform. Orders could also be placed through the supermarket by the shopping centre's smaller businesses. The items (mainly meals) would be collected at the supermarket and loaded by staff into the robot, which would then deliver the order to the relevant business or apartment. The customer receives an automatic notification as soon as the robot delivered the item.

Kaisi Spilling notes: "During the coronavirus epidemic, the robot has been delivering lunches for homeworkers and the lunch time slot has been fully booked."

Throughout the trial, the robot could request an elevator itself but needed an escort to open any doors that might have to be kept closed due to fire safety regulations. The escort was a university service design student, who reported any problems encountered by the robot and observed its interaction with people. The robot used on the trial was an OMRON LD model, which is a self-navigating autonomous mobile robot (AMR). Unlike traditional autonomously guided vehicles (AGVs), OMRON's mobile robots don't need depend on expensive modifications to facilities such as floor magnets or navigational beacons.

They navigate by the natural features of the facility, having been designed to move material within challenging environments that might include confined passageways, as well as locations where there might be people moving around. OMRON's software also integrates with a company's or building's other facilities management systems to enable the robots to become operational in the least possible time.

Esa Korhonen, Area Sales Manager at OMRON in Finland, explains: "Our mobile robots can dramatically boost the productivity of logistics operations. They can navigate effectively and provide invaluable support to human workers. This enables employees to focus on other tasks that require complex human skills."

"We are looking for new agile logistics solutions in the city. We are exploring how we could improve the smoothness of everyday life in buildings of the future and robotics is integrally related to a smooth everyday life," Kaisi Spilling concludes.

www.industrial.omron.co.za

Tectra engineers world-first roof tile solution

In a world-first roof tiling solution, Tectra Automation, subcontracted by robot specialist, Yaskawa, has engineered a unique automated production system that incorporates Bosch Rexroth aluminium extruder profiles with Yaskawa robots.

To implement mass production of a world-first roof tiling solution, Tectra Automation, subcontracted by Yaskawa Southern Africa, has engineered a unique automated production system that uses Bosch Rexroth aluminium extruder profiles, among other componentry, with Yaskawa robots.

The system will facilitate the transfer and pressing of sheets from a 200 °C molten mineral polymer blend; their cutting, packaging and palletising. Tectra Automation's scope of work included all processes from when the product exits the double-story extruder through to the palletised end product.

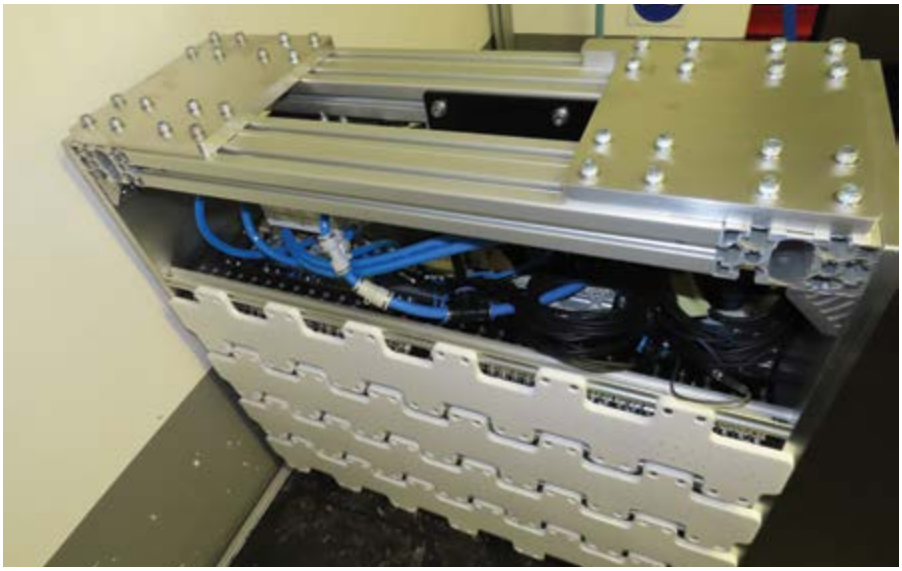
To address the issue of handling molten material at high temperatures, Tectra Automation designed and built a pliable lifting system incorporating a soft needle piercing system. Custom-made needle grippers, each containing 1 138 needles, pierce the hot pliable plastic sheets and, using Yaskawa robots, raise the sheets and transfer them to the press. At this point, the needles are retracted and form pressing and product begins.

"Our working relationship with Yaskawa South Africa has proved that our two companies complement one another," says Nico Davies, mechatronics engineer at Tectra Automation. "Our dual experience and long-standing relationship is what secured us this project, which would not have been possible without the specialised robotics supplied by Yaskawa."

Early stage project commissioning commenced during July 2020, with the order having only been received in January. "The COVID-19 disaster and associated lockdown did not impact project process in any way," adds Davies. "The team worked remotely with no difference in output, keeping to all project timelines. We procured the required parts and all equipment was onsite by year-end and full commissioning is expected to be complete by the end of April 2021."

Davies explains that the inherent flexibility in Bosch Rexroth's products, especially its extruder aluminium profiles, allows for a degree of adaptability in the production process. "It gives us the leeway to make specific changes to the system as and when required," he explains. "This is extremely beneficial when the customer needs the system to be adapted to accommodate new processes, or even changes to the production process itself."

Automation offers several advantages such as 100% repeatability; the ability to run 24/7; and improving both production quality and speed. "We work closely with our suppliers to provide a customised, flexible solution that meets clients' specific requirements," Davies points out. "Working with Bosch Rexroth and Yaskawa, Tectra Automation is providing an individualised solution that is tailor-made to overcome the unique application requirements of this roof tile manufacturer," he concludes. ❑



The system will facilitate the transfer and pressing of 200° C molten mineral polymer blend sheets, their cutting, packaging and palletising.

Bosch Rexroth appoints business intelligence manager

Dianne Seymour has been appointed Group Business Intelligence Manager for the Bosch Rexroth South Africa Group of Companies.

Her appointment follows a 15-year period of experience in enterprise resource management (ERM) consulting on Syspro ERP. Her focus was helping clients across the pharmaceutical, manufacturing, mining and distribution industries with Syspro ERP.

The corporate sector attracted Seymour with the offer of a position as a business analyst in 2015, and after only two years she was promoted to Business Systems Manager. The position saw her managing and overseeing business software development, support, maintenance, acquisitions, consultants, budgets, software projects and junior personnel.

Currently reading for her BCom degree in Information and Technology Management at MANCOSA, Seymour has also completed several courses that better equip her to deal with the demands of the business intelligence environment. Courses include Syspro modules, Workflow (Syspro and Flowgear), Basics of Supply Chain Management (SAPICS), Project Management (UNISA), and Microsoft SQL up to MSCA level.

"I love sharing my passion for technologies that make life easier," Seymour says. "So much can be achieved with today's technology, making it easier to work smarter, not harder." ❑

Optimising DeNOx plants in the cement industry

This article describes how SICK Automation's GM32 in-situ gas analyser is being used in the cement industry to minimise emissions in a denitrification (DeNOx) plant that is using selective catalytic reduction (SCR).

New environmental legislation and companies' self-imposed sustainability obligations have contributed to a marked increase in environmental awareness. This is especially the case when it comes to the emission of hazardous substances and environmental pollution. Many industries, therefore, are taking steps to reduce or prevent these dangerous emissions. SICK Automation's innovative in-situ gas analyser GM32 helps to reduce emissions in denitrification (DeNOx) plants using selective or non-selective catalytic reduction (SCR or SNCR).

SICK Automation's GM32 in-situ gas analyser measures nitric oxide (NO), nitrogen dioxide (NO_2), ammonia (NH_3) and sulphur dioxide (SO_2), as well as pressure and temperature directly inside the plant's process gas stream. The analyser unit is equipped with a gas permeable probe (GPP), which is positioned inside the duct. The direct measurement enabled from this location facilitates a short response time, leading to fast measuring results.

The analyser is ideal for use with selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR), two of the accepted secondary measures used to reduce NOX emissions. Primary measures include flame cooling, installation of low NOX burners, staged combustion and general process optimisations.

Cement industry case study

To comply with local emission regulations of 200 mg/Nm_3 for NOX and 30 mg/Nm_3 for NH_2, HeidelbergCement Group in South Western Germany invested in an SCR plant to supplement its existing SNCR solution.

The main difference between the two technologies is the use of a catalyst. The SNCR is installed in the riser duct or calciner of the rotary kiln at temperature ranges of 900 to 1 000 °C. The SCR, on the other hand, consists of a specific number of catalyst layers that operate at approximate temperatures of 300 to 350 °C. They can be placed in the high durst raw gas stream or before the main stack in the low dust gas stream.

The gas analyser would be placed at the SCR inlet between the ammonia water injection nozzles and the catalyst. The advantages of having the measuring location at the inlet is that simultaneous measurements of NH_3 and NO entering the SCR, and in this instance NO from the combustion process, can be collected. To achieve sufficient SCR control, the analyser had to meet two requirements: it needed to have fast response times for efficient control of the ammonia water injection; and extended maintenance-free intervals because of the challenging conditions in which it operates.

HeidelbergCement Group contacted SICK for a solution and the GM32, designed to cope with high dust, high temperatures and vibrations, was selected as the ideal solution. It was agreed that the analyser would be installed for a 12-month test period from March 2019 to March 2020.

The installed SICK gas analyser and filter requires checking, cleaning and maintenance only every nine to 12 months. Stack movements are possible due to higher temperatures and temperature fluctuations at the measuring station, and are compensated for with the analyser's auto alignment correction. This continuously aligns the light beam during operation to ensure stable and reliable measurement.

Compared to other measuring systems that require frequent calibration using test gases, integrated filters for zero and span automatically compensate for drift and ensure a correct and accurate measurement. This means less frequent test-gas calibrations and lower operational expenditure. Using the SICK Meeting Point Router remote service, onsite tests were conducted and a large amount of additional process data was collected and evaluated.

The test period proved that the analyser has a stable reaction time of less than 20 seconds without the need for cleaning or maintenance. The results show that with a delay of two to 17 minutes, depending on the measuring component, a continuous emission monitoring system alone is not sufficient for DeNOX process control.

The 12-month test was successful and, subsequently, another HeidelbergCement plant in Germany equipped its DeNOX system with two GM32 analysers for SCR control. The two devices were commissioned in June 2020.

The SICK in-situ gas analyser GM32 – measure aggressive gases directly and quickly, even in ATEX zones

How the GM32 works

Using the wavelength-specific light absorption by the gas mixture on the active measuring path, the sender/receiver unit determines the concentration of the gas components present. UV light sent from the sender/receiver unit passes the active measuring path of the GPP probe and is reflected by a triple reflector at the end of the probe.

The permeable filter element – the heart of the GPP – keeps all dust outside of the measuring path, while the gas permeates quickly through the pores ensuring the required fast response time. The GM32 uses differential optical absorption spectroscopy (DOAS), where the absorption lines of specific gases in a particular wavelength range are evaluated.

With its GM32 in-situ gas analyser, SICK Automation has proved that companies in the cement industry can maintain and restore a clean environment, effectively supporting climate protection.

www.sickautomation.co.za

Tenova chooses ABB automation for tinning line

ABB contract success in the Philippines metals industry continues to pave the way for productive cooperation with Tenova in the region

Tenova has selected ABB to supply the automation package for tinplate manufacturer Perstima in Malvar, Philippines.

Global metals plant solutions provider Tenova has selected ABB to supply and install a comprehensive drives and automation package for Southeast Asia tinplate manufacturer, Perstima, at its new electrolytic tinning and tin free steel line in Malvar, Philippines. The new solutions will be operational in June 2021.

Project scope includes the ABB Ability™ System 800xA DCS (Distributed Control System), which integrates control, electrical and communication systems for optimal visibility into all processes for stable production and the efficient use of raw materials and energy, plus the compact, high-performance AC800 PEC controller, with control desks and posts.

In addition, ABB will supply its Collaborative Production Management for Metals solution to optimise all aspects of process and production planning, asset monitoring and manufacturing execution. ABB's state-of-the-art ACS880 low voltage multidrives and motor control centre (MCC) switchgear complete the package.

When installation and commissioning is complete, Perstima will benefit from a compact, fully integrated, easy-to-use control, automation and drives system designed for flexibility, durability and optimal productivity.

"ABB was the logical choice to equip Perstima's new electrolytic tinning lines with proven technology for accurate line speed and tension control," said Stefano Marelli, Global Sales Southeast Asia, Tenova. "ABB's solutions matched perfectly the plant requirements and will provide Perstima with a robust drives and automation system that can be expanded as the plant develops."

"Discussions with ABB throughout the implementation phase have been hugely productive, quickly understanding Perstima's desire for adaptability and customised set-up for ease of operation," said Giuseppe Zanzi, Sales and Marketing Manager, Tenova. "We look forward to moving into the installation and commissioning stages in 2021, knowing we'll have ABB support throughout."

"This is another successful cooperation with Tenova in Southeast Asia, following projects in Indonesia and Vietnam," said Shailendra Dubey, Hub Industry Lead, Metals. "This is also our first involvement with Perstima, so gaining their trust and approval is a major milestone for us, and we look forward to a productive working relationship both with this customer and in the region as a whole."

abb.com/metals

Software-as-a-Service (SaaS) water quality monitoring

Bosch Capital has been appointed by environmental and water governance, risk and compliance specialists, Carin Bosman Sustainable Solutions (CBSS), to support the commercial development of the new LEGUAAN™ Software-as-a-Service (SaaS) water quality monitoring, data visualisation and reporting tool. This project is supported by the WADER programme of the Water Research Commission (WRC).

Bosch Capital has been appointed by CBSS to support the commercial development of the LEGUAAN™ Software-as-a-Service (SaaS) water quality monitoring, data visualisation and reporting tool.

Carin Bosman Sustainable Solutions (CBSS) has developed a water resource management tool to facilitate the efficient conversion of water monitoring data into meaningful visual graphs and reports that meet specific requirements of each organisation and to facilitate improved monitoring and compliance.

"In this exciting venture with CBSS, the Bosch Capital team is conducting a market analysis study that will inform the development of a commercial model and business plan for the LEGUAAN SaaS tool. This project also includes the development of a high-level financial model, to enable the analysis of the key financial drivers of the business," explains Rajiv Paladh, manager of Advisory and Funding at Bosch Capital. Bosch Capital is a member of the Bosch Holdings group of multidisciplinary consulting engineering companies. Bosch Capital offers advisory, capital raising and investment solutions, which form part of an integrated financial and engineering solution for Bosch Projects' clients

"This study is crucial in assisting CBSS to ensure that LEGUAAN will offer an excellent value proposition to customers."

The founding member of CBSS, Carin Bosman, had this to say regarding the monitoring tool: "We derived the name LEGUAAN from the South African water monitor, an agile reptile that plays an essential role in maintaining ecological balance in aquatic ecosystems. Key advantages of this cost-efficient system are time-savings for the user, coupled with the assurance that all data is accurately converted into meaningful information and graphical representations. Without the correct interpretation of results, it is impossible to make informed decisions about the management adjustments that are necessary to improve consumption, reduce water footprint and minimise impacts on water quality, as well as reduce liability risks for the organisation."

Once the scientific integrity of the data is verified, it is swiftly converted into interactive and intelligible charts, such as Mauchino diagrams (salt balances including nitrates), time-series graphs (single year, multi-year and stacked for seasonal comparison), box-plot diagrams for statistical evaluations, and Ficklin graphs. Graphs and reports are provided online to users in a secure, interactive dashboard format, thus enabling users to download and present them to their internal and external stakeholders.

Reports and graphs generated by this water resource management tool can be set up to compare a user's data to the limit values in the water-use licence, or any other site-specific limit value specified by a government agency. CBSS specialists are also able to assist with the development of scientifically correct site-specific limit values in accordance with the new Department of Water and Sanitation (DWS) policy on Water Quality Management.

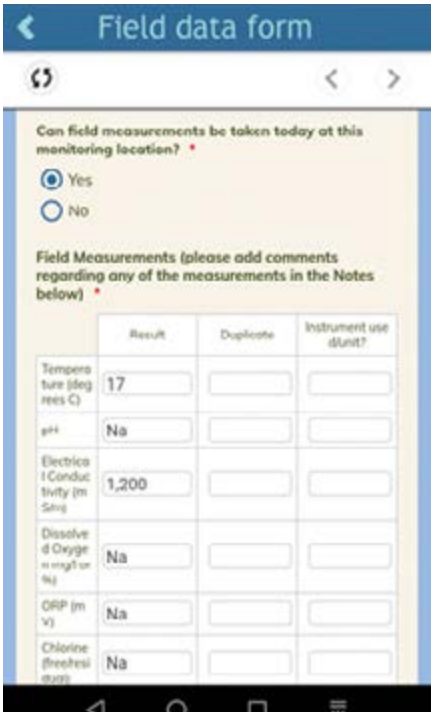
The name LEGUAAN is derived from the South African water monitor, an agile reptile that plays an essential role in maintaining the ecological balance in aquatic ecosystems.

CBSS has also developed the WaterMonster™ App that automates the capture of all critical field data necessary in the interpretation of water quality monitoring results. These factors include the type of sample, weather conditions at the monitoring location and observations about the colour, odour and flow of water. Relevant field readings of variables, such as temperature, electrical conductivity and dissolved oxygen are digitally captured.

CBSS has also developed the WaterMonster™ App that automates the capture of the data necessary for the interpretation of water quality monitoring results.

WaterMonster also documents the geo-location of where the sample is being taken, captures a photograph of the monitoring location and, if a sample cannot not be taken, records the reasons or obstacles for this. If a field sampler needs to purge a borehole before taking a groundwater sample, the purge-time is automatically calculated. Certain variables such as free chlorine and dissolved oxygen must be measured at the sampling location because concentrations change during transportation to a laboratory. All field observations are immediately available in a digital format and the data is submitted instantaneously to a dedicated, pre-determined email address in PDF-format.

By combining the capturing efficiency of the WaterMonster App, with the meaningful visualisations of LEGUAAN, users are able to easily convert unmanageable spreadsheets and lab reports into clear, visualised management information that can be used to inform actions of operators to enable them to contribute towards improving water quality around South Africa.



Relevant field readings of variables, such as temperature, electrical conductivity and dissolved oxygen are digitally captured.

www.boschholdings.co.za/cbosss.com/environmental-data-solutions

Keeping plastic tubs out of landfill

Research has highlighted that a significant proportion of consumers re-use margarine, large yoghurt, and ice-cream tubs made from polypropylene (PP), extending their lifespan and keeping these products out of landfill. Led by the Polyolefin Responsibility Organisation NPC (Polyco), the 'PP tub re-use research' aims to guide a higher-level of repurposing for these plastic packaging items by improving their design for re-use and recyclability.

"Polyco understands the value in research-based credible information. We initiated the research with The Moss Group to determine the extent to which margarine, ice-cream and large yoghurt tubs are re-used after their original use," says Mandy Naudé, CEO at Polyco. "We wanted to look at this market sector and understand how much of this PP packaging material is placed on the market, how much is recycled and how much goes to landfill. We then calculate what percentage of these tubs is re-used in households."

To collect this consumer data, 1 550 respondents were engaged telephonically, via online surveys, in face-to-face interviews and via social media polls to get feedback on what they do with large yoghurt, margarine and ice cream tubs. "More than 80% of respondents who participated in the research indicated that they repurposed these plastic tubs, most commonly for food storage, food distribution and household storage," says Naudé.

At least 103-million large yoghurt tubs, 80-million margarine tubs and 31-million ice-cream tubs are produced each year in South Africa, equating to an average of more than 10 000 t of this plastic packaging entering the market. The high repurposing rate results in lower volumes of PP plastic tubs entering landfill or landing up in the natural environment.

Available beach litter data, collected around the country in 2019 and 2020 and provided by a team led by Professor Peter Ryan (UCT) and Dr Maelle Connan (NMU), supports this and indicates that these tubs make up around 3% of the 12 378 bottles and tubs catalogued.

"Supporting the efforts of our PP tub research, we will use these results to guide PP packaging producers and their customers to improve the design of tubs for repurposing," says Naudé. "Design adjustments such as increasing the strength, improving the lid fit and having removable labels will lead consumers to use these items as storage containers for a longer period."

While the re-use rate of these PP tubs is high, the recycling rate of PP plastic products is approximately 30%. Re-using PP tubs for storage is a temporary solution and eventually these products will need to be disposed of. PP plastic tubs should be designed for circularity, not to be landfilled. Designing products for post-consumer recyclability has now been made a requirement by government.

"This consumer insight research has allowed us to understand what drives the re-use behaviour, which will be very important for brand owners who, under EPR regulations, will be required to manage their products at end-of-life to prevent them going to landfill."

New extended-producer responsibility (EPR) regulations are now requiring producers to take responsibility for their products to ensure that consumers can re-use and repurpose products and then recycle them with greater ease.

Driving the market for PP recyclate, designing products for recyclability, creating accessible recycling facilities and increased consumer awareness will increase the recycling rates of these products and lower the volumes of plastic going to landfill.

www.polyco.co.za

NFTN intervention helps lift SA foundry to global standards

MechChem Africa talks to Manini Phokwane Ramagaga, technical advisor for the National Foundry Technology Network (NFTN), an initiative of the Department of Trade, Industry and Competition (the dtic) about an intervention completed at Steelbest foundry that secured the future of 130 jobs.

"Steelbest, formerly known as Zealous foundry, specialises in high pressure die casting, mostly of aluminium components for the automotive industry," begins Manini Phokwane Ramagaga, who has a metallurgical engineering degree from the University of Johannesburg and over 20 years of experience in the South African Foundry industry, most notably in the automotive and jobbing casting sectors.

"The company makes cast components for cam-carriers, water pump housings, engine and axle components, housings, street lights, general engineering products and castings for the food industry," she adds.

"With the NFTN, my current role is to give technical support to the South African foundry industry, at large. I also contribute to the technical support of the existing South African steel and metal casting sector through research, development and productivity growth to promote local and export consumption i.e. to improve the casting industry's global competitiveness and its technical and regulatory compliance. It was in this capacity that I was first introduced to Steelbest, who had approached the NFTN to investigate a quality related challenge with regards to pinhole-porosity that was causing an exceptionally high scrap rate on an aluminium casting for a key automotive client," she tells *MechChem Africa*.

"This challenge was preventing the company from meeting the client's turnaround times for quality cast products; critical in the automotive sector, which assembles based on just-in-time principles; where every component has to be delivered on time for vehicles to be produced efficiently," she adds.

The high scrap rate was leading to poor productivity levels of acceptable quality, which was compromising the completion of orders due for delivery, she explains. If the foundry could not keep up with stock levels, this could have caused another South African foundry to close.

"I was initially asked to do a metallurgical assessment, but it became apparent from a gap analysis that this was a multi-facetted challenge, which could be attributed to process, die design and metallurgical skills shortcomings.

First off, a professional metallurgical skill set was required to meet the automotive requirements. "Having worked in the sector myself, I knew that an in-house metallurgist was going to be required and would be beneficial for the foundry for long-term success.

The NFTN partners with academia, science councils and government agencies who assist with human capital development within the SA foundry industry. This includes assistance with the development of artisanal, professional and specialised skills.

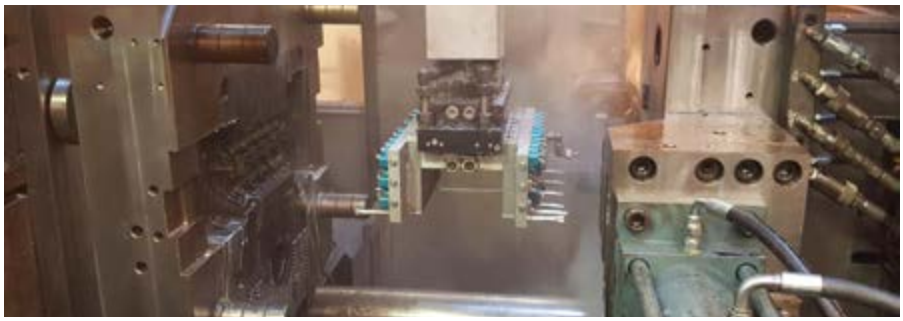
"Through our NFTN collaboration with Mintek, one of the three (3) Science Councils in the country with a skills development programme, for training and placing engineering personnel into South African industry, a metallurgical engineer was seconded, who has since been permanently employed as a metallurgist at Steelbest. We are hopeful that the young people we place will rise up the ranks and pass on their skills to more young people in the sector," she notes. The second intervention involved the simulation of the die component itself from eastern Asia. The die was optimised through simulation of the solidification rate so as to reduce the defects that occurred. "The die was modified using the results of the simulation to regulate the solidification rate and to keep the temperatures even in all areas," Ramagaga tells *MechChem Africa*. "This led to a further research and development collaboration between the foundry and a leading European Simulation Research Science Council, playing a key role in the automotive sector.

"To get the benefit of the upgraded die design, we then had to optimise the process and production output efficiencies, which was also at the core of resolving the challenge. That led to process operators being trained on the new improved process, and five additional operators were found to be needed," she continues.

These multi-faceted interventions significantly reduced the pinhole-porosity scrap challenge and raised the quality of the end products. They also generated a high degree of confidence in the capacity of the foundry to deliver to the automotive original equipment manufacturer (OEM).

When the original modified die design needed to be replaced, the new and optimised die was ordered, which further improved product quality and productivity. With the optimised die , the new metallurgist, the new process, the newly trained die operators, and all of the required quality checks, the scrap rate decreased to below 2.0 % – from nearly 25%. This resulted in the global order being renewed for a further nine years, securing work for the foundry up to 2028.

"Retention of jobs was key for the NFTN and the dtic and the way to do that is to develop a strong and sustainable order book, which for a global automotive OEM, means that high quality standards have to be achieved and maintained. "This success proves that the SA Foundry Sector can do it. With a bit of effort and cooperation and by going back to fundamental metallurgical principles, the South African foundry sector can produce high quality castings that can compete on a global scale," Ramagaga concludes. ❑



The optimised die, shown here undergoing its final spray cooling cycle.

Maintenance can be proactive instead of reactive!

Fluke's new TiS75+ Thermal Imager is ideal for use in preventative maintenance programmes.

New Fluke TiS55+ and TiS75+ infrared cameras offer technicians and contractors who need quality images and feature-rich cameras a range of extended options for troubleshooting, intermittent inspection and preventive maintenance tasks.

Technicians make several inspections every day, and it can be hard to remember what was seen at the inspection location. Clipboards to jot down notes are old-school! The new technology Fluke TiS55+ and TiS75+ come with built-in personal assistants, meaning the old clipboard is no longer needed and technicians can have all the information they need embedded in the images saved.

The device includes features such as:

- Voice annotation: Technicians can record to 60 seconds per thermal image, enabling them to identify exactly what is being seen or heard at the exact time of inspection.
- IR-PhotoNotes: Photos of asset numbers and other identifiers can be taken for use as a reference when looking at the thermal image on a computer.
- Fluke Connect Asset Tagging: Asset tagging enables thermal images to be sorted according to the asset type by first scanning a QR code of the asset before starting to capture the thermal images. The images will automatically be sorted into that asset type and can be viewed together when the camera is connected to a computer. This eliminates hours at the computer organising thermal images, by dragging and dropping or renaming files in the office.

Image focus

Focus is one of the most important parts of a thermal image so whether users are seasoned thermographers or new to thermal cameras, the new Fluke TiS55+ and TiS75+ thermal imagers feature:

- Manual focus for seasoned thermographers who can use a manual focus wheel to adjust the image to compensate for how far they are from the target.
- Fixed focus, for quick scans or for users new to thermography, enables the user to simply take the image from the preset fixed focus position. If set at 1.0 m from the target, for example, all images taken from this distance will be in focus.

Building health matters

Building inspectors always look for moisture, that's why Fluke includes a dew-point calculation in the TiS75+ thermal camera. When air is cooled to the temperature where it is saturated with water, moisture develops and wreaks havoc on buildings. Once the dew point is calculated, the camera will display the Dew Point Colour Alarm.

Everything the camera displays that is at the dew point temperature and below, will display as a thermal image. Everything above will display as a visual light image. This allows users to see where in the image condensation is occurring, and to see on a scale how far objects are below the dew point.

Fluke's TiS55+ ad TiS75+ infrared cameras are also a part of a growing system of connected test tools and equipment maintenance software.

www.comtest.co.za

Three SA researchers shortlisted for international forestry research award

Three South African researchers have made it to the global shortlist of the Blue Sky Young Researchers and Innovation Awards. They were selected from 14 candidates in the South African round. The awards, launched in 2016 by the International Council of Forest and Paper Associations (ICFPA), aim to recognise, celebrate and promote innovations being developed in the global forestry sector.

Justin Phillips and Hester Oosthuizen, both from the University of Pretoria, and Eddie Barnard from Stellenbosch University, go up against another 18 of their peers from around the world, with only three of the finalists earning cash prizes and the opportunity to present their work at the ICFPA's Global CEO Roundtable virtual discussion on 29 April.

"We are immensely proud of our finalists for making it this far, and demonstrating that South Africa can hold its own against the best in the world," says Jane Molony, executive director of the Paper Manufacturers Association of South Africa (PAMSA). "As a sector we constantly look for ways to support young people with an interest in science and technology and are proud of the career opportunities our member companies can offer them."

Furniture from paper sludge and cattle dip for killing ticks

Eddie Barnard is exploring the commercial viability of using technical lignin – a by-product from the wood pulping phase in pulp or paper making – and pulp and paper sludge – rejected, degraded, and spilled fibres and water from the pulping and paper making processes – to make composite materials. Lignin has binding properties, which when combined with sludge, could be used to make construction materials such as a replacement for particle board.

Justin Phillips has looked at how starch and nano-cellulose can be used as a carrier material for pesticide applications in the agricultural sector. The insoluble solid active ingredient in the pesticide attaches to the carrier, which is water-soluble and allows for safer and more efficient and safe controlled release of the pesticide, especially in aqueous environments such as animal dipping for tick prevention.

Hester Oosthuizen is looking at cellulose, which is uniquely positioned as a substitute for many petroleum-based plastics, but cannot be melt-processed and dissolved using common organic solvents. Oosthuizen examined the efficacy of using choline chloride and ionic liquids, considered greener and less volatile, to make cellulose fluid enough to produce cellulose-based materials using existing polymer processing techniques.

An international panel with connections to industry, academia and public policy has been assembled to judge the awards, with the local round adjudicated by Valeske Cloete of Mpact, Sanet Minnaar of Sappi and Mike Nash, an experienced chemical engineer and former head of PAMSA's Process Research Unit.

"South African Martin Wierzbicki was among the top three in the final international award in 2019," Molony concludes. "We'll be rooting for this year's three finalists to go all the way to the top!"

www.thepaperstory.co.za

New flange monoblock with shut-off valve

Designed for applications in the process industry, WIKA's new flange-connected monoblock shut-off valve has an integrated and compact design to enable the process flow to be separated from the instrumentation.

The one-piece construction and the double sealing (metal and plastic), tested in accordance with BS6755 / ISO 5208 leakage rate A, give the compact instrument highest possible safety levels. Its high-quality manufacture ensures smooth handling, even at high process pressures. The model IBF1 can be fitted with either a ball or needle valve.

The new instrumentation valve complements the existing monoblock portfolio, which includes the models IBF2 (block & bleed) and IBF3 (double block & bleed).

On request, WIKA can also supply a customer-specific assembly of measuring instrument and monoblock 'instrument hook-up', which comes leak-tested and ready for operation. All IBF models can also be fitted on level indicators and differential pressure measuring instruments for level measurement.

www.wika.co.za

WIKA's new flange-connected monoblock shut-off valve has an integrated and compact design to enable the process flow to be separated from the instrumentation.

UPS adds to smooth operations at Metric Automotive

Ensuring quality customer service even during power outages forms part of Metric Automotive Engineering's sustainable business strategy. The company recently invested in an uninterruptable power system (UPS) at its state-of-the-art technical facility in Germiston to ensure just this.

While the company has always had its own standby generators to provide power during load-shedding or utility outages, Metric Automotive Engineering operations director Andrew Yorke explains that this was still not ideal. "The short delay between utility power failing and the generators kicking in could have negative effects on our workflow," says Yorke. "The brief stoppage of our sophisticated machines can lead to damage to major components, which are in the middle of a high-precision machining process."

He notes this can not only damage components but invariably results in delays due to the unexpected rework required, all of which involves additional costs. The new UPS system – which includes two separate UPS units – provides an effective solution to these challenges.

"Both UPS units are fed by a specialised solar inverter system, giving us a bridging system that allows our operations to continue unimpaired," he says.

One UPS provides uninterrupted electricity supply to the critical machinery at Metric Automotive Engineering, powering the four crankshaft grinders, the seven reboring surfacing machines and the CNC lathes. The other UPS supports the administrative side of the business, ensuring there are no server outages. This facilitates smooth and continuous access to information and communication.

The company's self-sufficiency has been further enhanced by the implementation of an extensive rainwater harvesting system to collect water for all its cleaning processes. Yorke explains that some 60 000 ℓ of water can be harvested from a single substantial downpour of rain.

"This water is stored in tanks above and below ground, from where it is supplied into the operation by pressure pumps," he says.

With 50 years of experience, Metric Automotive Engineering is South Africa's most comprehensively equipped diesel engine component remanufacturer. It refurbishes large diesel and gas engine components and offers services such as cylinder head remanufacture, cylinder block line boring, milling, honing and boring. It also grinds camshafts and crankshafts, assembles engines and conducts dynamometer testing.

www.metricauto.co.za

WEG takes soft-starters to next level

The new WEG SSW900 soft-starters are the ideal choice for complete motor control and protection. These units allow quick and simple access to application information and configuration settings in any installation throughout a wide range of industrial segments where a three-phase induction motor needs to be controlled.

With its well-structured menu interface, the WEG SSW900 line gives users a new level of interactivity, including Bluetooth connectivity. These soft-starters provide event logs with dates and times, as well as setup and programming assistance. The built-in bypass extends the lifespan of the units, optimising space and reducing heat dissipation inside electric panels. This built-in bypass functionality also extends throughout the WEG soft starter product range, up to 1 400 A.

By allowing the smooth acceleration and deceleration of motors by controlling the voltage, soft-starters greatly reduce mechanical stresses on couplings and transmission devices during the start-up of a motor. In pumping applications, the smart control prevents water hammer and pressure overshoots in hydraulic piping.

Available from Zest WEG and its network of branches and value-added resellers in current ranges from 10 A to 1 400 A – and for supply voltages from 220 V to 575 V ac – the WEG SSW900 soft-starters can operate at ambient temperatures of up to 55 °C without current derating. They can substitute direct online starters or star-delta starters, bringing a range of benefits to the user's application. These include savings in electricity, as well as greater protection and increased durability of the electric motor.

Users also have access to diagnosis and fault history, and experience greater flexibility as the WEG SSW900 allows the installation of accessories in the application. Graphic monitoring and customisable main screens provide further convenience.

www.weg.net

The WEG SSW900 product range for motor control and protection gives users a new level of interactivity, including Bluetooth connectivity.

Keller's custom solutions for complete systems

While Keller's standard product catalogue covers most applications for pressure measurement technology, there are often great benefits to customising pressure sensors for more optimal use and integration into higher-level complete systems.

Keller's modular product design offers great flexibility and allows customer-specific adaptations to be made without causing soaring costs – even for small production runs. Creating tailored customer-specific solutions involves: defining basic sensor specifications in order to select the appropriate component; assess the environmental conditions to determine the appropriate design for the intended location; designing the requested customer-specific solution taking all standards and laws into account; assembling the electronic modules, taking into account application-specific customer requests; configuring electrical interfaces and connections; and customising product labelling.

Keller has 50 years' experience in countless challenging projects in the field of piezo-resistive pressure measurement technology. Applications that at first glance may seem trivial, can actually prove to be highly complex on closer analysis. By taking the actual usage conditions of the sensor into consideration right from the outset of a customisation, Keller has achieved major improvements in effectiveness and durability of its pressure measurement systems.

KELLER Custom Solutions optimise pressure sensors in higher-level complete systems.

Keller's custom solutions are available in South Africa from INSTROTECH

www.instrotech.co.za

Wi-Fi and Bluetooth modules for next-generation IoT applications

Mouser Electronics, Inc is now stocking the new Sterling-LWB5+ modules from Laird Connectivity, which deliver Wi-Fi 5 (802.11ac) and Bluetooth® 5.1 communications to next-generation Internet of Things (IoT) devices such as battery-powered medical devices, industrial IoT sensors, rugged handheld devices, and other connectivity solutions.

The modules are powered by the Infineon CYW4373E solution, supporting reliable and secure performance in industrial IoT settings. Ideal for harsh environments, the Sterling-LWB5+ modules boast a solder-down module form factor to minimise the effects of vibration and impacts, as well as an industrial temperature rating of -40 ±85 °C. The Sterling LWB5+ range provides for several small-form-factor PCB modules with options for integrated and pre-certified external antennas, as well as a couple of M.2 form factor solutions for increased host integration flexibility for designers' Linux platforms.

For optimum integration Laird Connectivity has also produced and certified a range of internal and external antennas, along with a reverse polarity SMA cable assembly specifically for Sterling-LWB5+ modules. The antenna range includes the proven internal FlexPIFA, Nanoblade and Mini Nanoblade Flex antennas as well as an external dipole antenna. The modules support the latest WPA3 security standards, and the devices' integrated power amplifier and low-noise amplifier (LNA) ensure reliable connectivity, even in challenging RF environments.

eu.mouser.com

Laird Connectivity modules are powered by the Infineon CYW4373E solution, supporting reliable and secure performance in industrial IoT settings.

GEMÜ Tugela butterfly valve

A GEMÜ R471 Tugela butterfly valve with automated actuation.

Valve specialist, GEMÜ, is now offering wafer versions of the GEMÜ R470 Tugela series in nominal sizes of DN 50 to DN 600.

The GEMÜ Tugela butterfly valve is particularly distinguished by its double-eccentric construction, which is why it is also designated as a high-performance butterfly valve and suitable for pressures up to 40 bar or temperatures up to 230 °C. The butterfly disc separates directly from the sealing seat when it opens, which reduces wear and thus increases service life. Thanks to the locking screw on the actuator flange, the gland packing can be retightened directly at the shaft, which sits in a carbon braid bearing, so that the butterfly valve can be serviced when installed. This, in turn, significantly reduces the maintenance requirements.

When constructing butterfly valves, a distinction is made between three main designs. In a concentric design, such as the GEMÜ Victoria series, the pivot point is in the centre of the seat valve, ie, the main seal is interrupted by the shaft. In a simple eccentric construction, the main seal is offset to the shaft axis and there is no interruption over the entire 360° sealing circumference with this design.

With the double-eccentric design, as the second eccentricity, the shaft axis is moved away from the piping axis so the shaft centre is slightly offset.

Further features of the GEMÜ R470 Tugela butterfly valve include: shaft blow-out protection as an additional safety measure in case the shaft breaks; and improved sealing due to an optimised disc design in spherical form. The GEMÜ R470 Tugela also has an antistatic spring for use in ATEX areas and a TFM seat ring, which is particularly low-brittle and ensures reliable use in a wide temperature range.

www.gemu-group.com

SA's next-generation valve and pump engineering specialist

MechChem Africa talks to Moeketsi Mpotu, executive director of Brimis Engineering, about localisation and the young company's approach to next-generation valve and pump services for South Africa's power, petrochemical and water sectors.

Brimis Engineering was founded in 2013 by its current MD, Andile Nqandela, to plug a gap in the market for engineering solutions in South Africa's Middelburg area, begins Mpotu.

"We started off doing general engineering: repairs, refurbishments and customisations, but we quickly developed niche expertise in valves, pumps and compressors. In Middelburg, we sit at the doorstep of our target clients, which include 10 power stations and about 50 coal mines, along with steel, ferrochrome, paper and petrochemical plants. Agility was a key selling point for us and, from the start, we have succeeded in offering quick response and turnaround times," he informs *MechChem Africa*.

Mpotu describes Brimis Engineering's first ever project as an ash crushing and slurry pumping line refurbishment project for a local power station. "We have had a heavy onsite presence from the beginning, with our first project involving resolving problems on an ash handling line, refurbishing the sump for an ash pump and slurry line and optimising the flow to prevent clogging and shutdowns at the power station," he continues.

Significant amounts of Brimis Engineering's current work still involves project teams doing onsite maintenance and refurbishment work. "We typically manage teams of up to 100 people on a single site from our headquarters and workshop facilities in Middelburg, where we have an in-house engineering and workshop team doing refurbishments, fabrication and the remanufacturing of various components.

"Clients come to us with valve or pump part problems, for example, when local spares of older equipment are obsolete, unavailable or no longer supported by the OEM. The units we see often date back to the 1960s, and we are able to reverse engineer replacement parts and/or whole units to create an equivalent or better product using more advanced materials and more precise workshop equipment," Mpotu tells *MechChem Africa*.

"Over 50% of our business is for the power industries, followed by the local mines that support this industry. Increasingly, though, we are involved with water boards such as Rand Water and Magalies Water along with several municipal water boards. We are also currently involved on the operating side of the Kusile Power Station, on the valve side for the water treatment plants, recalibrating some of the feedwater safety valves," he says.

Brimis Engineering's current niche specialism is on valves and pumps, particularly those used in critical applications such power station steam. "We have a very successful partnership with KSB on some of the imported valves and we are very proud to be an accredited KSB repair facility. Together with KSB, we are also able to deliver several new valves that meet the designated local content requirements for critical valves such as these," he adds. "For these valves the forgings are still imported, but smaller parts and all of the machining and assembly is done here to meet minimum local content requirements.

"We have an excellent relationship with KSB, which is one of the most supportive and ethical companies we do business with," Mpotu adds.

Also, though, Brimis Engineering is in the final stages of designing its own high pressure globe valve, the Brim 500. "We are currently at an advanced stage of engineering development, finalising the detailed design. We expect the first 100% locally designed and manufactured Brim 500 HP Globe Valve to be under trial at one of our South African power plants before the end of this year," he says proudly.

"No other local manufacturer manufactures these and, while valves are designated by the dti as a sector for local production and content, a dispensation is typically granted for importing any critical valve that is not locally available, which includes HP globe valves and many of the other control valves used in the power industry," he advises.

Describing the use of HP globe valves, he says they are critical for the safe operation of a steam turbine. Globe valves are steam-line drain valves

Brimis Engineering has developed niche expertise in the repair, refurbishment and reverse engineering of valves, pumps and compressors.

The valve testing bay at Brimis' workshop facilities in Middelburg, where all custom engineered and refurbished valves are tested.

which, when shut, must prevent steam leaks to the water drains. Explaining further, he says these are the valves that are opened on plant warm up to get rid of standing water in the steam lines. "One of the big risks to a plant on start-up is that standing water and condensation in the HP steam line cause water hammer. Globe valves are used on start up to purge the steam lines of any water or wet steam, so that only dry steam is allowed to pass through the HP turbine.

"Our Brim 500 valve will be 100% local and we know what the needs are for these valves and some of the problems associated with the imported versions currently in service," he notes.

With a more urgent current focus on power plant maintenance, Brimis Engineering is presently involved in several large onsite projects. "Our biggest project right now involves some 80 Brimis artisans and engineers at a power station in Standerton, doing maintenance and lot of reverse engineering on branded older valves, along with site support services. We also have between 30 and 50 of our people onsite at Kriel and 10 to 15 at Hendrina, all doing maintenance on critical valves and pumping systems," he adds.

Brimis' workshop facilities in Middelburg, where all of the custom engineering, in-house machining, valve testing and reverse engineering is done, are also very busy. "We are not coping with all the work we receive at the moment, so are having to outsource significant amounts of welding and hot work to entities in Johannesburg, for example. We are currently engaged with the SAIW, however, to get our ISO 3834 accreditation for high integrity welding, which we hope will enable us to become more responsive to our Mpumalanga client," he says.

Energy efficiency and preventative maintenance

With respect to energy efficiency, Mpotu suggests that heavy industry in South Africa is typically using tools from the 1970s and there is very little about their operations that can be described as energy efficient in the modern context.

He cites a recent visit to a chrome producer, which has been smelting at its Steelpoort facility for 35 years. "They recently demonstrated a mindset shift by deciding to invest in energy recovery technologies, which will enable recovery of some 20 MW of power, simply by capturing energy that has always been there for the taking.

"A similar project was proposed in 2010, but only now that we have serious power constraints has it emerged as a priority. Nowadays, I think all of us need to be looking at our own internal energy use. We can all find ways of using electricity more efficiently, reusing waste heat and fixing leaks. Energy efficiency is not all about buying expensive energy efficient pumps and motors, it's often simply about properly maintaining existing equipment to minimise waste," he notes.

Brimis has set up a partnership with the Swiss entity, Distran, the OEM for Ultra Pro ultrasound cameras for detecting partial discharges such as steam or gas in the power generation, oil and gas or chemical fields. "As a valve specialist, we have operators trained in the use of Distran ultrasound cameras to monitor gas leaks from critical equipment. For any plants using steam or gas, finding and fixing leaks has a huge impact on energy and production efficiency, as well as on costs and profitability," Mpotu points out.

These cameras, he says, can detect a leak from 20 m away, making them ideal for use at power and chemical plants immediately prior to a shutdown. "They enable every leaking valve, steam trap, gauge or pipe connection to be identified and repaired during the shutdown, before restarting the plant.

Another potential beneficiary of ultrasound leak detection is the water industry. "It is estimated that 15 to 20% of the potable water from our treatment plants goes to waste due to leaks. Modern leak technology can go a long way to reversing this situation," he adds.

Mpotu believes that the South African end-user mindset towards localisation also needs to shift a little. "End-users don't yet believe in our local capability and expertise in valves and pumps. At Brimis, we have many ex end-users with a huge amount of accumulated experience around the valve and pumping problems that occur on site. This gives us the unique ability to deliver a highly customised and targeted set of engineering solutions for our local power, mining and water industries.

"Brimis is capable, agile, responsive and we are in a far better position to meet South Africa's needs in this area than any importer of overseas products," Mpotu concludes. ❑

Brimis has a huge amount of accumulated experience around the valve and pumping problems that occur on site.

Advanced NDT offered by WearCheck AFS

Adri Ludick, NDT manager for WearCheck, outlines the benefits and details of various non-destructive testing techniques.

Jaco Venter, senior machinery inspector at WearCheck, conducts ultrasonic testing on a winder's brake components during a routine NDT assignment.

Advanced field services, transformer chemistry testing, reliability solutions – these are some of the extra services offered by condition monitoring specialists, WearCheck, in addition to traditional used oil analysis following recent expansion.

"The NDT approach features a variety of testing techniques through which the properties and condition of a component or system are evaluated without causing any permanent damage to it. NDT is typically used in critical component assessments, machine condition assessments and inspection of ancillary equipment such as main vent fans, compressors, mills, pumps and conveyors," says Ludick.

"Our NDT team delivers quality assurance and quality control of new as well as refurbished components. Our core NDT offering includes eddy current-, magnetic particle-, liquid penetrant-, radiographic- and ultrasonic-testing, along with visual inspection," he says, adding that NDT's non-destructive nature means that both money and time are saved in a condition monitoring programme.

Describing the advanced techniques on offer, Ludick begins with eddy current testing (ET), which is ideal for detecting surface defects such as early-stage cracks on metallic machine components. The process is now used across a wide range of industries, from aerospace to beer brewing.

During the testing process, a high frequency electric current (an eddy current) is induced into the material and the response of the associated eddy current field is measured. This information is processed to yield a profile of the component.

Defect-free material has a very specific 'fingerprint', so when the test results are compared to this, the presence of defects can be easily picked up and assessed. "When it comes to cracks, the earlier they can be detected, the less potential damage they can will cause to the component. Eddy-current testing can detect crack initiation at extremely early stages," he notes. "A more advanced version of this NDT technique is phased-array eddy current testing, which creates a 3D picture of the component, giving a clearer visual insight into anomalies," he adds.

Magnetic particle testing (MT) has a similar purpose to eddy current testing, in that both techniques detect surface cracks on magnetic materials. This is used across a wide range of industries. The process in this test is to magnetise the component and then saturate it with very fine magnetised ink or powder.

Any anomaly in the surface being tested causes a concentration of the magnetic field around it, therefore drawing the magnetic ink to the crack and making the defect visually detectable. A key advantage of magnetic particle testing is that it can be used to test very large surface areas, very quickly.

Liquid penetrant testing (PT) is typically performed on non-magnetic materials, such as copper or aluminium, and is essentially a non-magnetic version of magnetic particle testing. Once the surface is cleaned, it is saturated with a non-harmful penetrating ink. The penetrant is then wiped off the surface of the material before a developing chemical is applied over the test area. "This developer draws the penetrant from any cracks to form a visible indication, which is visually examined by a specialist and the results recorded. This method is used to test such items as vehicle components and ventilation fan blades," he says.

Radiographic testing (RT) is similar to having X-rays done on humans. It uses different types of X-ray sources that penetrate the material and pass onto an X-ray plate behind the component. It is a widely used technique that detects sub-surface defects which cannot be detected visually. "For thinner materials, such as a metal plate, a weak X-ray source is used, while thicker components such as ventilation fans require a stronger dose. The X-ray sources are contained in a 'bomb', which is aimed at the target," Ludick explains.

"Radiographic testing is often used on welds to test the integrity of the bond between the weld and the parent metal. Called digital radiography, using an electronic form plate instead of photographic film, it is the new trend for this technique," he adds.

He says that ultrasonic testing (UT) works just like a 'fish finder' used on a fishing boat to reveal the depth and size of fish. UT allows technicians to see sub-surface defects in both metal and non-metal components. During the process, an ultrasonic flaw detector instrument fires ultrasonic pulses into the material, while simultaneously detecting the reflection. By measuring the time difference between pulse and the reflection – and knowing the speed of sound in the test material – the location of a defect can be pinpointed.

An advanced UT option is phased array ultrasonic testing where, instead of one pulse, 64 pulses are fired into the component. "By fine-tuning the pulse-strength, it is possible to 'steer' the beam in different directions. The advanced option enables us to get a 3D picture of the component, instead of merely a pulse on a screen," he says.

Visual inspection involves WearCheck's highly-experienced, well-trained technicians who conduct a multitude of visual inspections on a range of components every day. "Their eyes are conditioned to recognising early-stage defects that are visible, and to identify potential 'hotspots' that require further testing," Ludick concludes.

www.wearcheck.co.za

nftn
NATIONAL FOUNDRY TECHNOLOGY NETWORK

Casting partnerships towards success

It is imperative to enhance the manufacturing competitiveness of South African foundries to increase local content and exports.

The National Foundry Technology Network (NFTN) exists to advance the competitiveness of the local foundry industry, especially distressed foundries through a range of support services.

The NFTN is an initiative of the Department of Trade, Industry and Competition (**the dtic**). Through technical interventions, skills development and enterprise development, the NFTN works to:

- **Build foundry capacity technology, tooling and process through support;**
- **Support the industry with quality standards;**
- **Support foundries with regulatory compliance; and**
- **Skills development with accredited core foundry skills.**

For more about our support services, or assistance to link up with a suitable foundry to meet your production requirements, contact **nftn@csir.co.za** or visit **www.nftn.co.za**.

The National Foundry Technology Network is an initiative of the dtic managed by the CSIR.

THA 17-2020

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