

MechChem

SEP-OCT 2021

AFRICA

CROWN
PUBLICATIONS



engineering.tomorrow.together.

100
Years Uhde

thyssenkrupp

This month:

Cabin cooling for South Africa's mining vehicles

Collaboration and the journey towards autonomously run plant

Specialty rotating shaft solutions for the renewable energy sector

Diesel engines: the road to zero harmful emissions



Explore a 3D chemical plant:

www.vega.com/chemical

www.vega.com/refining-petrochemical

Level. Switching. Pressure. Measurement technology for the chemical and petrochemical industry

Thanks to our decades of experience we understand the requirements of the chemical and petrochemical industry and its diverse media – from safe processing to reliable storage and efficient transportation.

And no matter whether solids, liquids or gases are being mixed or made to react: VEGA has the right sensor for the job. Reliable. Proven in the field. Easy to service.

www.vega.com

Looking Forward

VEGA

CONTENTS



CROWN PUBLICATIONS

Published bimonthly by
Crown Publications (Pty) Ltd
Cnr Theunis and Sovereign Streets
Bedford Gardens 2007

PO Box 140, Bedfordview, 2008

Tel: +27 11 622 4770

e-mail: mechchemafrika@crowns.co.za

www.mechchemafricamagazine.co.za

Editor: Peter Middleton

e-mail: peterm@crowns.co.za

Advertising: Elmarie Stonell

e-mail: elmaries@crowns.co.za

Design: Katlego Montsho

Publisher: Karen Grant

Deputy publisher: Wilhelm du Plessis

Circulation: Brenda Grossmann

The views expressed in this journal are not necessarily those of the publisher or the editors.



Transparency You Can See

Average circulation

Jan to Jun 2021: 7 196

Printed by: Tandym Print, Cape Town

Front cover: thyssenkrupp-Uhde
South Africa

Contact: Rajend Govender, CEO

Tel: +27 (0) 11 236 1000

info.tkissa@thyssenkrupp.com

www.thyssenkrupp-industrial-solutions.co.za



Publisher of the Year 2018
(Trade Publications)

MAINTENANCE SOLUTIONS AND ASSET MANAGEMENT

- 6 Correct lubrication for enhanced bearing performance
Wayne Holton, BMG's business unit manager for the Bearings, Seals and Gaskets division, looks at how friction, wear and lubrication affect bearing performance.
- 8 Full-service capability vital for reliable pump supply
- 9 Real-time monitoring reduces impact of COVID-19

WATER AND WASTEWATER SOLUTIONS

- 10 Lime slaker plant cuts water treatment costs
A new lime-slaking facility, which will help a mine water treatment plant achieve significant cost savings, has been equipped with a stainless steel Grundfos booster pump to reliably handle the corrosive permeate.
- 13 EWSETA capacitating entrepreneurs via 4IR solutions
- 14 Water stewardship gives mines the broader view
- 16 Is SA doing enough to avert a water crisis?

MINERALS PROCESSING AND MATERIALS HANDLING

- 18 Digital platforms, collaboration and the journey towards autonomously run plant
MechChem Africa talks to Multotec's Thomas Holtz about digital platforms for minerals processing plants and the need for closer collaboration if we are to realise the true value of autonomous processing.
- 21 Innovating cooperatives to create more jobs
- 22 Conveyor innovation for platinum processing plant
- 24 Container and component handling for automotive assembly
- 25 Instrotech's tried and tested bulk weighing technology

HEATING VENTILATION AND AIR CONDITIONING

- 26 Cabin cooling for SA's mining vehicles
MechChem Africa talks to Booyco Engineering's Brenton Spies and Grant Miller about HVAC systems for special vehicles operating under extreme conditions.

POWERGEN, PETROCHEM AND SUSTAINABLE ENERGY MANAGEMENT

- 28 Specialty rotating shaft solutions for the renewable energy sector
MechChem Africa talks to Saien Rugdeo of SKF about specialty solutions and services developed for wind turbines and renewable energy generators.
- 30 Embedded Generation: opportunities from the 100 MW threshold increase
- 32 Project nautilus extension announced
- 33 Realising energy efficiency in a time of escalating costs

CORROSION CONTROL AND COATINGS

- 34 A corrosion investigation for a biokinetics pool
Sassda's Michel Basson reports on case study involving pitting corrosion of a stainless steel support railing system following an upgrade to a biokinetics treatment pool.

LOCAL MANUFACTURING AND FOOD PROCESSING

- 36 Bosch Holdings celebrates 60 years of innovation in engineering
Founded in 1961 in Durban, South Africa, Bosch Holdings has since executed projects in over 120 countries around the world. Mike Gibbon, the company's current CEO, summarises some of this success.

INNOVATIVE ENGINEERING

- 40 Diesel engines: the road to zero harmful emissions
WearCheck technical manager, Steven Lara-Lee Lumley, unpacks diesel engine emissions and outlines the legislation and technologies being put in place to mitigate against harm.

REGULARS

- 2 Peter's comment: Collaboration, 4IR and lessons from COVID-19
- 4 On the cover: Modular plant, green hydrogen and the future focus of tk-Uhde SA:
MechChemAfrica talks to tk-Uhde's team about the modularisation of chemical process plant.
- 38 Products and industry news
- 44 Back page: TUKS students race robots

Collaboration, 4IR and lessons from COVID-19

Peter Middleton

COMMENT



It is now over 18 months since the full force of the COVID 19 Pandemic caused radical changes to the lives and working practices of almost every community on Earth. It is no surprise that so many technical articles and developments are emerging as a direct response to the ongoing need to minimise the spread of this too often deadly virus. In a nutshell, reducing the spread of COVID 19 involves minimising person to person contact: hence lockdowns, working from home, travel restrictions and social distancing guidelines. We have all been required to isolate at some level to limit the number of contacts we have with people 'outside of our bubbles'.

Science and technology were quick to step up in response. Initially with a treatment focus to fast track the delivery of healthcare equipment, medication, PPE and sanitising products, but a massive data collection drive quickly kicked in to monitor daily global spread, while the use of virtual meeting platforms, Internet-shopping and delivery services also rose exponentially.

The development and distribution of COVID 19 vaccines, however, is likely to emerge as the greatest and most successful global vaccination programme ever. On September 1 'Our World in Data' recorded that 39.6% of the world population had received at least one dose of a COVID-19 vaccine; 5.34-billion doses had been administered globally; and 40.5-million were being administered every day. On the negative side, however, only 1.8% of the people in low-income countries had received a dose, which creates opportunities for vaccine-evading variants and so demands urgent action from better-resourced nations.

The speedy development and approval of COVID-19 vaccines, along with a significant number of different vaccines that have proved effective, is a remarkable achievement for the scientists involved. Also, though, production volumes – delivered in highly regulated batches due to the possibility of biological contamination – are staggering. The world's biggest vaccine maker is now the Serum Institute of India, which at the end of August, was producing 150-million doses per month of its version of the AstraZeneca vaccine.

In a Minerals processing interview in this issue, Multotec's Thomas Holtz talks about the need for much closer cooperation and collaboration between service and equipment suppliers to realise the true value of Fourth Industrial Revolution (4IR) technology. He cites the success of the development programme for Tesla's autonomous motor vehicle as an example. This innovative success story, he says, is built on "an incredible collaborative ecosystem consisting of multiple highly specialised partners". Collaboration is

also clearly evident in the development, production and distribution of COVID-19 vaccines. A Nature.com editorial from June 2021 says that, while collaboration between academia and industry is well established, "... the speed and scale of achievement during the pandemic – globally, 16 vaccines have been approved so far, with a further nine in full phase III clinical trials – is rare, if not unprecedented".

Holtz argues that "the true value of the autonomous plant lies in production efficiency and optimisation: being able to extract the highest possible mineral recovery from the whole plant, from run-of-mine ore to saleable minerals." To achieve this, he points out, we need to be willing to form partnerships and alliances, share information and open up our businesses to a host of stakeholders, including competitors.

In an article on UNIDO's Industrial Analytics Platform, Alejandro Lavopa and Michele Delera argue that, although 4IR is the product of technological advances, it is uniquely marked by a blurring of the boundaries between the biological, the physical and the digital realms. "Machines 'speak' to each other through the internet of things, processes respond to intelligence devised by algorithms, and humans engage in real-time 'conversations' with mechanical processes through bidirectional interfaces," note the authors.

"What truly sets Industry 4.0 technologies apart is the novel way in which hardware, software and connectivity are being reconfigured and integrated to achieve ever-more ambitious goals, the collection and analysis of vast amounts of data, the seamless interaction between smart machines, and the blurring of the physical and virtual dimensions of production.

Another of Thomas Holtz' core 4IR messages is about people: "At the outset, I think we must make a case for the human being in this equation," he says. The collaborative deployment of our scientific and technological expertise to cope with and then overcome the COVID-19 pandemic has put the health and survival of the people most vulnerable to succumb to COVID-19 at its centre. This proves, beyond doubt, that science and technology innovations such as those associated with 4IR are invaluable, particularly when applied to people's real needs and imminent threats.

Climate change demands that we again collaborate to overcome a real and present danger and 4IR technologies are likely to be a core aspect of this multi-faceted campaign, which will need to have resource, production and energy efficiency at its core if we are to sufficiently limit green-house gas emissions to avoid irreversible harm to our planet. □

MechChem Africa is endorsed by:



Marching to maximum efficiency

We partner with you over the lifetime of your plant, driving continuous process optimisation to enhance plant efficiency and lower your overall cost per ton.

That's why the world's leading mining houses use Multotec mineral processing equipment.

Constantly working to lower your cost per ton



MULTOTEC

www.multotec.com

Modular plant, green hydrogen and the future focus of tk Uhde SA

MechChem Africa talks to Rajend Govender, CEO of thyssenkrupp Uhde South Africa (tk Uhde SA), along with key team members, Neville Eve; Ranka Sofijanic and Nithesh Mohun, about the modularisation of chemical process plant and the company's future-ready expertise in green hydrogen and organic carriers such as green ammonia.

“Most of our work still comes from traditional brown-field sites, which are some of the toughest environments to work in, particularly in Africa,” begins Rajend Govender, CEO of thyssenkrupp Uhde SA. “This opens up the opportunity to adopt the modular plant approach, which is not new to us,” says the CEO, who is a chemical process technology specialist with 20 years’ experience with thyssenkrupp and Uhde.

“We have long been designing and building plants or sections of plant off-site under controlled conditions that are not subject to the congested and risky environment of a typical operational plant. Much of our current work involves installing purpose designed and manufactured modular replacement units,” he tells *MechChem Africa*.

Ranka Sofijanic, the company’s chief engineer for Piping and Mechanical, continues: “We are typically working on congested petrochemical plants that were originally stick-built, onsite. Upgrading such sites means work has to be done between the surrounding units, often while the plant is still live, which makes safety aspects critical. Work can only be done under hot work permits; the hours onsite are often limited by daily permitting requirements; and COVID throws additional

limits on the number of workers allowed at any one time.

“By taking the modular approach, a whole plant upgrade can be built offsite on a skid, in an open and far safer environment. No hot work permits are required, there is no congestion, no live plant to work around and no additional man-hours need to be added to guarantee meeting deadlines,” she argues.

Describing a typical success, she says that tk Uhde successfully completed a modular plant upgrade for a coal tar filtration (CTFE) plant. “This project comprised 25 modules weighing up to 250 t. Modules included multi-disciplinary pre-installation (piping, mechanical, instrumentation, electrical and structural) that were all built off-site, transported and installed in the live plant, and connected up,” she recalls.

Neville Eve, chief of strategy for tk Uhde SA, continues: “We have also just completed a 65 t module for Natref, which was built and tested off-site before being shifted into place by a self-propelled modular transporter (SPMT), while observing all COVID restrictions and without any delivery time delay,” he says.

“A modular plant is much more than a replica of a stick-build onsite construction that is built offsite, though. Modular plant has to be

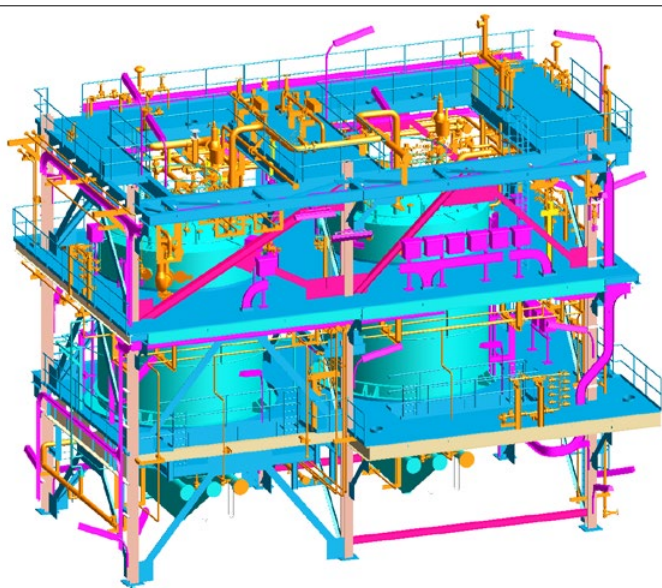
purpose designed with structural integrity so it can be safely and easily transported, placed and connected-up onsite in a ‘plug-and-play’ manner. Our design skills and experience in doing this routinely give us a competitive advantage,” Eve notes.

According to Govender, complementary skills sets such as laser scanning expertise are also important. “We have the modern resources and capability to scan an existing site in 3D before we start. This enables us to identify the exact space available and the exact positions for interconnection with the existing on-site plant. This allows us to design and build a perfectly customised module off-site that not only meets the upgrade requirements of the plant, but on installation, the unit will ‘plug’ into the existing plant like a block of Lego,” he explains.

Modularisation on a large scale enables plants to be built more cheaply. Logistics expertise allows the selection of the build location and vendor, including those offshore. “Our global parent has designed modules as large as 3 000 t, which can be built, for example, in the Far East and shipped to site in the Americas,” says Eve.

Sofijanic adds that while transportation of larger modules may seem expensive, it is actually very competitive when compared with the combined cost of shipping all of the individual materials and components required for a stick-build plant in a remote area. “While modular projects may attract small incremental design and structural steel costs, these are offset by the reduced cost of assembly, painting, insulation, inspections, testing and other work performed in the fabrication facility,” she says.

“Along with the densification advantage – modular design requires less plot space – structural design is critical and, owing to the increased quality required to ensure plug-and-play compatibility, the module’s reliability and life can be significantly improved,” continues Uhde’s Chief Piping Engineer. “Climatic conditions are also a factor. In some places, particularly in very cold or wet climates, there are several months of every year when construction work cannot be done. By building at a convenient off-plot site, the modular plant can be built in advance in a better environ-



tk Uhde successfully completed a modular plant upgrade for a coal tar filtration (CTFE) plant that comprised 25 modules weighing up to 250 t.

ment, substantially reducing time required onsite. This saves construction time and costs – and this is also true in South Africa and Africa, where weather often plays a disruptive role,” Sofjjanic informs *MechChem Africa*.

In addition, labour issues are more predictable in shop floor environments, where different disciplines such as insulation, painting, testing and shot blasting capabilities are more easily planned for and accessible. There is seldom a need to wait for a specialist to be mobilised onto an off-plot site, she adds.

Govender cites a local example where a plant had to be built in the heart of a gasification area with dangerous concentrations of phenolics in the surrounding atmosphere. “It was unsafe for any worker to be in that environment for more than 30% of a 12-hour shift. Everyone had to wear a full face mask at all times and nobody could be onsite for longer than four hours at a time.

“The solution was that we immediately adopted a modular approach, which massively improved the construction schedule and, of course, raised the end quality levels – because it is very hard to produce great quality construction work while sweating behind a full face mask,” he notes.

While modular plant design is far from novel – tk Uhde has long history in modular chlor-alkali plants, for example – the company now has the expertise to design and replace existing stick-built sections of plant with purpose built modules. “This is a much rarer skill that offers operators a more cost effective and reliable opportunity to upgrade and modify older plants,” Govender says.

In Africa, where the availability of contactors and expertise is scarce and the build often has to be done in remote areas with poor infrastructure, plant modularisation is the way to go,” he assures; adding that tk Uhde chlor-alkali plants, which electrolyse sodium chloride solutions to produce chlorine, sodium hydroxide (caustic) and sodium hypochlorite (bleach), are now being installed globally. These are all pre-assembled, tested, containerised, shipped to site and re-assembled.

Green hydrogen

According to Eve, the advent of Green Technology, including the world class manufacture of gH_2 (green hydrogen) has leveraged Uhde’s state of the art electrolyser technol-



Modular plant has to be purpose designed with structural integrity so it can be safely and easily transported, placed and connected-up onsite in a ‘plug-and-play’ manner.

ogy, originally developed for the manufacture of chlor-alkali products. The application of this technology in the green technology environment places it firmly at the heart of future business. “Our forward-looking focus is around green hydrogen and associated downstream technologies: green methanol, synthetic natural gas and green ammonia. We are now part of the Green Hydrogen Partnership (GHP) and working hard to transform the South African economy from being a fuel import dependent company to an exporting country – and the potential for South Africa is huge,” says Neville Eve.

Senior sales engineer for Green Hydrogen & Chemicals, Nithesh Mohun, explains: “In mitigation against climate change, countries are under increasing pressure to decarbonise. The production of green hydrogen using Uhde technology can be 100% CO_2 -free. All we need is a source of sea-, grey- or river-water. We first purify the water using reverse osmosis, before channelling the water to electrolyzers, which ideally use renewable electrical power from a solar PV, wind or hydro powerplant to split the water molecule into close to medical grade oxygen (O_2) and pure hydrogen (H_2).

“Using the green hydrogen as feedstock, we can then produce green ammonia, which has use as a green fuel for marine vessels, fertilisers or explosives. In addition, we can harvest carbon from the CO_2 emissions from traditional fossil-burning plants and, by combining it with green hydrogen, produce green

methanol (CH_3OH) or synthetic natural gas, which is very close to methane (CH_4). Using green hydrogen as the starting point offers immense potential for the downstream green derivative products value chain,” Mohun tells *MechChem Africa*

With respect to costs of hydrogen production, Mohun estimates that, even with the cost of green-power factored in, the cost of hydrogen production will reach cost parity with traditional carbon-based steam reforming processes within the next few years. “Our hydrogen electrolyser technology using traditional power is already cost competitive with steam reforming processes in the cost range of US\$1.8/kg to \$2.4/kg. With the adoption of renewable power, we believe the total costs will fall into this range within the next four to five years,” adds Mohun.

“As well as being leaders in large scale green hydrogen production and derivatives, we are part of a large global organisation with local experience and capabilities that enable us to be very flexible with respect to the delivery of brownfield and greenfield projects, from small to very large,” says Govender. “We combine modern solutions with emerging and existing plant in a unique, flexible and locally appropriate way, as long-term partners to local owners and operators.

“thyssenkrupp Uhde has a role to play across the entire lifecycle of process plant in Africa. We have been around for a 100 years and in Southern Africa for more than 60 years, so we are not about to disappear,” he concludes. □



Key team members of tk Uhde SA: Rajend Govender, Neville Eve, Ranka Sofjjanic and Nithesh Mohun.

Correct lubrication for enhanced bearing performance

Wayne Holton, BMG's business unit manager for the Bearings, Seals and Gaskets division, looks at how friction, wear and lubrication affect bearing performance.

To achieve optimum bearing performance and extended life, correct lubrication is as important as the appropriate selection of each bearing. Although a general multipurpose grease is adequate in many applications, more arduous operating conditions demand the careful choice of the correct lubricant and lubricating system. In selecting the right lubricant for a specific application, factors such as speed, ambient temperature, load, vibration and environmental conditions need to be considered.

Friction is the force of resistance between two bodies moving over one another. It is measured as the force parallel to the relative direction of movement of the surfaces that is required to overcome the resistance and cause the bodies to start

sliding. Friction wastes power. It is a generator of unnecessary heat, the cause of wear and tear damage, and it reduces the mechanical efficiency of plant and machinery. The undesired effects of friction are effectively reduced by using an appropriate lubricant and lubricating system, purpose designed for each specific application.

Damage to moving parts can manifest itself in different forms, including surface damage and wear. When materials of different hardness rub together, damage occurs mainly on the softer material. Damage is most severe when materials of similar hardness are rubbed together and when clean and smooth surfaces are rubbed together. In these instances, friction is high and the two surfaces are likely to seize. Wear is a

consequence of friction and involves the removal of material from at least one surface.

Modes of wear include adhesive and abrasive wear. Adhesive wear, which is caused by local welding of contact points and the subsequent ripping of material, increases with load and reduces with the hardness of the materials. Abrasive wear occurs when a harder surface gouges a softer one, or when hard particles are introduced between the surfaces, resulting in the tearing of the materials.

Pitting wear occurs as a result of surface fatigue of the material due to contact stresses exceeding the fatigue strength. This type of wear occurs when the surfaces are being 'run in' and reduce when any high spots are flattened sufficiently to distribute the load uniformly over the total area of the mating surfaces. When excessive loading occurs, pitting continues and will eventually destroy the surfaces.

The effects of friction and the resulting wear of moving components is reduced by effective lubrication. The purpose of any lubricant, which may take the form of an oil, a grease or a solid, is to separate the mating surfaces and thereby reduce friction and wear. Correct lubrication is critical for optimum bearing performance and extended service life.

Hydrodynamic lubrication has, as its basis, the presence of a 'wedge' of lubricant separating the two running surfaces and supporting the load by hydrodynamic reaction forces. This implies that, in the case of journal bearings, the shaft will, at low speeds and high loading, be eccentric. This eccentricity will reduce with increased shaft speed and a reduction in loading.

Ball and roller bearings are designed to be lubricated using boundary lubrication, thin film lubrication or full hydrodynamic lubrication systems. The specific duty will determine the most appropriate form of



Easylube single point lubricators from BMG are Electro-Mechanical, which allows for accurate automatic lubrication.



BMG's range of lubricants, oils and greases has been developed by leading suppliers, with the latest formulations and technologies, to meet the demands of all sectors, including mining, automotive, marine, general industry and consumer applications.

lubrication for the application. Extreme pressure additives may be necessary and, for bearings operating at high temperatures, a lubricant with a high viscosity index is often required.

Oil lubricants may be applied in a number of ways:

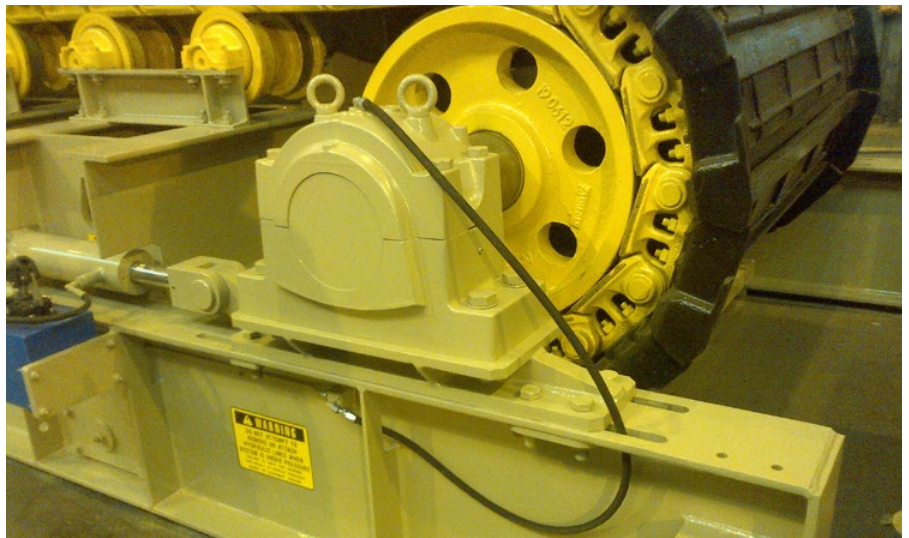
- **Oil bath:** The bearing is submerged in oil. This method is not suitable for high speed applications.
- **External pressure:** A pump is used to supply the bearing with lubricant. The circulating oil cools the bearing and removes any particles of dirt.
- **Mist spray lubrication:** The lubricant is sprayed onto the bearing under pressure, in the form of a mist.

Greases, which are a combination of mineral oil and a thickening agent (metallic soap) are difficult to pump continuously into bearings and are usually applied periodically, providing only boundary lubrication. Special devices are available, however, to continuously supply bearings with the appropriate amount of grease.

The main advantage of grease lubrication is that, because this material is a semi-solid, it also acts as a good sealant to prevent the ingress of dirt particles. However, working temperatures may limit the use of grease in some applications.

BMG's lubricants, oils and greases

BMG's range of lubricants, oils and greases has been developed by leading suppliers us-



To achieve optimum bearing performance and extended life, correct lubrication is as important as the appropriate selection of each bearing.

ing the latest formulations and technologies to meet the demands of all sectors, including mining, automotive, marine, general industry and consumer applications. Included in this range are mining lubricants and allied chemicals that offer solutions for the most difficult lubrication problems.

BMG's range of industrial products includes anti-seize compounds and penetrants, assembly and disassembly products, chain lubricants, transmission oils, cleaners and degreasers, electrical maintenance products, plastic moulding and cutting compounds, as well as engineering and fabrication materials. Also available are a number

of greasing solutions, including open gear lubricants and wire rope dressings, bearing and synthetic bearing greases, as well as other general grease products.

BMG has developed a bearing course for maintenance personnel, which includes technical training on correct bearing selection, handling, installation and maintenance. It also includes relevant information on the importance of correct shaft and bore tolerances, proper fitting tools and techniques, advances in lubrication technology and the basics of condition monitoring and failure investigation.

www.bmgworld.net

Refurbishment, fabrication and replacement service for sugar mills

In every year of the sugar industry's off-crop season, BMG teams are working closely with sugar mill engineers to refurbish and replace worn components in preparation for high productivity in the upcoming season.

Dorstener gearboxes have been used on diffuser drives, mill drives and feeder tables for many years and three of these planet carriers recently needed to be replaced, due to excessive bearing journal wear and cracking.

"In spite of tight time restrictions before the seasonal start-up of the mill, coupled with manufacturing challenges, BMG designed, fabricated and installed new carriers, reducing the normal 24-week delivery period to only four weeks, with cost savings of about 7.5 times that of an OEM replacement," explains Mike Cooper, general manager for engineering at BMG.

"Carriers are normally manufactured by Dorstener from cast iron, which is

extremely difficult to repair. In this case, there was the additional problem of bores positioned close together, with virtually no wall thickness between the bearing journals, which was where the cracking had occurred. Because of the harsh operating conditions of the mill and the high torque load of these units, we decided replacement was the preferred option over refurbishment.

"These planet carriers were re-engineered and fabricated out of 355WA steel plate, which is not only stronger than the original cast iron units, but also allowed us to manufacture the carriers in the far shorter lead time of three weeks.

The team was on a tight deadline to have drawings and designs approved to ensure highly accurate dimensions for a perfect fit with clearances to accommodate the gear mesh.

Welding challenges to maintain the structural rigidity of the system were overcome by machining interlocking tabs

in the top and bottom main plates, as well as in the webs and side rings, to ensure a more precise assembly for welding with less distortion. The webs and side plates were welded to the bottom ring and the entire assembly was then fitted onto the top ring for welding into place. Slots were later filled with weld metal, so the webs form an integral part of the structure.

BMG's specialist services to the sugar sector include bearing and gearbox inspection, bearing and chain refurbishment, large size bearing assembly and alignment and balancing, as well as customised product design. The company's mobile field services team conducts breakdown and routine maintenance on plant and carries out trouble shooting to ensure the highest level of plant output and reliability.

BMG's total plant maintenance solutions service is geared to optimise productivity and enhance process plant operating reliability to make a difference to the efficiencies of every plant. □

Full-service capability vital for reliable pump supply

Jordan Marsh, sales manager at Integrated Pump Technology, talks about the company's full-service offering, which includes a comprehensive stock of all critical spares; a local service centre and experienced staff to maintain units to OEM standards.

Even the best quality pumps need to be supported with a full range of aftermarket services, according to Jordan Marsh, sales manager at Integrated Pump Technology. "Reliable pumping is the life-blood of many sectors in our economy, making the choice of pump supplier a strategically important one," says Marsh. "This applies even when customers have specified the best pumps available."

He highlights, for instance, that Integrated Pump Technology is so confident of its Grindex range that it offers a 36-month warranty on all new pump units purchased. The expected lifespan is, of course, much longer than this, he says, and the company is well equipped to ensure long and reliable pump performance for its customers.

"Our full-service offering includes a comprehensive stock of all critical spares across the range, with a service centre and experienced staff to maintain units to OEM

standards," Marsh says. The necessary equipment and expertise are on hand to look after the complete range of pumps, from 0.4 kW units right up to the large 90 kW Grindex Bravo Mega pumps.

Integrated Pump Technology also supplies and supports Faggiolati slurry pumps and Leybold vacuum pumps, and can even service and test other brands of submersible pumps.

Among the technical services in the company's quality-accredited workshop is its test tank, which allows comprehensive testing of pumps with motors of up to 150 kW. According to workshop manager Fred Slabbert, continual investment in workshop capability means customers can benefit from a six-month warranty on refurbishments and repairs. The workshop can even conduct full refurbishments to original OEM specifications.

"Pump users can bring us their equipment for a professional assessment by our skilled

technicians," Slabbert says. "After careful examination, we generate a condition report, which gives all the details necessary for an informed decision, and customers are assured of aftermarket services to OEM standards."

Underpinning the company's high service levels is a dedicated workshop sales administrator, providing a strong link between customers and the workshop and spares store. "We prioritise quick and efficient turnaround times on all spares sales, repairs and quotes, keeping customers informed at each step in our relationship," he says. In the unlikely event of a customer needing assistance on site, the workshop is also equipped to provide troubleshooting assistance on most mechanical or electrical issues.

www.pump-technology.com



Experienced staff are on hand to maintain pumps to OEM standards at Integrated Pump Technology.



Locally assembled Grindex pumps in the Integrated Pump Technology service centre.

Real-time monitoring reduces impact of COVID-19

Juan Labuschagne of Martec, the Pragma Group's condition monitoring company, describes how IIoT (Industrial Internet of Things) technology and the use of smart sensors has helped to optimise on-site maintenance delivery and limit the adverse effects of the COVID-19 Pandemic on plant operations.



Since the arrival of COVID-19 we have experienced immensely negative impacts on our economy and infrastructure. Various industries and sectors have undergone massive operational changes, with the focus on reducing expenditure at the forefront of most management strategies. Companies have been forced to reduce staff either due to financial constraints or the operational risks of spreading the disease.

Compliance with compulsory restrictions or scaling down staff result in various complications as regards the reliability of costly infrastructure: reduced maintenance budgets; reduced maintenance staff and tasks; delays in critical maintenance activities; and limited contractor availability, for example. All these factors significantly increase the risk of failure of plant-critical equipment.

To keep unexpected failures to a minimum, planned and scheduled maintenance were traditionally the ultimate strategies. The industry has since moved on, however, and a new 'predictive maintenance' strategy is being born, thanks to smart sensors and devices with remote in-time/real-time monitoring capabilities.

In this day and age, most software and machinery suppliers provide an open type of architecture to enable the flow of communication and to enable integration with different processes. This new revolution (Industry 4.0) aims at industrial digitalisation and the networking of devices. This allows mass data to be stored so long-term and accurate observations can be accumulated using complex analytical methods.

The ability to use this technology to make

informed and accurate decisions during the restrictions of the COVID-19 pandemic resulted in various advantages, such as, reduced staff requirements to carry out physical condition monitoring tasks; effective maintenance planning with contractors and staff; increased production time; increased reliability of plant equipment; and effective resource and material requirements.

As an example, a large mining company was experiencing problems with unexpected failures on its electrical reticulation equipment, especially on medium and high voltage cables and terminations. Unexpected failures, even with only a few hours of downtime, at concentrator plants can result in the loss of millions in revenue. The decision was made to place smart sensors and devices on the cables to monitor partial discharge (PD) activity in real-time.

Partial discharge is an electrical phenomenon that causes deterioration of the electrical characteristics of insulation material within MV and HV equipment. PD activity can be detected using ultra high frequency (UHF) sensors and monitoring devices that collect data and process it so that engineering analysis becomes possible and defects identified. The most significant trends for PD analysis are the intensity of the pulse called the Q_{max} (mV) and the repetition rate of this pulse per power cycle, called the pulse rate (PPS). When the PPS starts to trend upward, the first alarm is raised and the customer notified. Depending on the type of insulation system and the PD characteristic involved, a decision can be made to inspect the specific equipment for defects or to conduct further

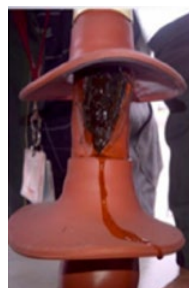
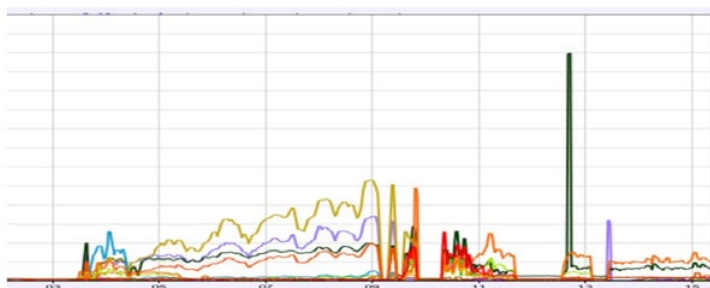
advanced online or offline testing to identify the problem.

PD problems can cause massive damage to surrounding equipment such as breakers, panels, transformers and motors, which get damaged due to cable termination failures. This results in considerable amounts of downtime. By applying modern real-time/in-time monitoring and analysis techniques, repairing a problematic termination can take as little as four hours, and this need only affect one specific power feeder to the plant equipment. Substantial revenue savings can result, particularly when taking into account the advantages of a properly planned outage that best suits plant availability.

Regarding the capability of using real-time monitoring, data analysis and trending on an IIoT platform, the possibilities are endless. Customers can fully customise the views and alarm limits of any data they want to trend from any type of smart sensor, database or SCADA platform on the plant. Martec's team of capable individuals and engineers can then analyse any triggered alarms and write informative flash reports to initiate corrective actions.

The IIoT will definitely be part of our 'new normal' going forward. The significance of having all the data in real time, with customisable alarm settings, makes every intervention much more accurate and informative, allowing us to better understand trending behaviours and to identify defects quickly and accurately.

www.martec.co.za



Left: A PD graph on medium voltage (MV) terminations trended over time. The escalation in Q_{max} (mV) as the resistance of the insulation deteriorates is evident until failure occurs, which trips the supply voltage. Right: Typical partial discharge (PD) failures owing to inadequate clearance between the unscreened areas of the cable termination. PD causes the build-up of a white acid-type powder due to the ionisation of the air around the activity.

Lime slaker plant cuts water treatment costs

A new lime-slaking facility, which will help a mine water treatment plant achieve significant cost savings, has been equipped with a stainless steel Grundfos booster pump to reliably handle the corrosive permeate.

Located in the Mpumalanga coal fields, a recently completed lime slaker forms part of a mine water treatment plant designed and operated by water reclamation and desalination specialist, Nafasi Water.

The facility – or reactor – combines calcium oxide with water on site, replacing the traditional delivery method of transporting the heavier calcium hydroxide powder. According to Ashton Drummond, chief strategy officer at Nafasi Water, this allows for a substantial reduction in transport costs.

“The savings achieved by slaking lime on site are significant, adding up over time to ensure an attractive payback period for the investment in the lime slaking reactor,” says Drummond. “The calcium oxide is added to a mixing tank, which is temperature controlled to ensure the optimal conversion to calcium hydroxide.”

The calcium hydroxide is an important element in the functioning of Nafasi Water’s treatment plants, where the company applies its proprietary HiPRO™ technology (Hi recovery Precipitating Reverse Osmosis) around South Africa.

“HiPRO™ allows high water recovery from complex mine-impacted waters,” he says. “Depending on the feed quality and product quality requirements, water recovery of between 98% and 99.5% can be achieved. At times, the only liquid to leave the plant is the moisture in dewatered sludges,” he says.

The plant treats mine-impacted water so that it is clean enough to be discharged back into the river system, in accordance with environmental regulations. The water quality is so high it is also made available to the local municipality, providing drinking water for the community.

The requirement for stainless steel in the two Grundfos end-suction pumps supplied to the project – one for duty and one for standby – is due to the corrosive nature of the reverse osmosis (RO) permeate being pumped. Stripped of mineral content, the water tends to leach aggressively. The pump transfers this water into the lime slaker, where it is mixed with the powdered lime in exact quantities and at the precise temperature.

According to Raymond Makgoga, associate sales engineer at Grundfos, the pump delivers 50 m³ per hour at a pressure of about 4.5 bar. To enhance the efficiency of the pump, it is fitted with an IE3 WEG motor rated at 15 kW. In this application, the pump is expect-



A view from the top of Nafasi's lime slaker plant showcasing the water tank, Grundfos booster pumps, calcium hydroxide storage unit and reactor.



Grundfos booster pumps for pumping water from the permeate water tank to the slaker tank and for backwash.

ed to meet a discharge head of 51 m. Makgoga also highlights that the WEG motor was able to accommodate the plant's requirement of a 525 V power connection.

“We regard strength and efficiency as the hallmarks of our newly developed Grundfos end-suction pump range, which includes the NB close-coupled and NK long-coupled configuration,” he says. “These powerful single stage pumps are designed to work hard in

the most demanding industrial environments, where only the fittest pumps will survive in the long run.”

He highlights that all Grundfos NB/NK stainless steel end-suction pumps are excellent solutions for industrial applications where pumping of aggressive media is required.

Among the features, he says, are optimised hydraulics in the housing and impeller, as well



Left: The top of the lime buffer tank where lime is stored during the slaking process. **Right:** With water recovery of between 98% and 99.5%, the only liquid to leave the plant is the moisture in the dewatered sludge.

as loose flanges for easy installation. The stainless steel shafts mean improved corrosion resistance with no sticking elements, while the heavy duty bearing brackets ensure correct lubrication for long pump lifetime.

Drummond says the relationship between Nafasi Water and Grundfos goes back many years, and its water treatment plants today make extensive use of Grundfos pumps. "When we issue our requirements for pump packages to the market, we generally find that Grundfos is exceptionally competitive, while offering technically compliant solutions to a wide range of needs," he says.

Makgoga notes that Grundfos was also recently able to provide two multi-stage centrifugal pumps with control drives to a Nafasi Water treatment plant in the Springs area of Gauteng.

The benefits of Nafasi Water plants to the local communities extend beyond the supply of clean water, notes Drummond. "Nafasi Water prioritises the upskilling of local residents in our plant operations, which has allowed some employees to enter the company as operators and develop their careers to become managers at these plants," he says.

The HiPRO™ process has been recognised

over the years both locally and internationally for its contribution to water quality and environmental management. It was awarded a gold medal by the South African Institute for Engineers and a Greening Future Award by the Mail & Guardian newspaper. It also earned recognition in the sustainability category of Nedbank Capital's Green Mining Awards.

Further afield, HiPRO™ was named by the United Nations Framework Convention on Climate Change (UNFCCC) as one its Lighthouse Projects in the Momentum for Change awards at COP17.

www.grundfos.com/za

Disinfecting water in the food & beverage sector

With Grundfos pumps used extensively in breweries, distilleries, wineries and soft drink plants, it is no surprise that the company also offers leading technology for disinfecting water in these facilities.

With a heritage of serving the beverage sector for the past 150 years, the company recognises that hygiene is at the centre of this industry, according to Grundfos associate sales engineer Raymond Makgoga.

"Alongside all the quality Grundfos pump solutions used by food and beverage producers, our offering includes the sophisticated Oxiperm Pro disinfection system," says Makgoga. "This is a one-stop chlorine dioxide generator that facilitates effective and efficient cleaning-in-place (CIP) solutions."

The system creates a diluted chlorine dioxide solution from sodium chlorite and hydrochloric acid, disinfecting the water supply and allowing pipelines in a plant to be reliably cleaned in between production batches. The use of chlorine dioxide is able to render the water safe and hygienic without affecting its taste or smell – another vital element for success in this sector, he says.

Dean Naidoo, lead key account manager OEM South Africa for Grundfos, highlights that the Oxiperm Pro has been tried and tested in many food and beverage applica-

tions. It has even been used to provide high quality drinking water for corporate drinking fountains.

"The accuracy of the dosing system supports the responsible use of water when cleaning and sanitising the inside of pipes," says Naidoo. "By ensuring the correct chemical strength, the user can optimise the water volumes that must be passed through the plant pipelines to remove microbes."

Water can even be recirculated through the Oxiperm Pro at a higher strength if pipeline testing indicates that the sanitation standard is not yet achieved, he says.

The componentry of the Oxiperm Pro includes three smart digital dosing pumps, a reactor and a controller. Designed to resist

chemical corrosion, the system includes specially selected materials such as Teflon, ceramics and polyethylene.

Colour-coding is used to enhance safety and ease of use, with red specifying hydrochloric acid and blue for sodium chlorite – ensuring no confusion of chemicals.

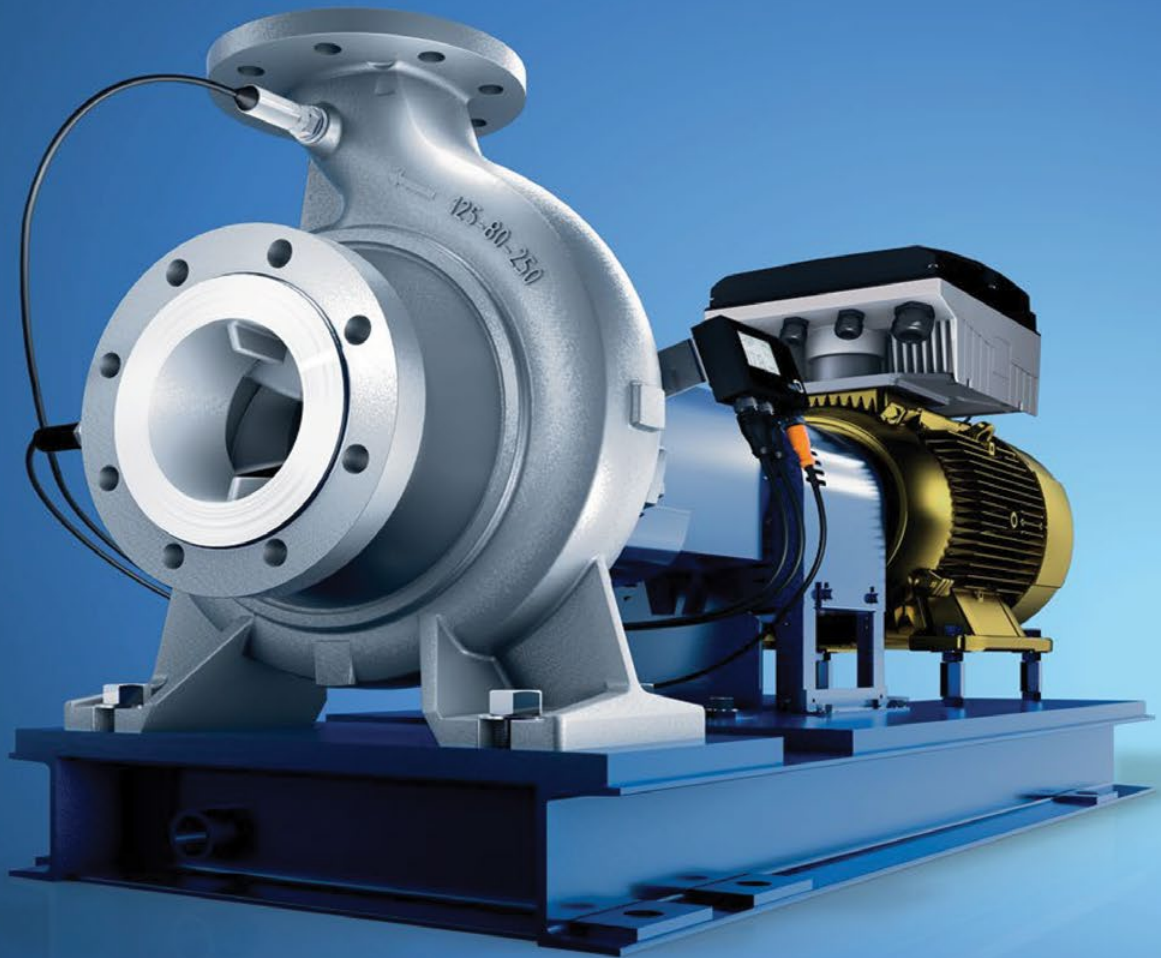
"Our capability in disinfecting water aligns well with our Grundfos value, particularly in helping to ensure water access for more people around the world and to safeguard our precious water resources," he says. "Many of our customers in the food and beverage sector share these goals, and we are confident that we can help achieve them."

www.grundfos.com/za



Operators conduct inspection and checking reports to ensure optimal performance, and that proportional dosing flow is maintained.

LET YOUR PUMP DO THE THINKING.



MegaCPK: the best standardized chemical pump in its class.

Your B_BBEE Partner

MegaCPK is a particularly powerful standardised pump destined for the chemical and petrochemical industry, and many other fields of application. The optimised design of its hydraulic components sets new standards in energy efficiency. This standardised pump offers particular flexibility and suitability for numerous applications, and can be easily adapted to local conditions. Find out more at: www.ksb.com/megacpk

KSB Pumps and Valves (Pty) Ltd

Tel: +27-11-876-5600

www.ksb.com/ksb-za

KSB
PETROCHEMICALS/CHEMICALS

150 YEARS
People. Passion. Performance.

KSB 



EWSETA capacitating entrepreneurs via 4IR solutions

Through 4IR solutions, the Energy and Water Sector Education and Training Authority (EWSETA) is capacitating entrepreneurs to address Eastern Cape Food, Energy and Water challenges.

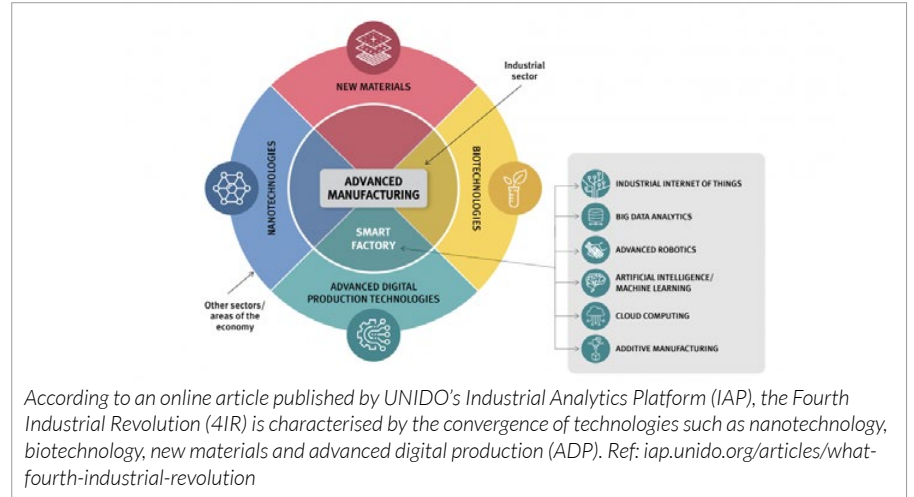
The Energy and Water Sector Education and Training Authority (EWSETA) has partnered with the 4IR-AquaTech Business Accelerator programme, which aims to capacitate young entrepreneurs with skills through a six-month mentorship programme designed to identify, develop support, fund and upscale a new generation of 4IR enabled solutions to address the Eastern Cape Province's pressing food-energy-water nexus challenges.

If one were to contemplate the challenges South Africa faces when it comes to water alone, the task is a mammoth one, considering water directly affects the country's socio-economic development, But the challenge is exacerbated by the fact that water is becoming an increasingly scarce resource.

Based on current usage trends, South Africa is expected to face a water deficit of 17% by 2030, and this shortage will be worsened by climate change. Water in South Africa has moved from being a marginal input to a central enabler of food security, energy security and climate security.

Ensuring water, energy and food security is a responsibility for all

The 4IR-AquaTech Business Accelerator programme has been developed by ICRD Group Holdings, an organisation that spearheads innovative entrepreneurship development programmes to help participants and alumni to become CEOs of their own successful businesses in the water and energy sectors. Its mission is to accelerate youth and women participation in the emerging Green Economy



According to an online article published by UNIDO's Industrial Analytics Platform (IAP), the Fourth Industrial Revolution (4IR) is characterised by the convergence of technologies such as nanotechnology, biotechnology, new materials and advanced digital production (ADP). Ref: iap.unido.org/articles/what-fourth-industrial-revolution

(GE). Lucky Litelu, Group Chief Executive for the ICRD Group, explains the importance of this EWSETA programme for entrepreneurs: "South Africa's historical disparity has rendered it difficult for entrepreneurs from previously disadvantaged communities to participate effectively in the mainstream economy due to lack of technical know-how, development resources, adequate financing and access to sustainable markets."

Twenty 4IR-AquaTech companies will be put through their paces on an intensive six-month training, coaching and mentoring programme, which will also see these start-ups matched with cutting edge technologies and market access opportunities. An important element of the programme is the widely-tested 'Sustainable Sanitation and Water Management' capacity development tool in the water, sanitation and resource manage-

ment sector, which will serve as a key resource during training sessions.

"EWSETA is excited to be leading a programme such as this one as we are mandated to drive entrepreneur and SMME development in the energy and water sectors given the critical role they play in addressing energy and water challenges and driving economic growth," comments Mpho Mookapele, CEO for the EWSETA.

"Furthermore, South Africa is rich with young minds that can drive innovative solutions for the challenges we face. Our role as EWSETA is to provide a platform for these young minds and ignite the passion of our innovators so they become part of the much-needed solutions that will change the narrative of poverty and undignified state of living for many of our people."

www.ewseta.org.za

A COMPLETE RANGE OF PUMPS FROM ONE MANUFACTURER

VERDER

A pump solution for every application

- ✓ Perfect cleanability
- ✓ Hygienic design

VERDER

passion for pumps

VISIT OUR WEBSITE

Water stewardship gives mines the broader view

SRK Consulting's Lindsay Shand, Fiona Sutton and Simon Lorentz talk about the growing acceptance of a broader water stewardship approach using best practice tools such as the International Water Stewardship Standard from the Alliance for Water Stewardship (AWS), which fully acknowledges that water connects an operation to the surrounding landscape and communities.



SRK Consulting's Lindsay Shand, Fiona Sutton and Simon Lorentz.

With South Africa's growing demand for water – and the impact of climate change on rainfall variability and water supply security – the need for a systematic approach to water stewardship in mining has never been greater.

Water management has long been a focus in the mining sector, according to Lindsay Shand, associate partner and principal environmental geologist at SRK Consulting. In 2014, for instance, the International Council on Mining and Metals' water stewardship framework outlined a standardised approach for mining companies, recognising that water connects an operation to the surrounding landscape and communities.

"In our past work with mining clients, SRK often only addressed a particular challenge or project, rather than taking the broader view," said Shand. "There is today, however, a growing recognition that a high-level, concerted approach to water stewardship is not only the environmentally responsible route to take, but also contributes to building the resilience of the mining operation."

This resilience lies in the ability to identify and manage the myriad water-related risks that operations face, she said. These might include water supply uncertainty, compliance issues related to water quality, and down-

stream discharge impacts. A water stewardship approach can provide the foundation for pro-active planning and action to avoid incidents that could threaten operational continuity or viability and present a threat to downstream water users.

Tools for progress

While the focus for mining operations is generally on the specific challenge at hand, larger corporations are starting to see the value of the bigger picture on water-related issues, concurred Fiona Sutton, principal consultant at SRK Consulting.

"Often, the scope and demands of water stewardship may seem a daunting prospect at operational level," said Sutton. "This is one of the reasons why best practice tools are so useful, such as the International Water Stewardship Standard from the Alliance for Water Stewardship (AWS)."

She highlighted that the AWS Standard offers a globally applicable framework for major water users to understand their catchment and their own water use and impacts, with practical guidance on how to effectively manage these impacts.

"Practical steps and guidance in the AWS Standard help water users to improve their water practices for better on-site water performance, while also contributing to wider

sustainability goals," she said. "Water crises are being exacerbated by climate change and are now acknowledged as societal risks due to their far-reaching consequences."

Catchment care

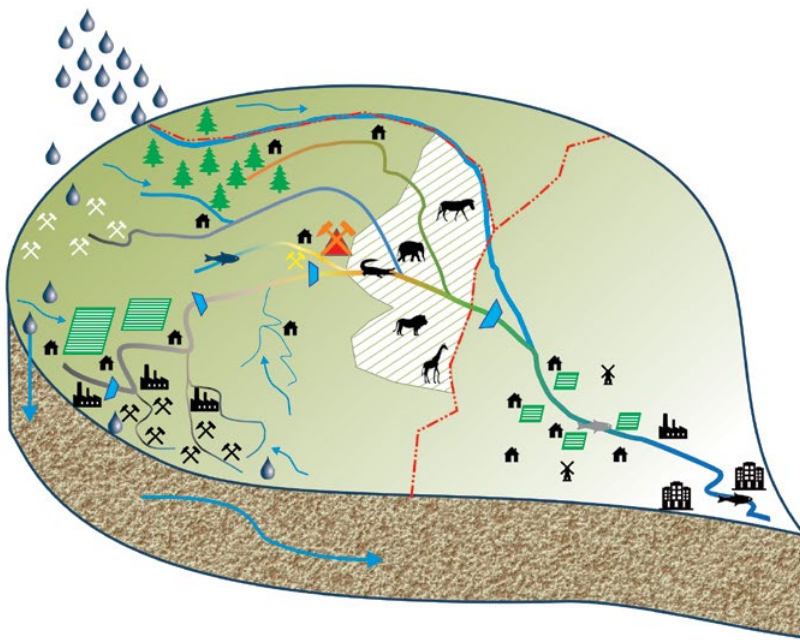
Water stewardship considers impacts not only on the mine site but in the wider catchment in which a mine operates, according to Dr Simon Lorentz, principal hydrologist at SRK Consulting.

"Risks specific to the company can be direct, which disrupt actual mining operations, such as the non-availability of water supply to manage operations like waste disposal," said Lorentz. "They can also be indirect, where supply chains are disrupted owing to water supply issues or poor water quality."

He noted that catchment-specific risks are influenced by local water resource management and governance effectiveness in dealing with factors such as increasing demand and unpredictability driven by climate variability. They are also affected by local infrastructure adequacy, the amounts of pollution being disposed into water bodies, and the resulting quality of available water.

"In one of our projects, we worked closely with a mine and the responsible authority to ensure that the quality of the naturally saline groundwater from an open pit was an

UNDERSTANDING WATER STEWARDSHIP



srk consulting

series of
 ✓ actions
 ✓ criteria
 ✓ indicators
 on how to manage water at site
 AND
 how water management should be stewarded beyond the site boundary

engaging water-using sites in understanding and addressing
 ✓ shared catchment water challenges
 ✓ site water risks and opportunities



A site in a catchment takes cognisance of the effects of upstream activities on a site (red triangle) as well as the potential impact of site operations on downstream water users.

acceptable quality before being discharged from site,” said Shand. “This strategy was guided by the presence of sensitive farming activity downstream of the mine and was made possible by taking the broader water stewardship approach.”

Strengthening reputations

The central position of water in many of the United Nation’s Sustainable Development Goals (SDGs) is another reason why many mining companies are starting to embrace water stewardship more systematically, said Sutton. Many corporates align their

strategies with the SDGs, and many of those are relevant to water. While Goal 6 on Clean Water and Sanitation is key, others that depend on access to water include No Poverty, Zero Hunger, Good Health & Well-being, Sustainable Cities & Communities, and Life Below Water.

“An added advantage of the AWS Standard is that it allows mines to be accredited once they have met the detailed range of requirements,” she said. “This is valuable in terms of companies’ reputations – whether in the eyes of investors, financial institutions, regulators or the general public.”

Credible benchmark

The AWS’s position as a member of ISEAL assures stakeholders that its water stewardship framework has been reviewed by an independent and competent body. The framework and the accreditation therefore provide a credible benchmark that can be trusted as a true indication of commitment.

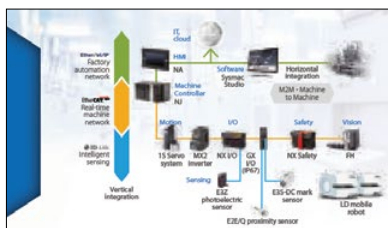
“SRK’s decades of experience in the mining sector, combined with its depth of expertise in water-related disciplines, positions us well to guide mining companies in their water stewardship journey,” concluded Shand.

www.srk.co.za

Covering the bases

Applying the principles of water stewardship on mines involves a range of considerations – both regulatory and strategic. On a recent project in which SRK Consulting was involved, the process involved the following among the various relevant areas covered.

- Water use licensing – a regulatory requirement which now also includes the need to consider climate change impacts.
- Reduced water consumption alternatives.
- Water quality monitoring.
- Challenges arising from the salinity of discharge water – considering upstream water quality conditions and downstream water users.
- Public consultation and disclosure – including a community water supply project. □



Full digital factory

- Assured compatibility
- Faster commissioning
- Easy integration

OMRON

Would you like to know more?
 +27 (0)11 579 2600
 info.sa@eu.omron.com
industrial.omron.co.za

Is SA doing enough to avert a water crisis?

In response to the Eastern Cape facing the prospect of taps running dry, Raymond Obermeyer, Managing Director at SEW-EURODRIVE suggests South Africa urgently and proactively address the water crisis.

As South Africa battles the third wave of COVID-19 vaccinations, and amidst the chaos, destruction and looting that has taken place in parts of South Africa recently, it's easy to forget another looming catastrophe: a water crisis with potentially devastating consequences.

In the Eastern Cape dam levels are perilously low after a multi-year drought, with dams servicing Nelson Mandela Bay at record lows. The province's main water supplier, Koega dam, is currently at less than 4% capacity and, of that, only 1.5% is usable water. The second largest dam in the province is Impofu Dam, which is at 16.64% capacity. Severe water restrictions have been imposed in the province to delay a potential Day Zero.

While the Eastern Cape's water shortages are primarily the result of a six-year long drought, the situation has been exacerbated by poor management of water infrastructure. "A well maintained and sustainable water and sanitation system is essential for any functioning economy," says Raymond Obermeyer of SEW-EURODRIVE. "Water scarcity has a profoundly negative influence, impacting economic productivity, livelihoods, safety and security."

Managing our water resources sustainably and responsibly, he adds, is even more important given the fact that South Africa – classified as the 30th driest country in the world – is a water scarce country. "The Department of Water Affairs and Forestry estimates that South Africa will have insufficient water supplies by 2025 unless we manage our water resources more efficiently."

South Africa's water infrastructure is in a woeful state after decades of mismanage-

ment and inadequate maintenance. "The Department of Water and Sanitation is well aware of the extent of the crisis and has admitted that 56% of its 1 150 treatment plants are in a poor and critical condition with 265 in a state of decay," says Obermeyer, pointing out that Iris dashboard data confirms this, revealing that 75% of wastewater treatment plants run by municipalities achieved less than 50% compliance to minimum effluent standards in 2020.

"In addition to poorly managed water infrastructure, the country has also allowed many of its rivers and dams including the Vaal River and the Vaal and Hartbeespoort dams to become polluted in recent years," he adds.

Earlier this year, the South African Human Rights Commission argued that government's continued failure to address the issue of pollution in the Vaal River and Vaal Dam has become a human rights issue and that responsible government officials should face criminal charges.

The deteriorating state of South Africa's water infrastructure assets has been well documented, says Obermeyer. "In 2006, the South African Institute of Civil Engineering started publishing an Infrastructure Report Card which detailed the views of its members on the condition of a range of public infrastructure, including water infrastructure assets. The inaugural report was followed by subsequent report cards in 2011 and 2017. The most recent report classified the country's bulk water resources infrastructure and water supply for non-urban areas as at risk of failure and blamed the deterioration on insufficient maintenance and neglect, funding shortfalls and a depletion of skills at senior levels." It appears that government has



finally started to acknowledge the scale of the looming water crisis with the accelerated establishment of a National Water Resources Infrastructure Agency and the prioritisation of 11 water and sanitation related infrastructure projects valued at R106-billion. Four of these projects, valued at approximately R68-billion, are ready for investment with construction expected to commence in the next two years.

For several years there have been calls for the establishment of a National Water Regulator, based on the theory that the Department of Water and Sanitation cannot be both a player and a referee in this space. Obermeyer explains that a regulator would ensure that regulatory oversight is separated from water resource management and water services provision. "Encouragingly, it appears that we are moving closer to the establishment of a water regulator with both National Treasury approving the idea and the Presidential Infrastructure Coordinating Commission Council formally proposing its establishment."

Obermeyer questions why it has taken so long for government to start acting more proactively. "The reality is that South Africa's water challenges are not going to be solved overnight. It takes many years to build water infrastructure and is expensive to fund. Given the constrained state of government's finance there is the very real risk that funding challenges will delay these projects. As a result it may very well be public-private partnerships that will fund, implement and manage these water projects."

In addition to public-private partnerships, Obermeyer says South Africa needs to implement 4IR technologies to better monitor and control water distribution networks. "In a water constrained country such as South Africa, water must be treated as the very precious resource it is. We cannot afford waste through water leaks, for example."

"We need measurable action when it comes to managing water. A key element of this is to better manage our scarce water resources sustainably with infrastructure that is fit for purpose. Should we fail, the Eastern Cape will not be the only province contemplating a day in the not too distant future when the taps run dry."

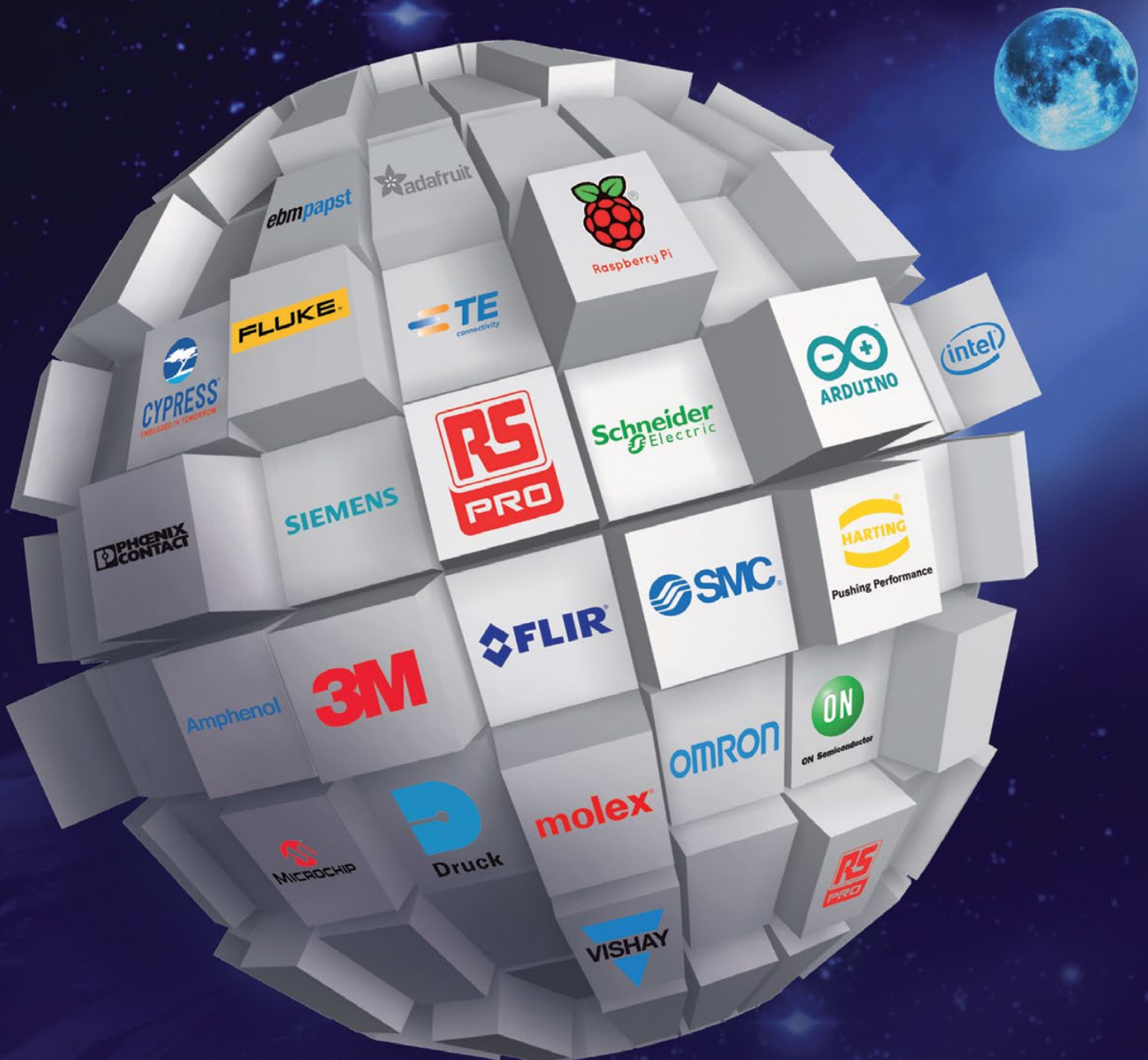
www.sew-eurodrive.co.za



"We need to better manage our scarce water resources sustainably with infrastructure that is fit for purpose," says Obermeyer.

The home of industrial and electronic brands

Select from over 500 000 products
across 2 500 global brands



South Africa: rsonline.co.za
Email: sales.za@rs-components.com

Africa: rsonline.africa
Email: africa@rs-components.com

Tel: +27 11 691 9300

RS Components SA, 20 Indianapolis Street, Kyalami Business Park, Kyalami, Midrand, 1686, South Africa



Digital platforms, collaboration and the journey towards autonomously run plant

MechChem Africa talks to Multotec Group CEO Thomas Holtz about establishing digital platforms for minerals processing plants and the need for much closer cooperation and collaboration between service and equipment suppliers, to realise the true value of 4IR-technology and autonomous processing.

“The journey towards the autonomous plant is not hugely different to the one for driverless vehicles, but before getting into that, I think we need to focus on the intent,” suggests Thomas Holtz, CEO of the Multotec Group.

“The idea of using technology to replace people, I believe, is the wrong mindset completely. At the outset, I think we must make a case for the human being in this equation. This notion that we can do minerals processing without humans doesn’t make any sense to me. Our equipment is often installed in remote areas surrounded by impoverished communities. Employment questions are therefore serious and we must question the role of the human in the digital 4IR environment,” Holtz argues.

The real challenge, he believes, is to see our organisations in ecological terms, with a head, heart and hands for thinking, feeling and doing. “Automated solutions may be able to think/analyse and do/respond faster and more consistently than a human can, but this discounts the human ability to feel empathy, connect with others and bring creativity and

energy in response to changes being experienced. The value to human beings and the role they play in creating and using digital platforms needs to be highlighted at the starting point of this journey,” says Holtz, adding that the skills and know-how are already available to make the workplace more attractive for everyone. “We need to embrace this journey with the acknowledgment of where the human being fits in,” he says.

Africa and South Africa are sitting on plant assets that are relatively old, many plants being more than 30 years old, he continues. “We can’t retrofit these old plants completely. We need to start building new plants from the ground up, but we need to start with a different mindset. The idea that we can replace an operator with a robot is the wrong way of thinking. Instead, we need to take an overview of the process flowsheet in its entirety: how plant engineers design the system; and how the equipment suppliers deliver pieces of equipment that can work optimally and seamlessly together to deliver the results required,” he says.

“Core technologies involved in 4IR plants include data management, communication



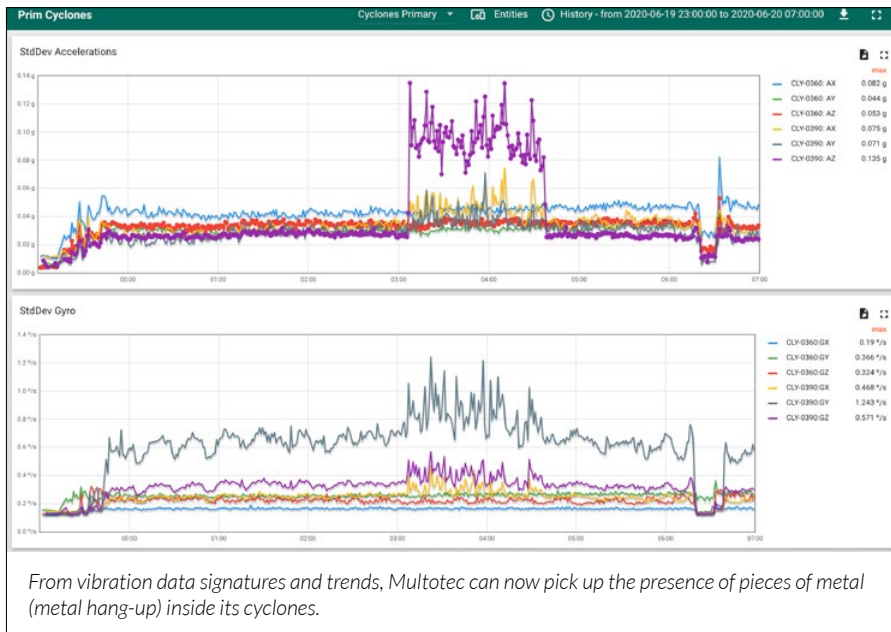
Thomas Holtz, group chief executive officer at Multotec.

technology, and sensors that collect data and the analytics to make sense of the data and provide useful information from it. The ability to share information coming from each piece of plant equipment becomes essential, because the whole system is influenced by all the components feeding into it. Shared data then needs to be collectively compiled, analysed and displayed to be of use to plant operators,” he notes.

This approach signals the need for collaboration: “We need partnerships, alliances, a network infrastructure and like-minded people to deliver the initial plant and then to keep the plant operating optimally. This is contrary to our current business model, where each company has an R&D division to develop and test prototypes before patenting



“The value to human beings and the role they play in creating and using digital platforms needs to be highlighted at the starting point of this journey,” says Thomas Holtz.



and commercialising begins, all while remaining in-house. In the new digital world with so many advanced technologies embedded into every aspect of a plant, this closed and confidential approach is surely going to be impossible.

“No company can do this on its own; all of the specialist equipment providers like ourselves will have to collaborate to make this possible,” Holtz tells *MechChem Africa*. “We need to be willing to form partnerships and alliances, share information and open up our businesses to a host of stakeholders, including competitors,” he says, adding that the package that ultimately runs an autonomous plant will, undoubtedly, be a collaborative one that uses shared information rather than copyrighted and protected IP.

Citing an example, Holtz says IMS has a Kawasaki crusher installed at a client site where Multotec has supplied screen panels and cyclones. “We are negotiating a shared platform to provide information from the screen panels that is useful for the crusher, and vice versa. We hope to start influencing the crusher efficiency based on the recirculating load we are picking up off the screen panel, for example. And we are already able to supply this data using vibration sensors on our panels. So our data can help make IMS’s Kawasaki crusher more efficient,” he explains.

“Through our involvement with SAMPEC, (South African Minerals Processing Equipment Cluster) we are trying to persuade our fellow equipment suppliers to identify more pilot collaborative projects that use common service providers for the communication, data and analytics technology. Ultimately, plant operators need to see the collective result, they can’t be expected to succeed by juggling separate pieces of information from different suppliers. The

ultimate goal is a single platform that brings all the interacting components together based on how the whole plant is running.

“But this depends on collaboration between different equipment providers and OEMs and this vital step on the journey needs to start now,” Holtz believes.

Multotec started its 4IR journey a few years back with some R&D projects on separate pieces of equipment. “We now have sensors on our cyclones, screen panels and mill liners, and we have invested heavily in modelling and trending the data so that we are able to live stream data, analyse it and extract performance and efficiency information. When we started out, we were under the impression that we would have to develop our own sensors. We now know that a simple standard sensor such as vibration sensor can provide almost everything we need,” he discloses.

Citing an example, he says Multotec cyclones are sealed units that typically run 24/7 on a plant. Refurbishment of these is based on the wear rates of the liner, but it is difficult to routinely check these liners. “So we set out to develop a way of monitoring the wear rate in real time to determine exactly when a replacement was needed. Initially, we looked at traditional thickness measurement tools: infrared, X-ray and ultrasound technologies. We soon realised that by putting a standard vibration sensor onto the outside of a cyclone we could easily pick up data about the vibration as a result of movement of material, and we could use this data to identify trends relating to liner thickness changes.

“Taking this further, we have partnered with an artificial intelligence (AI) company to develop machine learning algorithms based on the vibration data. It is amazing how much information we can pick up by fully analysing

the data from this simple sensor,” Holtz tells *MechChem Africa*. “We can now pick up the presence of pieces of metal inside the cyclone (metal hang-up) and we can notify the client immediately. And with AI technology, we can create algorithms to look for a multitude of specific performance, wear and fault conditions,” he adds.

He says that Multotec is also using gyro sensors to track how a screen is flexing in all three axes. “The data we get is complex, but with AI, we can determine a huge amount, starting with throughput and the recirculating load and going all the way to misalignments, faulty springs or exciters and screen media damage – and we are achieving 80 to 90% correlation on wear monitoring,” he says.

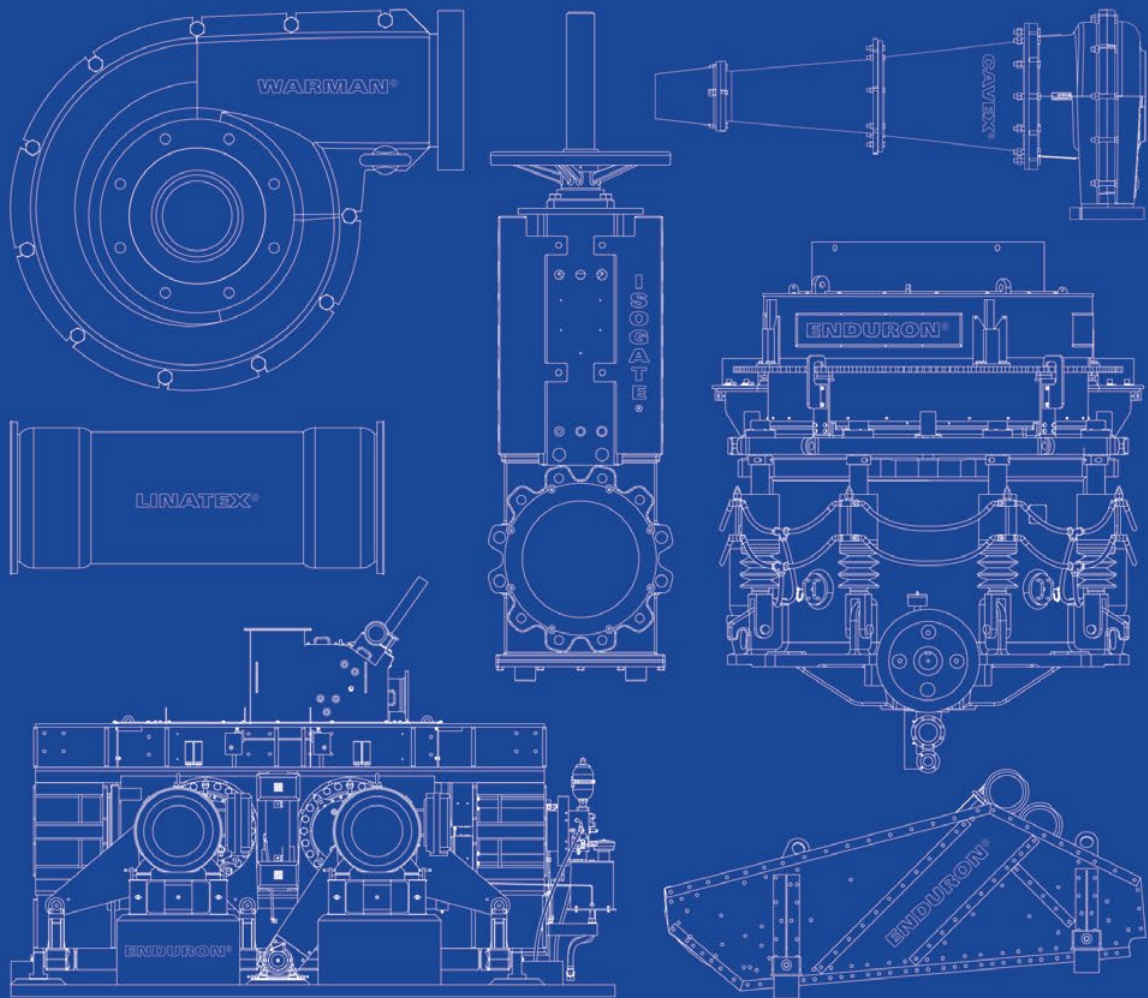
The business side also needs to evolve, he continues. “The real benefits do not lie in condition based maintenance, although these are useful,” Holtz asserts, adding that this is already being implemented on several Multotec installed units. “The true value of the autonomous plant lies in production efficiency and optimisation: being able to extract the highest possible mineral recovery from the whole plant, from run-of-mine ore to saleable minerals.”

Minerals processing lines always have variability and, if a fully autonomously run plant is the objective, the whole plant needs to respond quickly and automatically to these changes. With cyclones, recovery efficiency is determined by the minimum and maximum battery limits: the feed volume and pressure, for example. “If, for any reason, feed parameters exceed the upper or lower limits, valuable resources will be lost. Operators, therefore, tend to target the centre point of the limit band, but using feedback from a digital platform, the set point can be set at its most efficient point near the top of the band, because the system can auto-adjust to prevent the upper limit being exceeded. This enables the whole plant to be run in a narrow window at the higher capacity,” Holtz points out.

“Collaboration is key, though,” he reiterates. “We tend to like paddling our own canoes in South Africa, even when promoting localisation initiatives or lobbying for industry-wide government support. We need to be more prepared to align with each other, establish partnerships and share our IP with our fellow equipment providers.

“Tesla is the closest to having succeeded in developing the autonomous motor vehicle, but to deliver this innovative success story, an incredible collaborative ecosystem has been built consisting of multiple highly specialised partners. The autonomous minerals processing plant will need similar levels of collaboration. No one of us can do it on our own,” Holtz concludes.

www.multotec.com



Think about your entire circuit; we have.

Consider an end-to-end solution from Weir Minerals. Our product range covers everything you need. With best-in-class products from Cavex®, Enduron®, Isogate®, Linatex®, Trio® and Warman®, your circuit will work in perfect harmony. Whether it's a pump or an entire circuit, every Weir product comes with a lifetime of support from Weir Minerals' extensive global service network. That's what makes our market leading product range, market leading, from end-to-end.

For more information contact us on +27 (0)11 9292600.

To get more from your mine, visit www.minerals.weir today.

WEIR

Minerals

www.global.weir

www.weirafricastore.com



Innovating cooperatives to create more jobs

In celebration of the International Day of Cooperatives in July, Yershen Pillay, CEO of the Chemical Industries Training Authority (CHIETA) talks about the role and importance of cooperatives for job creation and sustainable living.

Cooperatives play a fundamental role in job creation, economic transformation and the creation of sustainable livelihoods. In fact, data from the International Cooperative Alliance (ICA) suggests that cooperatives provide jobs or work opportunities for approximately 280-million people across the globe.

This is extremely important given the current context of COVID-19 as many organisations prioritise retrenchment in an effort to stay afloat. The data also suggests that 12% of humanity is involved with one of the three million cooperatives worldwide, representing a significant contributor to sustainable economic growth (ICA, 2020). In fact, according to the World Cooperative Monitor Report (2020), the top 300 cooperatives in the world contribute to a total turnover of US\$2.1 billion.

The cooperative model is based on democratic decision making and the concept of working together towards a common goal. According to the ICA (2020), "a cooperative is an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise".

To own in a cooperative is to own in common; to work in a cooperative is to work in common. Cooperatives provide a human face to development. As such, they contribute to addressing many of society's most pressing issues by putting into practice the principles of voluntary and open membership, democratic decision making, member economic participation, cooperative autonomy, education and training, cooperation and concern for community.

Cooperatives role in education

The pandemic has the potential to spur cooperative production. The COVID-19 pandemic has disrupted schooling across the world leading to a need for innovative leadership in order to solve the myriad problems. One such problem is lost learning and disconnect between learners and teachers from the lockdowns associated with COVID-19. The disruptions brought about by the pandemic have deepened the digital divide as those without access to technology in rural com-

munities have experienced greater losses in learning compared to those with higher levels of access to the requisite technologies.

The digital divide in education, training and skills development will have to be bridged and the cooperatives' model provides a means for doing so. As schools around the world periodically close during COVID-19, e-learning has taken centre stage with teachers in some parts of the world forming platform cooperatives.

One such teacher-owned platform cooperative is MyCoolClass, established by teachers around the globe. MyCoolClass provides online tutoring and teaching, owned and operated by the teachers. The core group of teachers is based in Poland, the USA, Indonesia and South Africa and it provides services that no other online learning platform offers.

Approximately 1 600 teachers from more than 60 countries around the world have registered to join the cooperative. In an industry first, students will be allowed two teachers per course including courses being taught in different languages.

Platform cooperatives such as MyCoolClass illustrate the gargantuan potential of worker cooperatives in the context of COVID-19.

Working with the community

In the South African context, rural communities in Ulundi, KZN, are being organised into chemical manufacturing cooperatives using the rich reserves of Aloe plant extracts in the area. The abundance of the Aloe plant provides a unique feedstock for the cooperative production of luxury soaps, cosmetics and skincare products.

In collaboration with local communities

and the agricultural campus of Mtshana TVET College, CHIETA initiated a project to train and skill 20 cooperatives in the production of fast-moving consumer goods (FMCG). It is envisaged that each of these cooperatives will create a minimum of five jobs leading to at least 100 new jobs created for the rural community. The project was initially implemented in the Ugu district in KwaZulu-Natal and proved to be a great success.

Learning from the examples provided, more activism is required to assist workers in establishing cooperatives to take advantage of the massive earnings and job creating potential provided by worker cooperatives.

However, many cooperatives lack the management skills and technical support to grow and become sustainable. Democratic management often leads to conflict and a lack of conflict management skills leads to the destruction of relationships and the eventual non-viability of many cooperatives. The essential financial and strategic management skills are often also lacking in most cooperatives and addressing these pivotal skills gaps is a key factor for success.

To address the skills gaps in cooperatives development, CHIETA plans to support 200 chemical manufacturing cooperatives with innovative skills solutions to grow and become sustainable by 2025. We further call on industry to increase its investment into cooperatives development and to support more cooperatives in their purchasing and procurement activities. By doing so, this will enhance supply chain flexibility and long-term sustainability and further make a substantial contribution to socio-economic development.

www.chieta.org.za



Conveyor innovation for platinum processing plant

Danfoss, in support of engineering components provider BMG Electronics, an authorised DrivePro® service partner, has helped to assist DryTech International in its development of a unique wet screw feeder for use by a local platinum processing plant and smelter in the Limpopo province.



Left: Riaan van Niekerk, DryTech. Centre: Stephen Brown, Danfoss. Right: Mick Baugh, BMG.

DryTech provides innovative design solutions for thermal processing problems, successfully developing a variety of complex thermal processes ranging from mineral concentrate flash dryers to high-temperature reduction kilns and continuous vacuum dryers.

The company recently developed a wet screw feeder for a platinum processing plant that was having to deal with unusual characteristics of the material being processed from platinum group (PGMs), chrome and

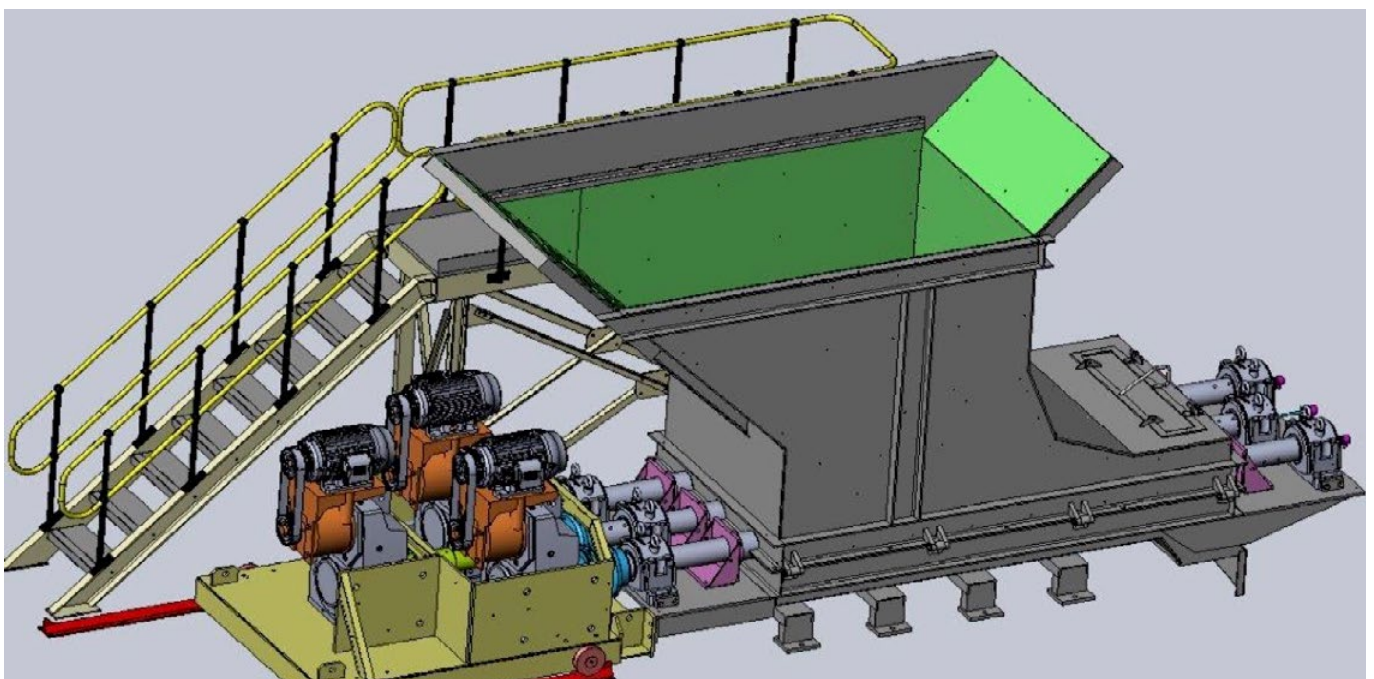
base metals. The material is extremely sticky, similar in constitution to clay, and needed to be transferred to a dryer.

In addition, this material was received not only from mines within the immediate area, but also from mines in the Mpumalanga province, a distance of over 300 km away. The plant found that, during the transit period, some composites dried out, while others remained wet.

From a mechanical design perspective, the gears required for the feeder would

be large-scale, posing some practical challenges when it came to physically fitting them into the unit without the screws clashing. Larger gears also substantially increase the costs of wet screw feeders. Ease of maintenance was a further requirement by the plant.

The throughput needed from the first wet screw feeder was between 30 and 40 t/h, with 15 t/h required for the second feeder. A trial machine was built by DryTech for testing the application and a three screw



For the DryTech wet screw feeder a critical requirement was that all three shafts needed to rotate in a co-ordinated manner to help prevent mechanical damage. A Danfoss VSD solution was therefore adopted.

shaft solution was found to be the most effective. While the three screw shafts were mechanically linked to one other during this trial, the client favoured a solution with independent shafts, using the preferred Danfoss FC 302 22 kW units controlling a 22 kW motor/gearbox on each shaft, with electronic synchronisation between them.

This was a critical requirement, as all three shafts needed to rotate in a co-ordinated manner to help prevent mechanical damage. This is because, should any of the shafts go out of synchronisation - even by a programmable amount, the machine had to be stopped. For example, if one of the motors, gearboxes or shafts became overloaded and slowed the motor down, it had to be detected by an out-of-synchronisation function and all screw shafts stopped. Once the problem had been cleared and the application brought back manually, the application could revert back into correct synchronisation automatically, instead of requiring the shafts to be returned to a home position manually.

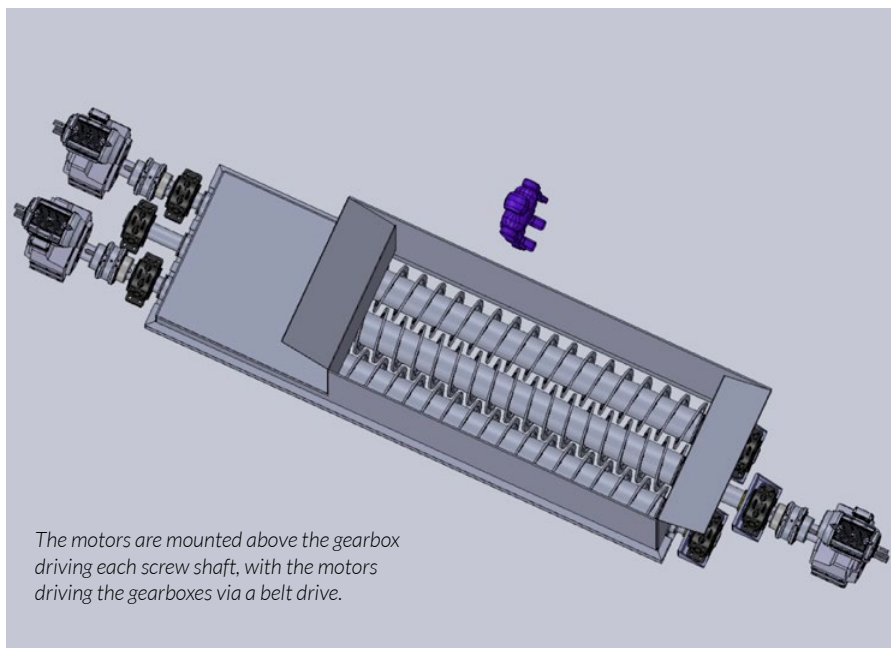
"The Danfoss FC 302 with its innovative alternative to the traditional servo control approach for positioning and synchronisation operations, provided the ideal solution for this client. The drives are adapted to the applications through simple parameterisation," says Stephen Brown, Mining Business Development Manager for Danfoss Turkey, Middle East & Africa.

During normal operation, the load on each drive is relatively light - at less than 50% of the motor's full load torque (FLT) - but because of the material's consistency, there are times when higher loads occur. It was for this reason that the 22 kW drives with 22 kW motors were put forward, and this has proven to be especially true during start or low-feed rate conditions.

The motors are mounted above the gearbox driving each screw shaft, which, according to DryTech, means the motor drives the gearbox via a belt drive. "We needed the flexibility to be able to adjust the belt pulley ratio during commissioning in order to set the maximum speed and, therefore, the throughput rate of the feeder," says Riaan van Niekerk, DryTech Spokesperson. "This also prevents mechanical damage at the belt, which will fail first."

Tighter speed and operation control

The final application set up by Juan Lerm, Field Service Technician at BMG Electronics, comprises three screws connected to the 22 kW motors and reducing gearboxes. The master or centre motor is attached to a Danfoss FC 302 with a PROFIBUS® and encoder option.



The motors are mounted above the gearbox driving each screw shaft, with the motors driving the gearboxes via a belt drive.

The PROFIBUS® master is the plant control system that sets the speed of this motor according to process requirements. The master motor is fitted with an encoder to increase its dynamic torque response and the shaft of this motor has a reference encoder to measure the actual rotational speed of the screw shaft. The higher the PPR (pulses per revolution) the better the syncing, as the increments are closer to each other, thus increasing the resolution of the feedback. "In this application we used 8192 PPR multiturn absolute encoders," explains Mick Baugh, electronics manager for the Electromechanical Division of BMG. "When the wet feeder needs to run, it gives a 'start' command to the master variable speed drive (VSD) via PROFIBUS®. The master VSD then gives the start signals to the follower VSDs."

The two follower screws are connected to FC 302 units with a VLT® Synchronising Controller MCO 350 option, also with PROFIBUS®, but in this case for monitoring purposes and not control. The Master encoder is connected to both MCO 350s as a master reference, which means the MCO 350 cards monitor the speed of the master shaft.

The follower encoder is fitted on the screw shaft of the follower screws and these encoders are connected to each

respective MCO 350 as a feedback signal. "The way this works is that the follower effectively mirrors the master encoder: if the master screw shaft runs at a certain speed, the follower MCO 350 card monitors that speed and matches it so the follower shaft is running in sync with the master reference," states Baugh.

"If the application stops in an alarm state, all the motors will coast to a stop, and the follower shafts will be out of sync. When a start command is given, the master VSD has a five-second delay, so the screws will ramp up, and the application goes back into sync by itself. The master will then ramp up to the speed reference as per the PROFIBUS® signal."

If maintenance has been done on the application, the screws will be out of sync. A manual sync was programmed so the VSDs will go into a second setup, and now each screw can be jogged, forward and in reverse, to put all the screws into a sync position. Once the screws are correctly aligned, the sync button can be pushed and the VSD will have a new zero position. The application can then be started up again and to run in sync.

"The fact that the MCO 350 option did not require the writing of a special APOS program was also a significant deciding factor in the selection of this novel solution," Baugh concludes. □

"The fact that the MCO 350 option did not require the writing of a special APOS program was also a significant deciding factor in the selection of this novel solution," says BMG's Mick Baugh

Container and component handling for automotive assembly

Ken Mouritzen, managing director of BLT World, describes the range of material and container handling equipment distributed by his company for optimum efficiency, reduced operational costs, enhanced safety and minimal maintenance in automotive assembly plants.



Mobicon mobile straddle carriers are designed for versatile container and product handling in and around automotive assembly plants.

“Automotive manufacturers are continually looking for ways to improve efficiencies within their operations and one area where costs can be significantly reduced is well-organised materials handling,” says Ken Mouritzen, managing director, BLT World. “In automotive assembly plants, containers, components, engines and completed vehicles are moved from plant to plant and the distances involved often mean extensive time in transport. This results in assembly delays and wear and tear on conventional equipment, which negatively affects productivity.

“By introducing a well organised materials handling system for each automotive plant, the supply to production lines and warehouses is more efficient, there is less damage to goods, reduced losses and enhanced safety for workers. All of these factors contribute to improved productivity and significant savings in manufacturing costs.”

BLT World’s Meclift heavy duty variable reach trucks increase efficiency and safety during materials handling procedures in automotive plants. Unlike conventional forklift trucks, Meclift machines are able to go into a container for efficient, swift and safe container stuffing/de-stuffing and are also designed for handling all types, sizes and shapes of components. This series has a lifting capacity from 16 to 42 t.

Various lifting attachments are available for Meclift variable reach trucks that enhance the performance, efficiency and safety of these multipurpose machines. For example, a Meclift fitted with a coil ram or coil clamp, can efficiently and safely handle steel coils or

steel plates of up to 32 000 kg. By combining the strength of these coil handling attachments and the extended reaching ability of these reach trucks, handling operations during automotive assembly are safer, faster and cost-efficient.

Another important lifting attachment is the double fork system that enhances the flexibility and performance of goods handling. This double fork attachment offers many benefits when loading and unloading automotive components. For example, four pallets or a similar load, can be easily handled at the same time and it is possible to fully load a 20 ft container with only two lifts. The weight of the load is not a problem because these double forks can handle the same maximum load of 18 t. Double forks use the same fixing points as normal forks, which means switching between the two is effortless. Fork positioning can be altered from inside the cabin, without the operator having to get out to manually adjust the gap between the forks.

With features such as hydraulic cab raising, forward and reversing cameras, and hydraulic side shift for accurate and effortless positioning, safety on site is improved.

BLT World’s Mobicon mobile straddle carriers are also designed for efficient, safe and versatile container and product handling in and around automotive assembly plants.

An important advantage of this container handler is that it utilises all parts of the yard and operates on pavements and in restrictive areas where conventional equipment cannot go. This mobile container handler turns in tight spaces and is also able to travel inside warehouses and under awnings. The Mobicon ensures the efficient movement and supply of components, engines and completed vehicles to and from each plant and line – in containers, on flat beds or in specialised racking systems.

By having only one container or product supply movement during automotive assembly, time savings are significant and there is no longer the need to run a fleet of conventional forklifts.

Other advantages for the Mobicon in automotive assembly include easy handling of ramps and speed bumps, reduced on-site congestion and minimal damage to stock normally caused by long forklift and container handling truck runs. Loads are no longer handled outside in wet weather conditions and container handling schedules are more efficient.

The Mobicon unit requires minimal maintenance, unlike conventional container handling equipment, where ongoing maintenance is necessary and costly.

The units also eliminate the need for costly yard repairs. One of the biggest problems associated with using conventional equipment to load and unload containers is damage caused to yards and pavements that are not suitable for carrying heavy weights.

Enhanced safety has also been critical in the design of this machine. The operator has a clear view of the working area and does not have to travel with a container hanging 3.0 m in the air, as with conventional systems. Instead of staff having to work at a trailer height of 1.5 m, they are able to work safely at ground level.

www.blworld.com

Instrotech's tried and tested bulk weighing technology

Instrotech's multi-function 6004MF version II weighing transmitter is a powerful, compact, field-mounted unit that can be selected for a variety of bulk weighing functions.

Specifically designed for weighing organisations, weighing equipment manufacturing companies and individual users, the 6004MF is a single electronic unit for weighing applications such as load cell transmitting; belt-weighing; loss-in-weight recording; through-put weighing; bag-filling; batch-weighing – and it can also be used as a dynamometer. The multi-function unit allows users to keep a single spare unit to replace any of the above functions in the field, reducing stock holding requirements for manufacturers, integrators and factories.

The 6004 range consists of three models, the 6004LC dedicated to standard load cell applications, the 6004BW dedicated to belt weighing applications and the 6004MF that is a multifunction unit.

Standard features include:

- Rugged, powder coated, cast aluminium housing with splash proof keypad.

- Inputs from load cell, incremental encoder and six digital lines.
- Programming via keypad and LCD display.
- User-programmable function keys, digital inputs and relay outputs.
- 15 point lineariser, min/max hold, auto-zero maintenance, and preset tare.
- PI control with auto-manual set points.
- Outputs for isolated analogue 1 to 5 V, 0 to 10 V or 0/4 to 20 mA.
- Data logging via SD card.

Version II of the 6004MF has an improved, simplified user menu interface, operation service manual and much improved EMI immunity. The design engineers have also improved the standard SD card functionality for fast on-site internet software upgrades with remote registration. Also vastly improved are the on-board PI control and system diagnostic information and output simulation functions.

When used specifically for the bulk handling industry, the 6004MF can be used in conjunction with Instrotech's range of fully hermetically sealed, stainless steel load cells from Vishay Revere Precision Group. The Revere bending beam load cell, model SHBxR, is particularly suitable for low capacity platform scales, packaging machines, belt-weighers, hybrid scales and process weighing applications.

Suited to capacities from 5 to 350 kg, the SHBxR load cell is a fully-welded construction with a water block cable entry to ensure that it can be reliably used in tough environments found in food, chemical and process industries.

For intrinsically safe and/or potentially explosive atmospheres the load cells are available with both local and international ATEX approval.

www.instrotech.co.za



Condition Monitoring is at the heart of machine reliability

WearCheck, Africa's leading condition monitoring company, is dedicated to saving money for you, our customers. We analyse data from condition monitoring and fluid analysis to schedule maintenance and avoid unexpected machine failure.

Accurately predicting maintenance = saving you time and money.

- +27 31 700 5460
- support@wearcheck.co.za
- wearcheckafrica
- WearCheck
- www.wearcheck.co.za



Oil & Fuel Analysis | Transformer Chemistry Services | Reliability Solutions



Cabin cooling for SA's mining vehicles

MechChem Africa talks to Booyco Engineering's managing director, Brenton Spies, and the company's executive director, Grant Miller, about HVAC systems for special vehicles operating under extreme conditions. These highly engineered Booyco HVAC solutions are now finding new markets in meeting the Occupational Health and Safety in the Workplace (OH&S) requirements for cabin cooling in mining vehicles.

From its inception in 1985 as a division of Howden, Booyco Engineering has been involved with the design, development and manufacture of high-end cooling systems. "We started out as a specialised military business unit within Howden, working for Armscor to develop engine cooling fans for the RooiKat armoured vehicle," begins Grant Miller, executive director of Booyco Engineering. "We then went on to develop the HVAC systems for these vehicles and the Booyco Engineering business of today was born from there.

"We quickly developed a skillset in building custom-designed reliable systems for high-value military and specialised vehicles subjected to excessive vibration, shock loading, dust and extreme temperatures – and these systems were built to very high 'milspec' specifications. We since offer HVAC systems that meet extreme conditions: solutions where traditional road-based mobile HVAC systems are completely inadequate," he adds.

Railway work has also grown significantly over the years and Booyco Engineering now services prestigious clients such as Union Carriage and Wagon (UCW), Bombardier, Alstom and Transnet. "We have designed custom locomotive HVAC solutions for nearly all of Transnet's investment programmes over the past 15 years, including the 19E, 15E, 20E, 21E, 22E and 23E electric locomotives as well as for the Class 43, 45 and 45 diesel locomotives. In order to ensure these units are properly maintained and supported, we have 15 permanent and dedicated service technicians on eight different Transnet sites around the country," says Booyco Engineering's managing director, Brenton Spies.

With respect to the ownership costs of the Transnet HVAC systems, Spies says these Booyco HVAC units are running at less than 2.0c/km on Transnet locomotives. "This compares to a Transnet KPI cost of 5.0c/km. So, far from being expensive, our systems are costing 60% less than Transnet expectations," he adds.

But this cost is actually a fraction of the total operating costs for the client. "Uptime is a much more important indicator, particularly

since the new OH&S regulations now specify temperature limits for driver cabins. "20 years ago, HVAC was a 'nice to have'. Now, because of OH&S regulations, it is a necessity, because if the HVAC system is down, the driver cannot work, so the locomotive is out of action until the HVAC unit is repaired. This downtime cost far exceeds the running costs or the HVAC unit costs – the cost of a single period of downtime can amount to the purchase and installation costs of several of our HVAC units," Spies says.

Servicing the mining industry

On the mining side, Spies notes that Booyco Engineering has been supplying both HVAC units and on-site service support for mining vehicles at an opencast operation in the Vaal Triangle for over 15 years, and support for HVAC units at mines in the Northern Cape for over 10 years. "This wasn't our main focus area though, and we are now looking to accelerate our work in the mining industry," he adds.

Brenton Spies explains: "After having undertaken a management buyout of Booyco Engineering in 2019, Grant and I forged a

strong working relationship with Booyco Electronics' Anton Lourens, whom I have known since our university days. Booyco Electronics is active in supplying its proximity detection and collision warning systems to various mines in South Africa, and our HVAC units are only being used by a small fraction of these. We see this as a huge opportunity for us to grow our mining client base, particularly in the light of the increasing need for cabin cooling to meet OH&S requirements," he relates.

Booyco Engineering has now established a set of standardised but customisable HVAC units suitable for cabin cooling of open cast surface mining vehicles as well as underground vehicles with enclosed cabins. "Our systems can operate off 12 V or 24 V in engine driven vehicles with the compressor connected to a suitable power take off (PTO) shaft. Or we can connect to the 380 V power supply for electrically driven systems or vehicles," Miller notes.

Describing a current project, Spies says that a fleet of used Caterpillar dump trucks, mobile drills and some other mining vehicle variants are being brought back from Namibia, and the company is replacing the



Booyco assemblers finalising construction of bespoke Booyco HVAC systems destined for the railway sector.

installed OEM HVAC and/or retrofitted HVAC systems, neither of which are considered suitable for the harsh environment in Northern Cape. These vehicles are going to be used to service a mine near Aggeney in the Northern Cape, where it is very hot. "Because South African working conditions now apply, HVAC systems are required and, while the vehicles were originally fitted with cooling systems, few of them are still working and none of these are suitable for the operating conditions," Spies tells *MechChem Africa*. We will be retrofitting our off-the-shelf cabin cooling system into these vehicles using the originally-used PTO.

Miller continues: "Generally, HVAC units are rated in kW of cooling, so our system for these units will deliver 7.5 kW of cooling to the cabins. But there are big differences between our 7.5 kW units and those designed for on-road buses and trucks.

"First off, our systems are rated to provide this level of cooling in ambient temperatures of up to 45 °C and can still provide cooling in temperatures of 50° to 55°C without tripping, while conventional units are generally only rated for 35°C. This 15° makes a massive difference to load requirements and the overall design. Component specifications are typically between 40 and 50% higher in our units to cater for the higher temperatures, and systems designed for 35 °C simply cannot operate at these temperatures without tripping.

"Also, conventional systems are designed for use on flat roads with vibration absorbing soft rubber tyres. On a tracked or wheeled vehicle being used off-road where vibration and shock loading is the norm, these HVAC units can be destroyed within months," he says.

"Whenever a low-cost HVAC system in the vehicle stops working, the driver has to stop working, so the vehicle has to be taken out of service until the cooling system is repaired. So while our more robust systems might be more expensive than conventional systems, they are much more cost effective in the long run, because downtime is massively reduced and the life of the units extended," he notes.

"We have a proven track record," continues Spies. "Our HVAC systems last and, while maintenance is going to be required to get the longest life, this is an integral part of our service offering. Filters need cleaning and compressors will have to be refurbished or



Final quality inspection of Booyco HVAC systems, which are built to withstand excessive vibration, shock loading, dust and extreme temperatures.



Completing a Booyco refrigerant compressor assembly used on many military and mining systems.

replaced, but we have these maintenance needs carefully mapped out for the entire lifecycle of the units, and we can provide field service technicians to ensure that the necessary planned maintenance is carried out," he assures.

Spies notes three unique advantages of using Booyco HVAC units: the design expertise for dealing with extra high temperatures and harsh conditions; the reliability of the units and their associated extended life; and the company's field services and maintenance offering, which ensure that the expected uptime and reliability is achieved.

"On the rail side, we employ fulltime technicians at eight Transnet sites to look after the Transnet fleet, while for exported military

systems, we have service agreements with local providers, which we train and supply to take care of maintenance. We have a good maintenance track record in mining, too, having been on site at one mine for 15 years where we have three permanent technicians taking care of the 100+ units fitted to this operation's vehicles.

"We have years of proven experience in designing, manufacturing and maintaining specialist systems for use in extreme conditions and we are now taking all of that expertise and putting it into our mining units. Whoever buys a Booyco HVAC system will get the same reliability, quality and life that Armscor, Bombardier, Alstom, Transnet and all of our International customers have enjoyed for many years," Miller concludes. □



SPECIALISED MOBILE AIR CONDITIONING

011 974 8640 | info@booyco.co.za | www.booyco.co.za
 101 Newton Road, Meadowdale, Germiston, South Africa



Specialty rotating shaft solutions for the renewable energy sector

MechChem Africa talks to Saien Rugdeo, SKF's sales and business intelligence manager for Gauteng and North West Province, about specialty solutions and services developed for wind turbines and renewable energy generators.

“Globally, SKF partners with many of the wind turbine OEMs such as Nordex, Siemens and Vestas. These OEMs use either their own designed components or they incorporate gearbox and generator units from other manufacturers for installation into the Nacelles of their wind turbines,” begins SKF's Saien Rugdeo.

“Our core focus as SKF is on the main drive shaft. Depending on the design of the turbine, this is either a direct drive with a large bearing connected directly to the generator; or a convectional bearing arrangement with a supported shaft connecting to the generator via a gearbox.

“The generator itself, which is the source of the electrical generation as well as the connecting gearbox, also requires high quality precision bearings for the rotating generator coils,” he continues, adding that SKF bearing products supplied to the wind turbine industry are vital components that keep the turbines rotating and generating safely, efficiently and reliably.

The bearings used for wind turbines tend to be large, with average shaft sizes exceeding 400 mm. “Our Nautilus hub-

units for direct drive turbines, which are designed to be integrated into the Nacelles, can be in excess of 2.0 to 2.5 m in diameter. These bearings come with integrated sealing carriers to improve cleanliness and reduce the risk of bearing contamination during the mounting process. The integrated seal design also helps to reduce weight and associated costs, and it makes seal replacement easier from the top of the turbine, without having to dismount the carrier,” Rugdeo says.

“Fostering our industry partnership, we also supply a range of specialty products purpose developed for the industry, which trusts us because of our 100-year legacy of developing fit-for-purpose quality solutions and our ability to deliver at the scale and performance levels necessary and expected,” he tells *MechChem Africa*.

A particular innovation with respect to the bearing design for wind turbines is SKF's black oxide coating. Black oxide is a rolling element coating developed for environments where lubrication requirements are critical, particularly in low lubrication and high moisture applications. This coating, which was originally a proprietary SKF innovation, is now widely used for offshore turbines. “Black oxide coatings enhance grease adhesion to the rolling element surfaces and are ideal for inaccessible environments where regular re-lubrication is prohibitive but critical for long

INSOCOAT coatings create an electrically insulated barrier to prevent current leakage. Left: INSOCOAT deep groove ball bearing. Right: INSOCOAT CARB toroidal roller bearing.

term reliability. This is now standard on most main shaft and gearbox bearings,” he explains.

Because of the electrical nature of generators, SKF has also developed speciality products to overcome current leakage, which is a common cause of generator bearing failure. “An electrical path coming through the rolling elements of the bearing to the outer or inner ring can cause sparking, which causes electrical erosion on the bearing contact surfaces and damage to the lubricant. This is very common if steel bearings are used,” he says.

SKF offers two potential solutions. The first is called INSOCOAT, which is a physical surface treatment of aluminium oxide applied to the inner or outer raceway using the plasma-spray coating process. INSOCOAT coatings produce an exceptional surface finish that creates an electrically insulated barrier to prevent current leakage from occurring.

“We offer specialty SKF Hybrid bearings to solve this problem. These have rings made of steel, but instead of using steel rolling elements, Hybrid bearings use ceramic silicon



Above left: An SKF Hybrid deep groove ball bearing. Hybrid bearings use ceramic silicon nitride rolling elements. Above centre: SKF Nautilus hub units for direct drive turbines can be in excess of 2.0 to 2.5 m in diameter.

nitride rolling elements as an insulating barrier between the inner and the outer rings.

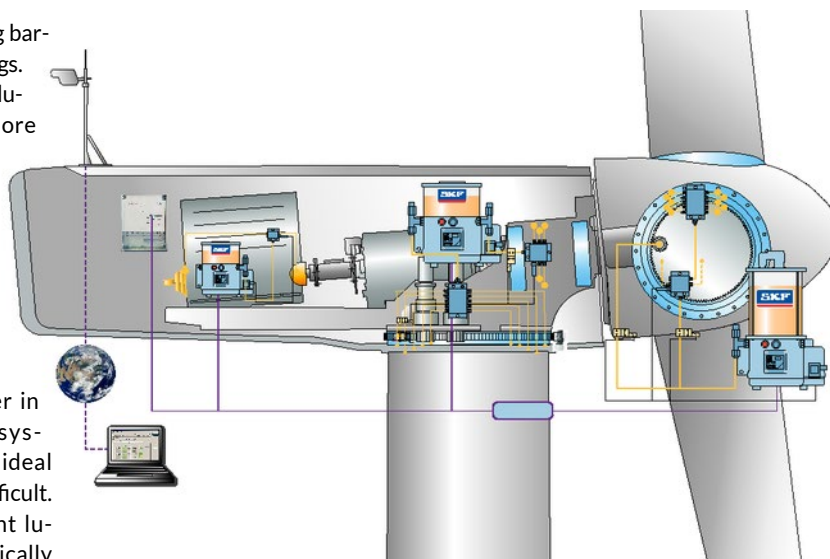
"These are both SKF-developed solutions and, while obviously a little more expensive compared to standard steel bearings, they are premium products that significantly extend service life and enhance performance, particularly in the generators of wind turbines," notes Rugdeo.

SKF also owns Lincoln Lubrication, a world leader in automated lubrication systems. These systems are ideal for use where access is difficult. "Automated multiple point lubrication systems are typically installed in the Nacelles of wind turbines for delivering the greases and lubricating oils required by the bearings of the main shaft, generator and slewing rings," he continues. Such systems are essential because of access difficulties: the nacelle of a wind turbine is typically over 100 m above the ground and, if offshore, may only be accessible via boat or helicopter.

Also in response to the access issues, SKF has the capability to monitor the vibration data and temperature coming off installed bearings. "For wind turbine condition monitoring, we have a customised service called WindCon, which involves fitting accelerometers at strategic points that transmit output signals wirelessly to the cloud. These signals are accessed by one of our Remote Diagnostic Centres (RDCs), which are strategically placed around the world.

"Depending on customer needs, we assign analysts to remotely monitor and track the condition of each bearing – its history and fault frequencies – and we can quickly identify concerns relating to each component. This gives wind farm owners an early warning of a possible failure, enabling them to track the severity and intervene at the ideal time to minimise disruption and damage," Rugdeo says.

"If we detect damage on the outer ring of a wind turbine bearing, for example, we will watch how that progresses, how it translates into the vibration spectrum, recording the increase in magnitude over time. Based on the expertise of our global team of analytical specialists, we can identify the point of criticality so that an 'in-time' replacement can be scheduled," he explains. "Though there are many service providers able to monitor bearings on wind turbines, SKF is one of the very few, in a global sense, that can offer fault detection, replacement and maintenance services to customers," he adds.



A diagram showing the possible bearing lubrication and condition monitoring points for SKF's WindLub and WindCon systems.

"In most industries, bearings don't fail overnight or accidentally. They tend to fail for an identifiable reason, such as misalignment, a lubrication failure or brinelling. From our RDCs, we can now identify which bearings are likely to fail and endeavour to act well in advance of an unexpected failure.

"With respect to development, every bearing failure report we do goes into a knowledge database, which enables us to identify common causes and devise solutions to overcome them, such as in the case of current leakage problems. We are routinely optimising geometries, developing new surface coatings, new materials or heat treatment procedures so as to constantly reduce failure rates and improve reliability," he continues.

"An up tower bearing replacement is ex-

pensive and income loss due to downtime can be huge too, so it is vital to use premium quality bearings from authorised and accredited distributors for critical applications such as these. The intrinsic value of using SKF products is not embedded in the price paid, it lies in the peace of mind and reliability benefits that come with our products. There is a lot of knowledge and experience that comes with an SKF partnership," assures Rugdeo.

Here in South Africa, he says the aftermarket is still relatively small since most units are still operating within their OEM warranty period. Wind Farm owners are not yet looking to manage the wind farms themselves, so they tend to take out service contracts with OEMs for the immediate maintenance. "This is likely to change with time, though, as more units come online and warranty periods expire," he says.

Speaking about the raise of the embedded-generation threshold in South Africa from 1.0 MW to 100 MW, he says he was thrilled with the positive market response. "The unlocked potential for private producers to generate power is now immense. Companies and people that have the capacity, the finances and the need, can be producers as well as consumers of power.

"This is an open invitation to be self-sufficient while still contributing to the country's wellbeing. I call this creative destruction, because it destroys our dependency on fossil fuels, while unlocking higher level and more rewarding future jobs in the new and modern renewable sector.

"This makes me very optimistic about the long-term future of the South African economy and the renewable energy sector," Saïen Rugdeo concludes. □



An SKF automated multiple point lubrication system interface.

Embedded Generation: opportunities from the 100 MW threshold increase

'The 100 MW Embedded Generation Threshold increase and associated opportunities require an enabling environmental regulatory framework and support', according to this report from CDH's (Cliffe Dekker Hofmeyr) environmental law specialists, Margo-Ann Werner, Alecia Pienaar, Laura Wilson and Anton Ackermann.

The insecurity around the risks to South Africa's energy security, coupled to the economic impacts of COVID-19, has intensified the business sector's long-standing call for increased private power generation capacity. Following President Cyril Ramaphosa's announcement in June 2021, the Minister of Mineral Resources and Energy gazetted amendments to Schedule 2 of the Electricity Regulation Act 4 of 2006 (ERA) on 12 August 2021 to increase the exemption threshold for an electricity generation licence (Exemption Threshold) to 100 MW, with self-generating operations now being able to 'wheel electricity through the transmission grid, subject to wheeling charges and connection agreements with Eskom and relevant municipalities'.

There is no limitation as to the type of technology to which this capacity exemption applies.

Energy landscape and challenges

The energy landscape is informed by the 2019 Integrated Resource Plan (2019 IRP), which contains capacity allocations for electricity generated from different technologies, including coal, hydro, storage, PV, wind, CSP, diesel and gas. Based on these allocations, the Minister issues ministerial determinations under section 34 of the ERA, specifying the new electrical energy generation capacity requirements and whether an organ of state or independent power producer (IPP) will be responsible for establishing the new generation capacity. These ministerial determinations have given effect to various IPP procurement programmes over the years.

Whilst load shedding and the associated capacity constraints generally take centre stage in the energy security dialogue, the objections and challenges to environmental permission for energy projects are starting to come to the fore because such challenges have bearing on project development and investor appetite in the energy sector.

Alternative technologies to coal-fired energy facilities, such as gas and renewable technologies, are not immune to environmental challenges with increasing



The Kathu Solar Park in the Northern Cape, which is a dispatchable CSP IPP project with a combined generation and storage capacity of 100 MW. With the lifting of the embedded generation threshold to 100 MW, self-generating operations of this size become possible, with the electricity able to be 'wheeled' through the transmission grid, subject to wheeling charges and connection agreements with Eskom and relevant municipalities.

objections and appeals lodged in respect of the environmental permits granted to LPG and LNG, solar and wind projects that have been or are to be bid in IPP procurement programme rounds. In respect of renewables, this is of particular concern in light of the release of the Renewable Energy IPP Procurement Programme Bid Window 5 Request for Proposals in April 2021, for which bids were submitted on 16 August 2021. Considering the long lead times and extensive costs associated with environmental permitting application and amendment processes, the legal challenges have the capacity to compromise the projects in their entirety, as they may impact on their ability to meet IPP procurement programme bid requirements; private sector requests for proposals; and reach financial close.

With all of these setbacks amidst a power supply crisis, the increase in the Exemption Threshold is welcomed in encouraging a boom to embedded generation developments as added energy security sources in addition to IPP Programme projects. But this development is only a single piece of a larger integrated regulatory puzzle, with an enabling environmental and associated permitting framework being an equally material part before benefits of the Exemption Threshold increase can be realised.

Environmental regulatory developments

The misalignment with timing in environmental permitting applications processes, project development, and bidding, has created practical challenges. This is occasioned by capacity constraints of environmental permitting authorities which may delay approval of applications particularly for environmental authorisation (EA) and water use licences (WUL). From an EA perspective, and in light of the requirement for an EA for energy generation facilities where the generation capacity exceeds 10 MW (save for PV facilities of up to 10 MW in urban areas or to be developed on existing infrastructure), there have been a number of regulatory updates that streamline and expedite timeframes for certain energy development projects in designated areas.

Pursuant to the implementation of various strategic environmental assessments, the Department of Forestry, Fisheries and the Environment (DFFE) has published various notices in terms of the National Environmental Management Act 107 of 1998 (NEMA), which cater for the identification of:

- Geographical areas important for the development of strategic gas transmission pipeline infrastructure, specifi-

cally the designation of nine phases of Strategic Gas Pipeline Corridors. To this end, the DFFE has further published 'fast-tracked' procedures to be followed when applying for or deciding on EA applications, and substantive amendments to EAs, for the development or expansion of gas transmission pipeline infrastructure within the strategic gas pipeline corridors (Strategic Gas Pipeline Procedures). The Strategic Gas Pipeline Procedures provide that only a basic assessment (BA) process is required, which should facilitate and speed up EA application and amendment processes for this type of infrastructure in these areas.

- Geographical areas of strategic importance for the development of large-scale wind and solar photovoltaic energy facilities, which are known as Renewable Energy Development Zones (REDZ). In July 2020, DFFE promulgated three new REDZ in addition to the existing eight which, in relation to solar PV developments, are located in Emalaheni in Mpumalanga and Klerksdorp in the North West, and in relation to wind energy projects, Beaufort West in the Western Cape (the New REDZ). With the New

REDZs designated in mining regions, and given the high energy demands associated with mining and processing, it is anticipated that the development of large-scale renewable projects by mining companies and independent power producers will be incentivised. These projects, which would be located close to Eskom's load centres, could potentially make use of existing infrastructure, including roads and grid infrastructure pertaining to former mining operations.

- Similar to the Strategic Gas Pipeline Procedures, the DFFE has also prescribed BA processes for EA applications and substantive amendments in relation to the development of electricity transmission and distribution infrastructure of large-scale wind and solar photovoltaic facilities located in the REDZ.

From a water perspective, the Department of Human Settlements, Water and Sanitation (DHSWS) has reduced the WUL application process from an extensive 300 days to 90 days. This initiative falls within Operation Vulindlela, a project established by the presidency and National Treasury to accelerate the implementation of structural reforms to overcome the current delays syn-

onymous with the processing of applications for WULs. To address these constraints, the DHSWS has communicated that additional officials will be recruited to fast-track WUL applications. No amendments to the application regulations have been finalised to date; however, it is understood from the DHSWS that as of April 2021, all applications will be finalised within 90 days provided such applications are accompanied by all the requisite administrative and technical information required by the DHSWS to allow it to carry out the necessary screening and assessment of the overall application.

Conclusion

The environmental regulatory framework developments to facilitate renewable energy generation, coupled with the 100 MW Exemption Threshold increase, will hopefully encourage and contribute towards a robust embedded energy sector; energy security; and associated economic recovery stemming from energy and infrastructure development that South Africa desperately needs.

Although encouraging, there will remain the need to appreciate the risk of challenges and learning from them to ensure robust assessment and public participation processes are carried out. □

Are your turbines generating power but not enough ROI?

High winds, harsh elements, rough storms and remote locations. These conditions and more can limit turbine performance and reliability. When turbines go down due to maintenance issues or equipment failure, the high cost of repair crews and crane day rates can send costs per kilowatt hour soaring. Long wait times for spare parts can send them even higher.

Proven SKF Life Cycle Management solutions can help. SKF has been working with leading OEMs to optimize turbine performance, reliability and energy output since the industry began.

Backed by our extensive global engineering, manufacturing and service footprint, we can provide you with original or upgraded products with quick deliveries.

SKF can help to predict the remaining service life of your components with vibration measurement and analysis via remote monitoring, enabling greater machine uptime and much more cost-effective planned maintenance. Together, these SKF Life Cycle Management solutions will help you optimize turbine power output and improve leveled cost of energy.

SKF South Africa (Pty) Limited
 16 Mannin Road, Jet Park
 Tel: 011 321 3500
 Email: sales.za@skf.com

SKF

© SKF is a registered trademark of the SKF Group. | © SKF Group 2021

Project nautilus extension announced

Electrocomponents has announced nautilus 2, an extension to the original project to commercialise leading-edge robotics technology for the non-destructive testing of petrochemical storage tanks.



The nautilus project's prototype robot undertook its very first proof of concept oil tank inspection in an industrial environment in the summer of 2020.

Electrocomponents plc, a global provider of product and service solutions, has announced that Project nautilus has entered the validation phase of its highly innovative robotic inspection platform developed for non-destructive testing (NDT) on storage tanks in the petrochemical industry.

nautilus 2 is a 12-month extension to the three-year project, enabling it to move forward from the initial phase of development and testing to the delivery of a commercially viable product based on the underlying technology. Field trials are now taking place on 10 water tanks in the United Arab Emirates (UAE) conducted by project partner Sonomatic, a leading oil and gas exploration service provider, which is supplying the NDT sensor and service. Two further consortium partners are providing remote support during this second phase, with project lead Electrocomponents responsible for fulfilling delivery, and InnoTecUK providing the robotics platform.

Oil and fuel storage facilities require a robust and reliable infrastructure and regular inspection is critical to ensure tanks are fit for purpose. Existing inspection methods often result in storage tanks being taken out of service to be drained and inspected for corrosion, which is hazardous, time consuming and costly work.

One answer to this problem is a small robot that can monitor and plot its own position while carrying out inspections. The nautilus robot uses active real-time remote controls to move around a tank and an ultrasound probe to take measurements of floor thinning. It then records data regarding location for post-processing following retrieval of the robot. The robot's design also offers the smallest possible footprint to allow entry to liquid storage tanks via small manholes.

"The project has now been extended by a further 12 months, supported by additional funding from this innovative industrial consortium, which brings together complementary skillsets from many different companies and organisations in the UK," says Mike Burrows, Senior Innovation Adviser at Electrocomponents.

"We are excited to see the project deliver proof of concept and move to the next stage in its evolution with field trials and possible commercialisation. The platform and the NDT inspection devices have gained significant interest from more than 60 operators and inspection companies. Additionally, we believe the platform will not only prove to be of significant value to the petrochemical industry, but also will open up many opportunities for the reuse of the tech-

nologies being deployed in the robotics and in the system."

Project nautilus is a UK-based consortium championed by several leading global companies and institutions, which started working together in February 2018 to design and develop a multi-million-pound certified non-destructive testing (NDT) solution. Co-funded by Innovate UK, the full consortium includes InnoTecUK, London South Bank University, Sonomatic, and TWI. In addition, the Quality Functional Deployment (QFD) model for the project was developed via RS Monition, Electrocomponents' maintenance engineering specialist service.

The nautilus project's initial three-year development programme began in February 2018, and the prototype robot undertook its very first proof of concept oil tank inspection in an industrial environment in the summer of 2020.

In addition to activities carried out by the project members, Electrocomponents' DesignSpark engineering platform has been part of the multidisciplinary team throughout the project. □

Further details about Project nautilus can be accessed via this QR code.



The nautilus robot's design offers the smallest possible footprint to allow entry to liquid storage tanks via small manholes.

Realising energy efficiency in a time of escalating costs

Taru Madangombe, vice president of Power Systems at Schneider Electric, talks about what can be done to mitigate against the impact of tariff hike's on SA's economy, particularly in the mining, minerals and metals (MMM) industries.

South Africa will soon see the fallout of the 15.63% energy tariff hike which came into effect on 1 April, impacting all customers apart from the poor who will continue to use government's free basic energy (FBE) service. The tariff increase comes after the National Energy Regulator of South Africa (Nersa) and Eskom reached an agreement, following an order by the High Court of SA, to add R10-billion to the utility's allowable revenue in 2021/22.

The above will undoubtedly have a considerable impact on tariff paying customers and put additional financial strain on an economy that is navigating the uncharted waters of the COVID-19 pandemic.

Energy is not only expensive but a liability

The question, therefore, is what can be done to mitigate the impending tariff hike's impact on SA's economy? For one, it's important to acknowledge that energy's increasing cost will continue to put the economy at risk as businesses and industry struggle to overcome the resultant financial impact of higher energy costs.

Costs, therefore, need be controlled, and energy efficiency and savings remain the answer. Fortunately, there are numerous feasible options available that can go a long way to helping businesses and industry cut costs whilst improving efficiency and realising longevity.

Effective power management has emerged as an important enabler of organisational energy efficiency. An integrated power and energy management software platform, for example, enables organisations to optimise their power distribution infrastructure, maximise operational efficiency, and improve bottom-line performance.

So how does it work? A power and energy management solution analyses and mitigates quality related issues while also tracking and optimising equipment performance. Importantly, it investigates energy consumption, uncovers potential saving and accurately allocates energy-related costs.

In real-world scenarios, power and energy management software, for example, can analyse and isolate total energy usages from all electrical and piped utilities, identify

waste and reduce costs.

Industry savings

The local Mining, Minerals and Metals (MMM) industries are major users of power and as a result will be impacted significantly by the tariff hike. Now is the time for these industries to operationalise and integrate sustainability to become successful resource companies in the future.

However, to realise MMM industries that are energy efficient, concrete steps based on an established sustainability strategy must be taken. At Schneider Electric we recommend these four important steps:

- Energy efficiency via reliable and efficient power distribution solutions.
- Yield improvement using digital-based integrated operations management.
- Adopting low emissions technologies such as renewable and microgrid technology.
- Using green processes and products for energy and automation – all part of the circular economy.

We will also see an increased shift by electro-sensitive users such as the MMM industries towards self-generation options to save costs.

A sound sustainability strategy can realise numerous benefits such a reduction by a minimum of 25% in energy costs by identifying and eliminating losses in energy uses and distribution. This is a significant amount that can go a long way to minimising the impact of the tariff hike.

With a strong sustainability strategy in place, MMM industries stand to benefit from considerable efficiency gains. Here, two pillars: the minimisation of resource wastage; and the optimisation of operations management processes through the integra-



tion of process and energy management efficiencies, play critical roles.

Digital transformation

The key to unlocking business value from digital transformation is to consume less energy without sacrificing productivity or comfort. These two goals, often thought to be contradictory, have come into alignment through the digital transformation of energy management and automation.

Software management tools bring visibility and control over enterprise-wide energy consumption. For example: before, facility managers were in the dark as to whether lights were getting left on. Now, they can automate lighting, HVAC and other systems to ensure energy is used only when needed.

The above also benefits utilities as it provides full visibility of their networks to mitigate energy losses and improve grid performance. With a central dashboard, businesses can now easily locate and execute performance enhancements.

Ultimately, by taking a number of important steps, local business and industry can weather the tariff hike storm while establishing operations that are based on energy efficiency and sustainability processes and strategies.

www.se.com/za

"A power and energy management solution analyses and mitigates quality related issues while also tracking and optimising equipment performance. Importantly, it investigates energy consumption, uncovers potential saving and accurately allocates energy-related costs."

A corrosion investigation for a biokinetics pool

This article outlines a Sassda case study involving pitting corrosion of a stainless steel support railing system following an upgrade to 316L material, which was expected to be an improvement on the original 304 system. Sassda's acting Executive Director Michel Basson reports.

Sassda was recently called upon to comment on visible corrosion and pit marking on the stainless steel railing system, installed in a biokinetics pool and necessary for safely supporting patients being treated in the water. Within six months of the pool being refurbished, the first visible signs of corrosion and pitting became apparent on the newly installed railings.

Although the pool is filled with a saltwater solution, the chloride and chlorine levels were within the recommended corrosion protection range of the grade 316L material used. The pool temperature is maintained between 32 and 34°C and the pool is in an enclosed environment, with a high roof enabling humidity levels to be kept low. The grade of stainless steel used has been confirmed by spectrometer testing to be the specified austenitic grade, 316L.

As seen from Figure 1, the railing components are submerged in the saltwater solution and never cleaned. However, the components are exposed to water being constantly circulated and therefore not oxygen deficient or stagnant. What is interesting about this investigation is the fact that the grade 316L railing system was installed to replace a grade 304 system which had been in use for four years before the first signs of discoloration and possible corrosion became evident. The replaced equipment was still available and spectrometer tests confirmed that grade 304 stainless steel

had been used. Figure 2 shows the damage to the material surface caused by pitting corrosion. At the lower right, a very rough surface finish is visible, while on the right, the mounting to the pool structure reveals the onset of crevice corrosion. Also to be noted are the unsealed crevices, which lack post-weld treatment, and the tube surface finish, which shows an incorrect grain direction.

Failure of components is not usually caused by one incident or for one reason. It is common for failure to be attributed to a series of smaller, less critical factors and therefore important to investigate the following:

Material grade

As mentioned, the previous installation had been manufactured in grade 304 stainless steel and the new installation in grade 316. The owners of the pool reported good lifespan and performance from the original 304 stainless steel, while the new 316 grade showed signs of pitting as early as six months from start of use.

Since grade 316 contains molybdenum it is especially protected in high chloride environments, so the 316 should have performed better in this application. Technically, the original grade 304 should not have been suitable for the application since it lacks the specific protection against pitting corrosion offered by the molybdenum content in grade 316. In this installa-



tion, the opposite was found to be the case.

Material surface finish

Such applications would normally make use of very highly polished surfaces. Sassda would ordinarily not advise using any surface finish less than #600 grid in this scenario and, judging from the visual evidence, the finish on the new railing components is not up to requirement and was found to be as rough as #180 grid.

It was also noted that the finish was in the circumferential grain direction. When the components are installed horizontally, the grain direction points vertically and water that could possibly contain contaminants can drain off. If a component is installed vertically, the grain direction becomes horizontal and the small ridges impede the washing off to remove any contaminants or chloride deposits.

The visual evidence also pointed to the fact that the welding was not properly smoothed down as expected for this type of application. The equipment should have had at least the same shiny surface smoothness as the hand railing and similar structures we find at airports and public places.

Exposure to salt or harmful chemicals

Although the choice of grade 316 stainless steel was correct, the surface finish was not to the required standard. This could potentially limit the performance of the stainless steel and evidence points to this. Even with occasional spikes in chloride and chlorine levels in the pool water, it would not be expected that 316 would deteriorate at this rate.

The risk of pitting is addressed by the fact that the water circulating in the pool will prevent stagnant conditions. There are, therefore, adequate oxygen levels in the water to maintain the protective chromium oxide layer on the material surface. During the investigation no other chemical or forms of pollution could be identified as contributing factors.



Figure 1: A view of the biokinetics pool and its railing components, which are submerged in the saltwater solution and should not require cleaning.

Cleaning frequency and method

Since the equipment remains submerged, a standard cleaning regime should not be required. Any chloride build-up is washed away during use and/or by the circulating water. No additional cleaning regime need be in place and no additional chemicals need be used. Maintenance, or the lack thereof, cannot have been a contributing factor in this case.

Fabrication

Several fabrications and design issues came to the fore as part of the investigation. The following issues stand out:

- Inadequate surface finish should not be a real fabrication issue since the tube can be bought from distributors in the required finish. This case could be a result of ignorance regarding forms and finishes available.
- The weakest points in any assembly for use in corrosive conditions are always the joints, whether bolted, welded or otherwise. In the joint areas (as visible in Figure 3) the risk for crevice corrosion is elevated when joints and seams are not completely sealed. The water in the crevice will be stagnant and the passive layer in this localised area will be compromised. Further to this, a secondary galvanic effect will occur in the crevice, with hydrogen breaking away from the water molecule and binding with chloride ions to form hydrochloric acid in the crevice. This is why corrosive by-products are so abundant at joints to the floor and wall. Welded joints are also risk points since the metallurgy of the weld will differ from the parent material. Welds should preferably be fully purged to ensure maximum weld integrity.
- Welding on this project seemed to have been done using stick electrodes. This gives rise to excessive heat in the welded area, which impacts negatively on the weld metallurgy as described earlier. Welding for this type of application needs to be much more sophisticated to control heat input and to protect the metallurgy of the joint.
- Some of the components had been exposed to extreme forms of corrosive attack over large continuous areas. The corrosion patterns indicated the possibility of ferrous contamination that usually occurs in fabrication areas where workers either grind mild steel close to stainless steel or use the same abrasives for both stainless steel and other metals.
- Post-weld treatment and post-fabrication restoration of the surface



Figure 2: Damage to the material surface caused by pitting corrosion. At the lower right, a very rough surface finish is visible, while on the right, the mounting to the pool structure reveals the onset of crevice corrosion.

integrity was either not done or not done properly.

- As mentioned previously, there is usually no one single factor that causes a stainless steel product to fail. Rather, it is a case of several small things going wrong. In this instance we could confirm good material choice, a non-problematic design and an installation environment that remains stable within the design parameters.

We did find some serious flaws in the fabrication process that detracted from the material's ability to render proper service in these conditions. It is our opinion that, should the same material be used with the correct surface finish and fabricated to acceptable manufacturing standards, this 316L stainless steel railing system would give a cost-effective service life and possibly last for decades.

Recommendations

Since pitting is unpredictable and not clearly visible and, as such, dangerous with respect to unexpected early failure, Sassda recommends that all the existing material be scrapped to ensure there is no risk of hidden pitting in salvaged material.

The manufacturer of the new components should be given a full brief in terms of fabrication standards and requirements. Sassda can assist with this.

In critical or special applications, it is advisable to make use of fabricators and installers with a good track record for this type of work. Stainless steel is costly in terms of initial material cost, but life cycle costing (LCC) proves it to be unsurpassed as a cost-effective solution. It is therefore important that the material is handled by knowledgeable and skilled persons.

sassda.co.za



Figure 3: In the joint areas, the risk of crevice corrosion is elevated when joints and seams are not completely sealed.

Bosch Holdings celebrates 60 years of innovation in engineering.

Founded in 1961 in Durban, South Africa, Bosch Holdings has since executed projects in over 120 countries around the world. Mike Gibbon, the company's current CEO, summarises some of this success.

It was inconceivable for the founders of Bosch Holdings in 1961 to have guessed that 60 years later, the company would have expanded into a global operation, offering consulting engineering, skills development and project finance solutions throughout South Africa, into Africa and internationally, having executed projects in over 120 countries.

Bosch Holdings has been involved in many prestigious projects around the world, starting with the design in 1963 of Durban's iconic sugar terminal. Innovative engineering, authentic people and pursuing excellence in every aspect of our business are key to our success. We value our team and we encourage our people to grow, have fun and reach their full potential as we continue our journey together. Our relationships with clients are central to our business and we are committed to embracing the latest technologies and improving the lives of those around us through integrated project solutions.

We ensure the successful completion of every project, in line with the highest standards, in terms of safety, quality and time, and within budget restraints.

Bosch Holdings, with its head office in Durban, KwaZulu-Natal, is supported by a strong regional presence, with highly qualified professionals at more than 10 office locations across South Africa, Kenya, Brazil and the United Kingdom.

The Group comprises eight companies – Bosch Projects, Bosch Munitech, Bosch Ulwazi, Bosch Capital, Bosch Engenharia, Booker Tate, Bosch East Africa and Bosch Trading – all offering specialist services.

Bosch Projects provides consulting engineering and project management services to diverse sectors, including: industrial, water and wastewater plants; roads, urban developments and buildings; ports and terminals; and the sugar and agriculture sectors. Bosch Projects also designs and supplies a unique range of process production equipment to the global sugar industry.

Bosch Munitech provides specialist 'reality capture' services, consisting of underground utility detection, 3D laser scanning and material thickness testing.

Bosch Ulwazi facilitates the advancement of engineering skills. The company



The Phoenix Wastewater Treatment Works.



The Bronkhorstspruit Biogas Plant.

provides solutions for engineer development and technical training, as well as supplier/enterprise and socio-economic development. Through Bosch Ulwazi's enterprise development programme, the Group strives to develop black-owned businesses that operate in the engineering sector. Recent expansion of Bosch Ulwazi's services includes consulting engineering solutions. Bosch Capital provides a range

of financial advisory services, including corporate finance and project finance advisory, capital raising and investment facilitation for public and private sector projects and transactions. The company's delivery model combines financial expertise with the Group's engineering capabilities to deliver integrated and customised solutions.

The establishment in 2008 of the Group's first foreign subsidiary, in Brazil, Bosch

Engenharia was a significant milestone, creating new opportunities for the company to offer enhanced engineering services to include multidisciplinary engineering, equipment supply and plant operations management in the South, Central and North America's.

The Group's carefully structured global growth strategy has also seen the establishment of Bosch East Africa in Kenya and the acquisition of Booker Tate Limited in the UK.

The Bosch East Africa team, which is based in Nairobi, is well-positioned to lead projects in and beyond Kenya with professional services including mechanical and electrical engineering, building services, project and construction management.

Booker Tate in the UK is a leading global agri-business consultancy that specialises in bringing agricultural projects to realisation. Over five decades Booker Tate has developed recognised world class competencies in conceptualising, implementing and professionally managing large-scale renewable resource production systems.



The 200 000 t coking coal storage facility in Richards Bay.

Bosch Trading offers a customised solutions service to clients looking to improve the efficiencies of sugar and ethanol factories in Brazil and Central America. The company acquires and supplies both new and refurbished plant and equipment from Brazil on an international basis.

With the Bosch Holdings team's steadfast commitment to excellence, the highest standards of service delivery and to uplifting the quality of life for the people of South Africa, the company is set to celebrate many more milestones.

www.boschholdings.co.za

Notable milestone and award-winning projects

Water and Agriculture: The Bivane (Paris) Dam; numerous projects growing and irrigating sugar cane on over 250 000 hectares across four continents; undertaking of agricultural assignments in over 100 countries; water master planning in Bulawayo for one million inhabitants; regional planning for iLembe District Municipality; water reticulation analysis and design in Zimbabwe, KwaZulu-Natal and Johannesburg; the Vlakfontien 210 ML Reservoir; the eThekweni's Northern Aqueduct in KZN; A communal ablution programme servicing 350 informal settlements; one of the largest flood protection works in SA to control floods up to 10 000 m³/s.

Roads: The R1-bn phased re-alignment and upgrade of the N2 from Grahamstown to Fish River; rehabilitation of urban arterials and streets for eThekweni; implementation of the new R600-million Gonubie Link Road dual-carriageway urban arteria.

Urban Developments: Brettenwood

Coastal Estate; the 49 ha Bridge City new CBD development; international development experience with a residential and mixed-use Fumba development on Zanzibar island; the Mt Edgecombe Retirement Village; the 2 000 ha Ntshongweni Urban Development, including the participation in establishing the world's largest Green Star rated urban area, with R6-billion infrastructure services.

Buildings: The Serena Hotel 200 room refurbishment and additional top floor in Kenya; refurbishment of the Westgate Mall after the terror attack in Nairobi; the Coega Head Office; a prestigious Sandton office upgrade.

Sugar and Industrial: the greenfield TSB Komati Sugar Mill; a 200 000 t coking coal storage facility in Richards bay; the first and largest 4 MW Biomass plant (Bio2Watt) in Africa; the Ubombo expansion project – the largest brown-field sugar expansion project in Africa;

the design and supply of 15 patented Bosch Projects chainless diffusers and 61 continuous vacuum pans globally; numerous 25+ MW power plants, including integration to both factories and the Eskom grid; worldwide experience in the FMCG industries, including a rum plant in the Caribbean, alcohol plants in East Africa and many breweries assignments; numerous large materials handling projects, including a 750 000 tpa sugar packing plant in Egypt, and a 9 000 t/hr conveyor design.

Training and Development: notable achievements include the development programme for Transnet Capital Projects of 30 Black women and for 1 000 staff for BMW.

Financial Advisory Services: Undertaken eight water sector study projects for the Water Research Commission and transactional advisory work for a large parastatal for ports and terminals in South Africa. □



DUST FREE INSTRUMENTATION & CONTROL ROOMS

RTS Africa Inertial Spin Filters

No Maintenance – No Down Time – No Dust

RTS Africa Engineering (Pty) Ltd

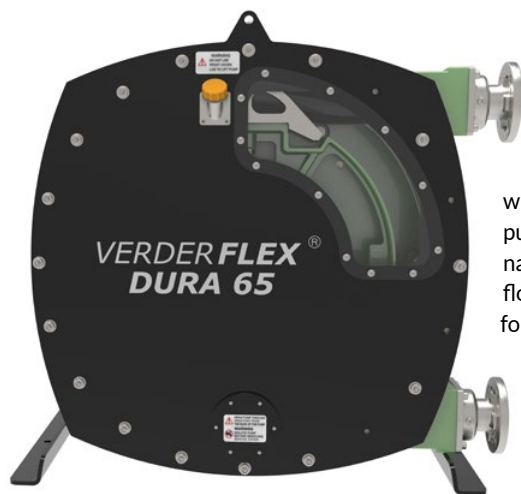


🌐 www.rtsafrica.co.za 📧 info@rtsafrica.co.za ☎ +27 82 879 0734

The new Verderflex Dura 65

The proven Verderflex Dura hose pump series has grown to include the Verderflex Dura 65 hose pump, which replaces the popular Verderflex VF65.

Thanks to the optimisation of the rotor, rotor shoe and sliding surface of the hose, the new Verderflex Dura 65 achieves the highest flow rate on the pump market at this size. With a maximum flow rate of 33000 l/hr, it exceeds the performance of the previous VF 65 by 20%. Additionally, since the rotor requires fewer revolutions for this performance, the hose has less occlusions



The new Verderflex Dura 65 hose pump exceeds the performance of the previous VF 65 by 20%.

and therefore achieves a 20% longer hose service life.

According to Darryl Macdougall, managing director, Verder Pumps South Africa, "The new Verderflex Dura 65 is much more than just a facelift to replace the Verderflex VF65. Our R&D team placed significant focus, not only on the technical standpoint, but also on what would make life easier for both the owner and the user".

The pump offers a seal-less and valveless, proportional flow rate. By incorporating the technical advances of the rest of the DURA range and increasing the utilised length of the hose, the unit has a class leading swept volume that enables the pump to achieve a maximum continuous flow rate of 22 m³/hr. This puts the DURA 65 with a flow rate that matches existing pumps in the market, which are designated as '80' size, making the cost per flow rate with the Dura 65 better value for money. In addition, the robust hose can be changed on site.

Verder has also made some modifications to ensure that servicing is more about ease and reduced time than mess and complexity. There is now a filling nozzle for the lubricant and a service access

port on the front cover.

To make the pump safer, a lifting point has been fitted on the front cover and a valve and hose tail added at the lubricant drain port to prevent spillage over the floor when emptying. There are options for a level indicator and max/min fluid sensors for the lubricant bath, which can be connected for remote monitoring. These can also support hose failure monitoring.

Key features of the Dura 65 include:

- Class leading continuous flow rate of 22 m³/hr.
- Greater utilisation of hose through greater swept volume – higher flow/ lower revolutions give longer hose life.
- The same reliable design of the Verderflex hose, providing optimal hose life.
- Filler nozzle/access ports enable the hose to be changed without removing the front cover.
- Self-priming/dry running/seal-less peristaltic technology.

The smaller pump sizes of the Verderflex Dura are also available with an integrated frequency converter including potentiometer and installed hose breakage monitoring: the iDura launched in September 2020 is available from the Dura 5 to the Dura 35. The iDura series can be controlled via 4-20 mA, Modbus® RTU, CANopen or Profibus via the inverter.

www.verder.co.za

CHIETA boosts growth for women entrepreneurs

In line with global trends to open more doors for women entrepreneurs and eliminate gender-related biases, the Chemical Industries Education and Training Authority (CHIETA) is focusing on developing women-led small businesses to encourage their participation in the mainstream economy, particularly within the chemicals sector.

According to the 2020 Mastercard Index of Women Entrepreneurs (MIWE), women are making progress in South Africa, but challenges persist, and only 19.4% of business owners in South Africa are women.

CHIETA's women-focused projects include the CHIETA 12-month Small Business Programme, which upskills women entrepreneurs in business development. The comprehensive programme catered for 49 delegates in Tshwane and Ekurhuleni in 2020 at an investment of over R1.4-million.

Yershen Pillay, CHIETA CEO, says the response to the programme, the uptake by the delegates, and the impact on individual businesses was extremely encouraging. He explains, "We face severe skills shortages in engineering sectors in this country, which can hinder economic growth. To bridge this gap,

we need to see a change in attitudes towards women in engineering – both how they are perceived in industry, and how they themselves view engineering. This course is proving to be a firm steppingstone to business growth in our vibrant chemical engineering sector."

Koketso Mashishi, owner of Haimish skin care products, says she has benefited from several CHIETA support initiatives, "I was part of the University of Johannesburg CHIETA group in 2020 and passed my Small Business Enrichment Programme. CHIETA also enabled me to complete my N2 in Chemical Manufacturing, to achieve my certificate in the SEDA Quality Management Systems course and to attend digital marketing training." Mashishi emphasises that many opportunities have opened for her since joining CHIETA. Looking ahead, she believes that women manufacturers and formulation developers need to provide a platform to train other women interested in participating in the industry.

Other successful graduates include Dichaba Kubayi, owner of Hygiene cleaning products and services, Sesomo Molapo of Randfontein-based Baroeng Trading Projects,

Kurhula Mkansi, director of VKM Dynamix, which manufactures detergents and provides cleaning services.

Pillay has congratulated all the CHIETA Small Business Programme graduates and encouraged industry to make a point of supporting women-owned businesses in the chemical sector. "The fact is, according to a UN Global Compact article, businesses that invest in gender equality experience higher productivity, higher return on investment, and higher consumer satisfaction. It's worth it," he concludes.

www.chieta.org.za



Koketso Mashishi, owner of Haimish skin care products



Guided wave radar level transmitters

INSTROTECH offers Kobold's NGR, a robust, maintenance-free level sensor that uses time domain reflectometry (TDR) technology for the precise level measurement and monitoring of oil- and water-based liquids, grinding and hydraulic oils as well as mixtures for cleaning, degreasing and care products. The NGR can also work in deposit-forming and foaming liquids.

The NGR's guided radar uses time-of-flight technology to measure electromagnetic pulses. The time difference between the sent pulse and the reflected pulse is

used to calculate the level, both as a continuous value (analogue output) and a free position switching point.

Key features include:

- Measures liquids
- Temperature range: -20 °C to +100 °C.
- Pressure range: -1.0 to +10 bar.
- Output: 4-20 mA/0-10 bar switching output: PNP or NPN.
- Probe length: 2 000 mm (max) for mono-probe and coaxial tube 4 000 mm (max) for wire rope.

The flexible probe can be changed or cut, allowing the sensor to be integrated quickly into any application.

The NGR sensor's intuitive setup uses four buttons and a display to ensure quick and easy adaptation to the application.

Kobold's NGR operates on a modular sensor concept, adaptable for every application and suitable for almost every liquid. The measuring principle is independent of the medium's density, temperature, pressure, humidity and conductivity.

www.instrotech.co.za

Skyriders provides access services at Ingula

The Ingula pumped storage scheme in the Little Drakensberg escarpment in KwaZulu-Natal consists of an upper and a lower dam, each capable of holding about 22-million m³ of water. The two dams are 4.6 km apart and are connected by underground waterways that pass through a subterranean powerhouse with four 333 MW generators.

To generate electricity during times of peak demand, water is released from the upper dam, passing through the pump and turbines into the lower dam. During

periods of reduced energy demand, the water is pumped from the lower back to the upper dam.

Periodic inspection of the four units by specialised structural, civil or mechanical teams requires rope access and confined-space standby rescue. Both these services were provided by rope-access specialist, Skyriders, after being awarded a contract for all four units in 2020, according to marketing manager Mike Zinn.

The fact that the specialists them-

selves do not necessarily have any rope-access experience means that Skyriders deploys some of its highest qualified and most experienced technicians to provide the necessary assistance and access.

Describing Ingula as one of the most challenging industrial environments Skyriders has been involved with to date, Zinn adds that the contract has been a significant extension of the inspection, repair and access work that Skyriders has carried out for electricity utility Eskom over the years at the bulk of its power-station fleet.

www.ropeaccess.co.za

Locally manufactured knife gate valves

BMG and Abrasive Flow Solutions (AFS) – part of the Engineering Solutions Group (ESG) of Invicta Holdings Limited – play a major role in the local valves sector through the design, distribution, supply and support of a broad range of slurry related valves.

Included in this range of FPV and KLEP valves are slurry knife gate valves, which are manufactured by AFS and distributed throughout Africa by BMG. The AFS manufacturing plant in Benoni is equipped with advanced equipment and is supported by specialists who offer technical support to ensure optimum safety, efficiency and the extended service life of every system.

"BMG's Fluid Technology Low Pressure division works closely with AFS specialists to further improve the quality of knife gate valves by lengthening their service life and reducing maintenance requirements. These objectives are being achieved through the latest developments in design technologies, advanced materials and durable coatings," says Willie Lamprecht, BMG's Business Unit Manager, Fluid Technology, Low Pressure division. "Our highly-skilled teams have a thorough un-

derstanding of the processes where valves are installed and are able to specify the correct valves required for every application. We also assist customers to solve the problems of difficult installations and applications.

"To ensure optimum safety, efficiency and the extended service life of each system, selection of the correct industrial slurry valve is critical. Valve selection is based on various factors, including the size and shape of particles, pressure, temperatures and chemical content."

The BMG knife gate valves range is particularly well-suited for use in harsh conditions in diverse industries, including the mining, chemical and petrochemical, water and wastewater, energy production and agri-food industries.

The range includes:

- FPV Urethane-lined high pressure slurry knife gate valves, designed for full on/off applications.
- FPV wafer slurry knife gate valves, designed as a space saving option for slurry applications.
- The FPV flanged slurry knife gate valve, a bi-directional gate valve

BMG's wafer lug knife gate valves, with a narrow body, have been designed as a space-saving option in corrosive applications



with long-wearing, field-replaceable rubber sleeves.

- FPV high pressure slurry knife gate valves, which have a full flanged body manufactured in cast ductile iron with a double-coat epoxy coating for durability in harsh operating conditions.
- BMG's wafer lug knife gate valves, with a narrow body, have been designed as a space-saving option in corrosive applications. The resilient seat is an elastomer sleeve that supports and guides the gate, ensuring full tightness when closed.

BMG's range of industrial slurry valves includes butterfly, diaphragm and pinch valves for the control and isolation of abrasive slurries, which all meet stringent quality and safety specifications.

www.bmgworld.net

Diesel engines: the road to zero harmful emissions

WearCheck technical manager, Steven Lara-Lee Lumley, unpacks diesel engine emissions and outlines the legislation and technologies being put in place to mitigate against harm.

Barely a week goes by where climate change, global warming and the quality of air and airborne pollutants are not in the news, and quite often vehicle emissions are the primary focus of the headline.

Every day, millions of diesel-powered ships, trains and trucks busily move consumer goods and raw materials from ports, distribution centres and rail yards to stores and industrial facilities throughout the world. Diesel engines are also widely employed in pipeline pumps, electric and water plants, industrial machinery, mining equipment, factories and oil fields.

Unmatched in their reliability, durability and fuel efficiency, diesel engines play a fundamental role but, through their exhaust emissions, they are also associated with a number of environmental and health-related issues.

To successfully navigate the road to zero harmful emissions, we must understand the emissions we are trying to limit, the standards that govern them, the technologies we can employ and the role of the fuels and lubricants we select.

The diesel exhaust gas emissions we are trying to limit

The four main pollutant emissions generated by diesel engines are carbon monoxide (CO), hydrocarbons (HC), particulate matter (PM) and nitrogen oxides (NOx). NOx is a general term referring mainly to nitric oxide (NO) and Nitrogen Dioxide (NO₂) gases.

The gas portion of diesel exhaust is mostly CO₂, CO, NOx, sulphur dioxides (SO₂), and HCs, including polycyclic aromatic hydrocarbons (PAHs). CO and HCs are generated in the exhaust as the result of incomplete combustion of fuel, but exhaust hydrocarbons can also come from the lubricant.

SO₂ is generated from the sulphur present in diesel fuel, so the concentration of SO₂ in the exhaust gas depends on the sulphur content of the fuel. Oxidation of SO₃ produces sulphur trioxide (SO₃), which is the precursor of sulphuric acid which, in turn, is responsible for the sulphate particulate emissions and acid rain.

Out of the various compounds produced, NOx gas and PM are typically portrayed as

the two 'bad boys' of diesel exhaust and have proven to be the most challenging of regulated pollutants when it comes to diesel engine design that is compliant with emission standards.

NOx gases are generated from nitrogen and oxygen under the high pressures and temperature conditions in engine cylinders. Diesel engines run both hotter and at higher pressures than their petrol counterparts and subsequently produce more NOx gases.

Diesel emissions of NOx contribute to the formation of ground level ozone, which irritates the respiratory system, causing coughing, choking, and reduced lung capacity. Ground level ozone pollution, formed when nitrogen oxides and hydrocarbon emissions combine in the presence of sunlight, presents a hazard for both healthy adults and individuals suffering from respiratory problems.

PM or soot is created during the incomplete combustion of diesel fuel. Its composition often comprises hundreds of chemical elements, including sulphates, ammonium, nitrates, elemental carbon, condensed organic compounds and heavy metals such as arsenic, selenium, cadmium and zinc. Though just a fraction of the width of a human hair, particulate matter varies in size from coarse particulates (less than 10 µm in diameter) to fine particulates (less than 2.5 µm) to ultrafine particulates (less than 0.1 µm).

Ultrafine particulates, which are small enough to penetrate the cells of the lungs, make up 80-95% of diesel soot pollution. When one



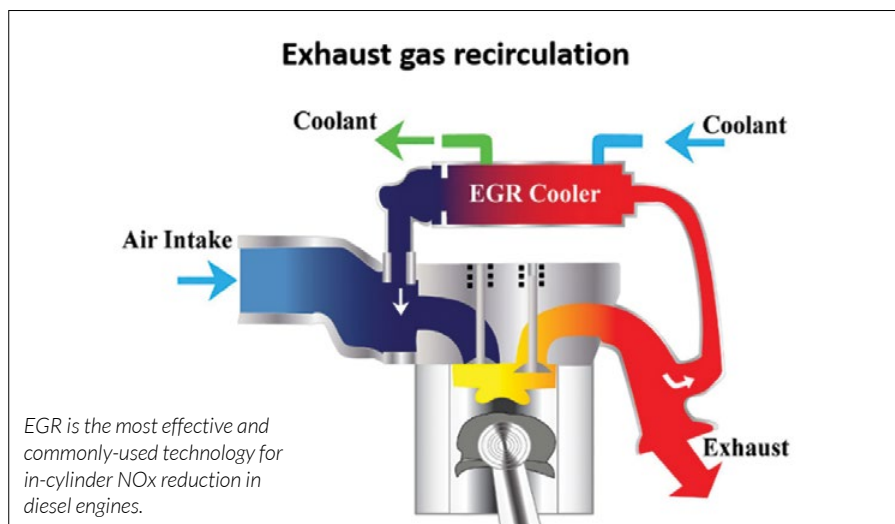
inhales these microscopic particulates, they can become embedded in your lungs and impair the breathing function. As a result of this, diesel PM was officially classified as carcinogenic by the WHO in 2012.

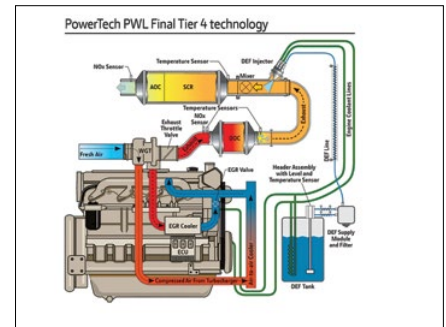
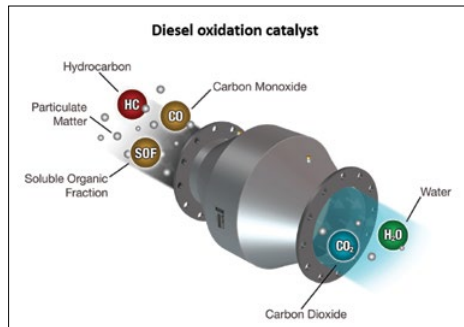
The standards that govern diesel emissions

Emission standards set quantitative limits on the permissible amount of specific air pollutants that may be released from specific sources over specific timeframes. They are generally designed to achieve air quality standards and to protect human life. Different regions and countries have different standards for engine emissions. In order to conform to these emission standards, engines need to produce cleaner exhaust emissions by producing less harmful by-products.

There are four main sets of emissions standards: United States (TIER), Japanese (CEC Central Environment Council), India (BHARAT) and European (EURO) with various markets outside of these regions mostly using these as their base. The European standards are the most widely-followed vehicle emission guidelines in the world, and as such South Africa has elected to follow this standard - although in a somewhat lagged fashion.

Although emissions regulations date back to 1970, the first EU-wide standard - known as Euro I - wasn't introduced until 1992. Since





Left: Diesel oxidation catalysts (DOCs) are highly effective devices that reduce CO and gas and liquid-phase HC emissions by 80% or more. Middle: Diesel particulate filters (DPFs) are designed to trap and retain solid particles until they can be completely oxidised or burned. Right: A schematic of a diesel engine emissions system that meets the Euro Tier IV emissions standard, which specifies: NOx control through a vanadium-based, open-loop selective catalytic reduction (SCR) system or exhaust gas recirculation (EGR); PM control through the use of a diesel oxidation catalyst (DOC) or an aftertreatment system comprising a DOC and an SCR.

then, there has been a series of Euro emissions standards, leading to the current Euro VI version introduced in September 2015.

The aim of Euro emissions standards is to reduce the levels of harmful exhaust emissions, primarily NOx, CO, HC, PM emissions and, in the case of Euro VI-compliant engines, ammonia (NH₃).

Emission mitigation technologies we can employ

Diesel emission control systems can be broadly broken down into two categories: (1) in-cylinder strategies and (2) aftertreatment systems. The selection and configuration of which technologies are used depends on the engine manufacturer and machine application.

In-cylinder technologies

As emissions standards tightened, more advanced in-cylinder control strategies were applied, that included energy-efficient cylinder heads and valve train systems, closer piston-to-bore clearances and modified ring positioning to assist in lower emissions output. In the last two decades, the design of diesel engines has progressed rapidly, most significantly in the areas of fuel injection systems, electronic controls and air handling through the use of variable-geometry turbochargers.

Many of the latest generation engines have common-rail or unit-injector designs, a common feature that produces far higher injection pressure than the old mechanical systems, coupled with precise electronic control of injection timing. Other in-cylinder techniques also include the adoption of the Miller cycle, diesel water injection and homogeneous charge compression ignition (HCCI). These various techniques help achieve a more complete combustion and reduce particulate formation and fuel consumption.

Air handling strategies have focused on the use of variable geometry turbochargers to provide the right amount of air under specific engine operational conditions. Tuning these parameters minimises production of both PM and NOx.

Another popular in-cylinder technology for NOx control is an exhaust gas recirculation (EGR) system, which recirculates a portion of cooled exhaust gas back to the engine's cylinder, reducing peak combustion temperatures and temperature-dependent NOx formation. EGR is the most effective and commonly-used technology for in-cylinder NOx reduction in diesel engines.

Since EGR reduces the available oxygen in the cylinder, incomplete combustion and the production of PM increases when EGR is applied, so NOx and PM must be traded against each other in diesel engine design.

Aftertreatment systems

An aftertreatment system treats post-combustion exhaust gases prior to tailpipe emission. In other words, it is a device that cleans exhaust gases to ensure the engines meet emission regulations.

Within the aftertreatment category there are a further two classes – filters and catalysts.

In chemistry, a catalyst is a substance that causes or accelerates a chemical reaction without itself being affected. Catalysts participate in the reactions but are neither reactants nor products of the reaction they catalyse. A catalytic converter is a device that uses a catalyst to reduce the toxicity of emissions from an internal combustion engine either through the process of oxidation or reduction.

The first diesel emission catalysts, introduced in the 1970s for underground mining applications, were simple oxidation catalysts designed for the conversion of CO and HC, but as the years rolled on and requirements intensified, more specialised catalysts were developed.

Filters do exactly as their name implies, they physically filter out something. To be more specific, these are porous devices for removing impurities or solid particles from a liquid or gas passing through it.

Ultimately, using a combination of physical mechanisms and chemical reactions these systems can, under the right conditions, achieve

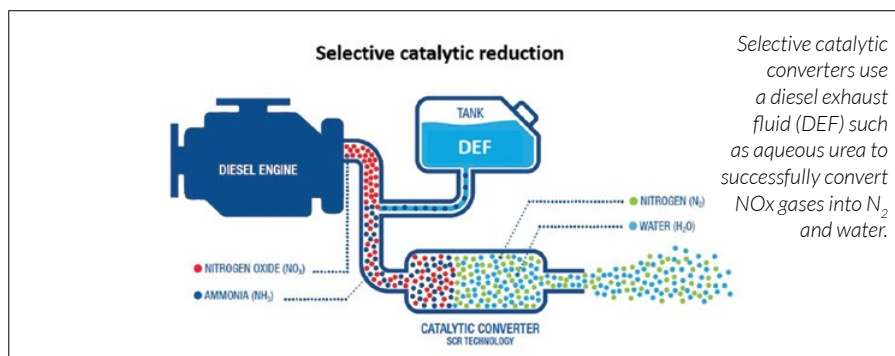
near complete removal of particulates and harmful gases. Let's take a closer look at some of these technologies and how they work.

A diesel particulate filter (DPF) is a device designed to remove soot from diesel engine exhaust gases. DPFs operate by trapping soot particles from the engine exhaust, preventing them from reaching the environment. Unlike catalytic converters, which are designed to reduce gas-phase emissions flowing through the catalyst, the particulate filter is designed to trap and retain the solid particles until the particles can be oxidised or burned in the DPF itself, through a process called regeneration.

The most common DPFs in widespread use are cellular ceramic honeycomb filters with channels that are plugged at alternating ends. The ends of the filter, plugged in a checkerboard pattern, force the soot-containing exhaust to flow through the porous filter walls. While the exhaust gas can flow through the walls, the soot particles are trapped within the filter pores and in a layer on top of the channel walls. Soot particles are captured and retained in the DPF through a combination of depth filtration inside the filter pores and surface filtration along the channel walls. Given the small pore size and design of the honeycomb filters, DPFs can achieve a particle trapping efficiency of 99% or greater.

The honeycomb design provides a large filtration area while minimising pressure losses, and has become the standard, so-called wall-flow filter for most diesel exhaust filtration applications. Ceramic materials are widely used for particulate filters, given their good thermal durability, with the most common ceramic materials being cordierite, silicon carbide and aluminium titanate.

However, over time the trapped soot accumulated in the filter, if not removed, increases backpressure, which can compromise engine performance, increase fuel consumption and eventually lead to DPF failure. To prevent this, the DPF must periodically be regenerated to remove soot through a process that burns off (oxidises) the soot. There are two broad categories of the regeneration processes, (1) active and (2) passive, although most com-



mercial applications use some combination of the two.

Active regeneration requires the addition of heat to the exhaust to increase the temperature of the soot to the point at which it will oxidise in the presence of excess oxygen. The combustion of soot in oxygen typically requires temperatures in excess of 550 °C. Since these high temperatures generally do not occur in the exhaust/DPF during normal engine operation, active regeneration systems may include the use of a diesel burner to directly heat the exhaust entering the DPF; or the use of a diesel oxidation catalyst (DOC) to oxidise diesel fuel over the catalyst as a means of increasing the DPF temperature.

DOCs also require excess diesel fuel in the exhaust, which may be accomplished through a fuel injector/hydrocarbon doser mounted in the exhaust upstream of the DOC; or through late in-cylinder post injection strategies. Other forms of active regeneration include the use of electrical heating elements, microwaves or plasma burners. The use of a DOC in combination with some form of exhaust fuel dosing is, however, the most common active regeneration strategy currently used for on- and off-highway applications.

Passive regeneration, as the name implies, does not require additional energy to carry out the regeneration process. Instead, this strategy relies on the oxidation of soot in the presence of NO₂, which can occur at much lower temperatures. In order to achieve this, a passive system uses a catalyst, which contains precious metals such as platinum, to convert NO in the exhaust to NO₂, which reduces the ignition temperature of the soot to below 550°C. In some cases, the catalyst coating is applied directly to the DPF; or an upstream oxidation catalyst may also be used. Many commercial systems use a combination of a DOC and Catalysed DPF (C-DPF).

Catalytic converters

Diesel oxidation catalyst: CO, as well as gas and liquid-phase HC emissions, result from the incomplete combustion of diesel. Diesel oxidation catalysts (DOCs), are highly effective devices that reduce these emissions by 80% or more from diesel.

In most applications, a DOC consists of a stainless-steel canister that contains a honeycomb structure called a substrate, which is made up of thousands of small channels. Each channel is coated with a highly porous layer containing precious metal catalysts such as platinum or palladium. As exhaust gas travels down the channel, CO and HCs react with oxygen within the porous catalyst layer to form CO₂ and water vapour.

Using a DOC also protects the DPF. Hydrocarbon liquids or vapour can interfere with the DPF's ability to trap and remove particulate matter, so engine manufacturers often route the exhaust through the DOC first, then into the DPF.

Selective catalytic reduction (SCR): NO_x gases generated from nitrogen and oxygen under engine combustion conditions can be successfully converted to N₂ and water using SCR technology – one of the most effective technologies available today. SCR systems are classified into two groups, Urea-SCR and Hydrocarbon-SCR, the latter being most commonly known as a lean NO_x catalyst (LNC).

Urea-SCR uses a reductant known as a diesel exhaust fluid (DEF), which is injected into the exhaust gas to help reduce NO_x emissions over a catalyst, with aqueous urea (CH₄N₂O) being the reductant of choice in SCR systems for mobile diesel engines.

The urea-SCR system uses a metallic (e.g. vanadium-based) or ceramic (e.g. zeolite-based) wash-coated catalysed substrate and the chemical reductant – usually aqueous urea – to convert nitrogen oxides into molecular nitrogen and oxygen in oxygen-rich exhaust streams.

On thermal decomposition in the exhaust, urea decomposes to ammonia (NH₃), which serves as the reductant. As exhaust and reductant pass over the SCR catalyst, chemical reactions occur that reduce NO_x emissions to nitrogen and water. Urea-SCR catalysts are often combined with a particulate filter for combined PM and NO_x reduction.

The reaction between NO_x and NH₃ is never perfect and, even though SCR systems can achieve efficiency rates often higher than 95%, there is sometimes a waste stream of unreacted NH₃ that goes into the atmosphere.

This excess NH₃ is known as NH₃ slip.

For this reason, SCR systems may also include an oxidation catalyst, called the ammonia slip catalyst (ASC), downstream of the SCR catalyst, which oxidises ammonia slip to harmless N₂ and water, usually over a platinum/aluminium oxide base. The ASC is increasingly important in SCR systems designed for high NO_x conversion efficiency, especially in the higher-rated Euro engines.

Lean NO_x catalyst (LNC): Catalytic reduction of NO_x with hydrocarbons is an attractive NO_x abatement method under lean burn conditions, especially when the diesel exhaust is used as a reducing agent. In this process the system injects a small amount of diesel fuel or other hydrocarbon reductant into the exhaust upstream of the catalyst. The fuel or hydrocarbon reductant serves as a reducing agent for the catalytic conversion of NO_x to N₂.

A lean NO_x catalyst often includes a highly-ordered porous channel structure made of zeolite, along with either a precious metal or base metal catalyst. The zeolites provide microscopic sites that are fuel/hydrocarbon rich where reduction reactions can take place.

NO_x adsorber catalysts (NAC): NO_x adsorber catalysts (NACs), also referred to as lean NO_x traps (LNTs), provide another catalytic pathway for reducing NO_x in an oxygen-rich exhaust stream. They are known as adsorbers or traps because part of their function includes trapping the NO_x in the form of a metal nitrate during lean operation of the engine.

Typically, NACs consist of precious metals (e.g. platinum or palladium), a storage element (e.g. barium hydroxide or barium carbonate) and a high surface area support material.

Under lean air to fuel operation, NO_x reacts to form NO₂ over the precious metal catalyst, followed by reaction with the barium compound to form barium nitrate.

Following a defined amount of lean operation, the trapping function becomes saturated and must be regenerated. This is commonly done by operating the engine in a fuel-rich mode for a brief period of time to facilitate the conversion of the barium compound back to its original state and giving up NO_x in the form of N₂ or NH₃ gas.

The role of fuel and lubricants

Steven Lumley will continue this discussion around reducing air pollution through stricter diesel engine emission standards and techniques in Part 2 of her Technical Bulletin, which we hope to present in summarised form in our next edition.

Part 2 will examine the intricacies of appropriate lubricant viscosity as well as the performance criteria of a range of additives and how they contribute to the war against harmful emissions, or not. □

Solutions for all intralogistics needs

With years of experience in integrating systems and designing complete solutions for specific applications, Bonfiglioli can provide the right product to support its customers' growth in materials handling, transportation and storage technology.

Our engineering specialists work side by side with customers to create the best possible solution, whether the request is to optimise an existing machine or to develop a new line. Our relationship with customers is based on an active partnership with fast decision-making processes to develop individually tailored systems.



Automation is perceived to be difficult, mostly when it involves the integration of different products. This is not a challenge with the Bonfiglioli range, which is designed for easy integration. Our complete drive package can greatly reduce installation costs and ensure peace of mind and, in the unlikely event of an issue, we offer a single point of contact.

In the last quarter of 2020 Bonfiglioli South Africa was the preferred partner to upgrade a logistics process plant in KwaZulu-Natal. This involved the supply of geared motors and invertors, with the integration of the drives implemented by CHN Automation.

CHN Automation successfully integrated

Bonfiglioli Agile drives with a 3rd party PLC using the EtherCat protocol. The communication between the devices has shown to be stable and reliable since installation. All the software and related files, including XML files are available on the Bonfiglioli website, www.bonfiglioli.com.

The Agile (AGL) Series is a flexible compromise for standard applications, namely warehouses, materials handling, textile machines, food & beverage, packaging, ceramics and hoisting applications. The Agile Frequency Inverter Series comes in three sizes covering power ranges between 0.12 and 11 kW, with open loop control for asynchronous and synchronous motors. Standard features include sensor-less vector control, an integrated torque-off safety function and on-board Modbus with optional Profibus & CanOpen communication cards which deliver key benefits of smooth start, feed roll control and low energy consumption. For integration into functional safety environments, AGL also offers STO functionality according to SIL 2 and PL d.

Bonfiglioli's high quality and safety standards are evident through UL, CE and TUV Rheinland certifications, while Agile's functional safety meets the EN61508 SILEN standard for inverter controllers and all other standards. Our Bonfiglioli family includes 20 sales branches, 13 production plants and more than 500 distributors around the world supporting customers with dedicated services.

As per our motto 'We Engineer Dreams' □



Bonfiglioli
We engineer dreams

www.bonfiglioli.com

Tel: +27 11 6082030

TUKS students robot race

On Saturday 28 August 2021, the University of Pretoria’s Faculty of Engineering, Built Environment and Information Technology held its annual TUKS Robot Race Day.

The annual TUKS Robot Race Day is back, after being postponed in 2020 due to the COVID-19 pandemic.

Now in its eighth year, the event, coordinated by the University of Pretoria’s Faculty of Engineering, Built Environment and Information Technology, has grown in leaps and bounds with more students getting involved and showcasing their innovation, programming, and engineering skills.

Professor Tania Hanekom, Function Head for Undergraduate Studies in the Department of Electrical, Electronic and Computer Engineering at the University of Pretoria said that, as students are still working remotely due to the ongoing COVID-19 pandemic, paper tracks were designed so they could be printed on A4 pages and pasted together to allow the race to be attempted at home.

“Students work in teams on their robots making use of all the online skills they have acquired over the past few months. At this stage, we plan to let every team upload a video of their MARV (Microcontroller-based Autonomous Robotic Vehicle) that navigates a track at home. These videos will serve as the heats for the competition. The teaching team for the microcontrollers module will judge the performance of the MARVs based on the videos to determine the finalists,” she said.

Professor Hanekom added that the COVID-19 pandemic halted many projects last year which forced students and lecturers to facilitate lessons online and proved to be quite a challenge. “We were disappointed we could not have a Robot Race Day amongst



Professor Tania Hanekom and RS Components SA's Education Specialist, Wesley Hood.

other projects last year, but this year, we’re glad we are still strongly supported by the University’s partnerships with industry, which provides the necessary resources to maintain this flagship event. On behalf of the students and the engineering faculty, I would like to thank RS Components SA for assisting us again with various components for the MARVs and for general support over the years. We look forward to future engagements with RS,” she added.

Wesley Hood, Education Specialist for RS Components SA, said that nurturing the next generation of innovators and engineers was high on the company’s agenda. “One of the ways we continue to support the TUKS Robot Race is by giving the students access to the necessary components and tools they require to build their robots – helping to bring

theoretical concepts to life. It’s amazing to see the talent that the University of Pretoria is nurturing within the Engineering Faculty and each year seems to bring new and exciting developments. RS would like to commend Professor Hanekom and her team for their efforts in making the Robot Race Day an annual success,” he said.

This year’s Race Day finals took place on Saturday 28 August 2021. Given the present situation, the event was not open to the public but was presented online. Spectators can still join in the fun from anywhere in the galaxy! Simply scan the QR code.

za.rs-online.com



A collection of microcontroller-based autonomous robotic vehicles (MARVs) designed and built by TUKS students.



**BEARINGS INTERNATIONAL IS COMMITTED TO DELIVERING
QUALITY, WITH VALUE, TO ALL OUR CLIENTS.**

Bearings International is a member of Hudaco Industries. We are a leading distributor of bearings and power transmission products in Southern Africa. With our customer-focused approach, we are committed to delivering value to all our stakeholders and offer quality solutions that make a real difference to optimising plant availability and turnaround time.



Bearings & Seals
Chains & Sprockets
Electric Motors & Drives
Belts & Pulleys
Gearboxes & Couplings
Lubricants & Tools
Field Services



Tel: 011 899 0000 | Email: info@bearings.co.za | www.bearings.co.za



Boost your plant's productivity and profit 6 ways with a Flexicon® conveyor

1 Convey Almost Anything

FLEXICON® Flexible Screw Conveyors move free-flowing and non-free-flowing materials, from sub-micron powders to large pellets, including products that pack, cake, seize, fluidise, abrade or smear, with no separation of blends.

2 Fit Any Layout

You can route the flexible conveyor vertically, horizontally or at any angle, over or under obstructions, through small holes in walls or ceilings. Mobile units serve multiple functions and require minimal floor space.

3 Cut Maintenance

The rugged inner spiral is the only moving part contacting the material and is driven beyond the discharge point, preventing material contact with seals or bearings, minimising wear and maintenance.

4 End Contamination

Fully enclosed, it prevents spillage, dust and contamination of your product and plant environment. The tube's removable end cap allows evacuation of material and in-place flushing with air, water or steam, or rapid removal of the screw with no tools.

5 Meet Industrial or Sanitary Standards


All material contact surfaces are available in carbon steel or stainless steel, with the exception of the polymer conveyor tube, enabling you to meet industrial, food, dairy or pharmaceutical standards at low cost.

6 Enjoy the Fastest Payback


The combination of top performance, low initial cost and low operational cost maximises your return on investment and profitability.



See why thousands of engineers have purchased more Flexicon conveyors than all competitive designs combined.




Free-flowing materials




Large particles




Moist, sticky materials



Friable materials



Products that pack, cake, smear



Blends of dissimilar ingredients

Contact Flexicon today for free specification assistance and a quote!

SOUTH AFRICA
sales@flexicon.co.za
+27 (0)41 453 1871

UK +44 (0)1227 374710
USA +1 610 814 2400
AUSTRALIA +61 (0)7 3879 4180
SPAIN +34 930 020 509
FRANCE +33 (0)7 61 36 56 12
GERMANY +49 173 900 78 76
SINGAPORE +65 6778 9225
INDONESIA +62 81 1103 2400
CHILE +51 2 2415 1286

flexicon®
.co.za

140745



See the full range of fast-payback equipment at flexicon.co.za: Flexible Screw Conveyors, Tubular Cable Conveyors, Pneumatic Conveying Systems, Bulk Bag Unloaders, Bulk Bag Conditioners, Bulk Bag Fillers, Bag Dump Stations, Drum/Box/Container Tipplers, Weigh Batching and Blending Systems, and Automated Plant-Wide Bulk Handling Systems