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HVAC and COVID-19

Peter Middleton

COMMENT



HVAC systems are “suddenly sexy in our COVID reality”, I read on a recent weekly eNewsletter from CBInsights. It links to a business report that found “deals involving HVAC startups have more than doubled since 2015” – that would be way before COVID-19 – but, it continues, “with a new high deal count in 2020”.

According to the WHO, the primary transmission mode of the SARS-CoV-2 virus that causes COVID-19 is through infected secretions in saliva or respiratory droplets that are expelled into the air when a person coughs, sneezes, talks or sings. If enough infected droplets are inhaled by a person nearby, they too can become infected leading to their saliva and respiratory droplets advancing the disease’s spread.

Hence the advice to wear a mask, which limits the distance droplets will spread from an infected person’s mouth or nose.

The WHO advice lists two size ranges for droplets. Respiratory droplets are between 5.0 and 10 µm in diameter. These will not generally remain airborne though, hence the advice that close contact (within one metre, according to the WHO) with an infected person who is coughing, sneezing, speaking loudly or singing, poses a significant risk of their droplets being breathed in and infecting others nearby.

Also, when falling from the air and onto nearby surfaces, infected respiratory droplets can be transferred to uninfected people via touch, hence the need to sanitise surfaces, wash hands and avoid touching the mouth and nose. This is known as fomite transmission.

Respiratory droplets of less than 5.0 µm in diameter, according to the WHO, are referred to as droplet nuclei or aerosols. These smaller droplets can remain suspended in air, making it possible for people to become infected without being in close contact with a ‘spreader’, “if the aerosols contain the virus in sufficient quantity to cause infection within the recipient”. Citing several studies in health care settings, however, the WHO scientific brief of July 9 reported that “no studies have found viable virus in air samples”.

Since confined spaces with crowds of people have been the focus of avoiding infection, I have always been surprised that travelling in an aeroplane is deemed relatively safe. WHO special envoy for COVID-19, David Nabarro, says this is directly due to “modern aircrafts’ air filtration systems” and that “the ventilation system includes really powerful filters, which means that, in our view, they are relatively safe.” He goes on to add that travellers should respect social distancing

rules, particularly in confined settings, “especially when there’s singing or shouting”.

In Chapter 8 on air travel in a report titled *Travelers’ Health* put out by the USA’s CDC (Centres for Disease Control and Prevention), the authors note that modern and modified aircraft recirculate between 10 and 50% of the air in the cabin, mixed with outside air. The recirculated air passes through a series of filters 20 to 30 times per hour and in newer-model planes, “through high-efficiency particulate air (HEPA) filters, which capture 99.9% of particles (bacteria, fungi, and larger viruses or virus clumps) down to 0.1 to 0.3 µm in diameter.

The report suggests that “air generally circulates in defined areas within the aircraft, thus limiting the radius of distribution of pathogens spread by small-particle aerosols. As a result, the cabin air environment is not conducive to the spread of most infectious diseases”.

As a caveat however, it notes that some diseases may be spread by contact with infected secretions, such as when an ill person sneezes or coughs – and the secretions or droplets land on another person’s face, mouth, nose or eyes.

The Health and Safety Executive for the UK (HSE), in its guidance for general ventilation states that employers must, by law, ensure an adequate supply of fresh air in the workplace to help reduce the risk of spreading coronavirus. So, the advice reads, “focus on improving general ventilation, preferably through fresh air or mechanical systems” and, where possible, employers should “consider ways to maintain and increase the supply of fresh air, for example, by opening windows and doors”.

Also suggested is to improve the circulation of outside air and prevent pockets of stagnant air in occupied spaces, by using ceiling or desk fans, for example. “The risk of transmission through the use of ceiling and desk fans is extremely low providing there is good ventilation in the area it is being used, preferably provided by fresh air”.

Similarly, it continues, “the risk of air conditioning spreading coronavirus (COVID-19) in the workplace is extremely low as long as there is an adequate supply of fresh air and ventilation”.

While I am unconvinced of the sudden transition to the sexiness of HVAC systems due to the COVID-19 pandemic, it has focused our minds on the need for fresh and clean air. It’s good to be reminded that air conditioning is not only about making us feel more comfortable inside than we feel outside. □

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The Festo Core Product Range: Stars in Automation

Quality and attractively priced solutions from a reliable partner are the keys to success during difficult times, leading many companies to expand their use of automation. In response, Festo has added more products to their Core Product Range which, according to the Festo South Africa Head of National Sales, Adrian Bromfield, are a step towards becoming the partner of choice for automation companies.



This year, the South African government has had to impose strict restrictions to suppress the spread of COVID-19. As a result, there has been a ripple effect on the economy and industry, including the automotive, food and beverage, textile and medical industries. The Festo Core Product Range, also known as Stars in Automation, offers solutions to support automation in these industries during these times.

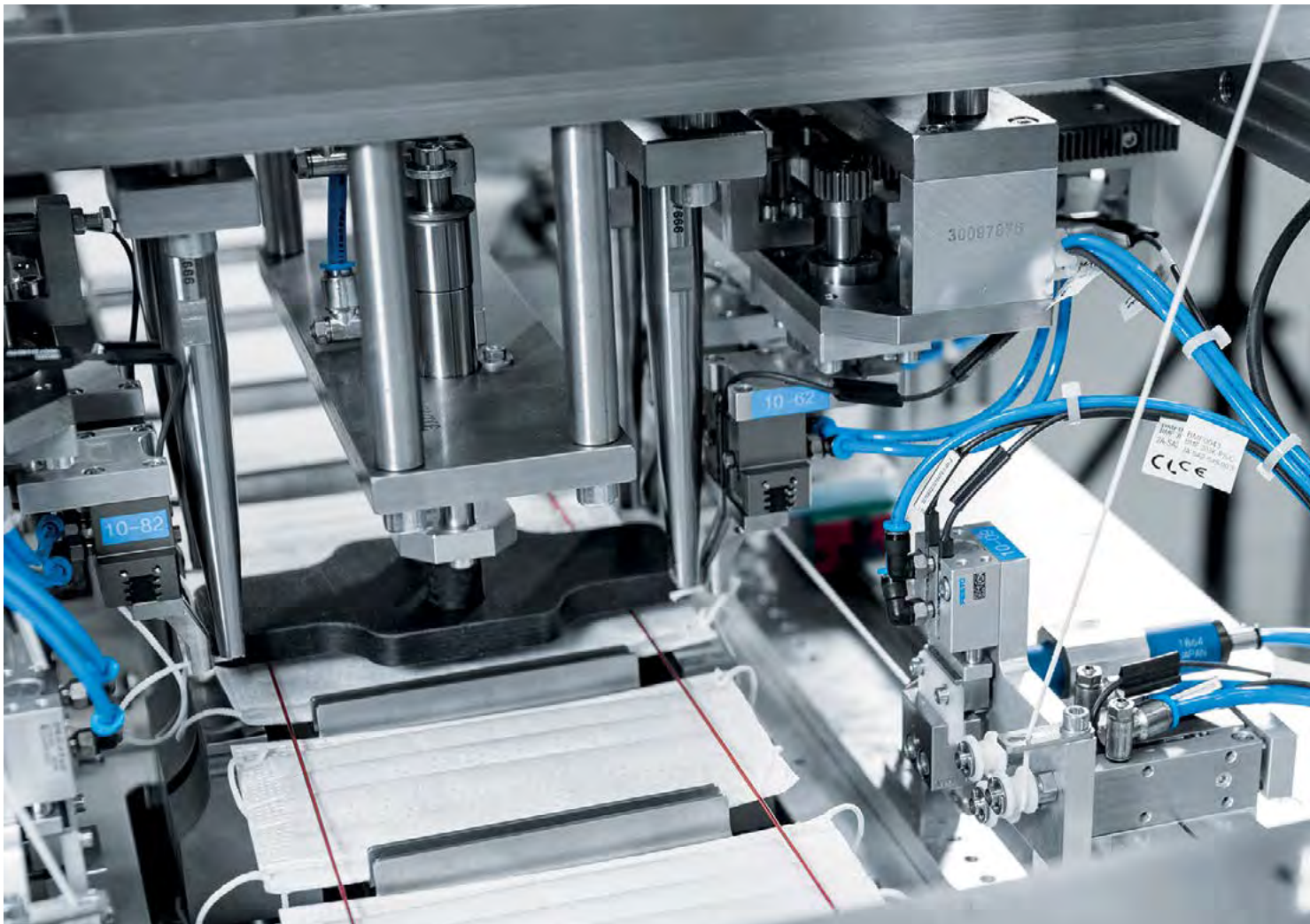
The Core Product Range consists of the latest technologically advanced solutions to assist customers to become more competitive, without compromising high-quality and

attractive prices. Through these selected products, Festo is helping companies to cut costs and effortlessly realise up to 80% of the automation applications needed by their industry.

“As a preferred partner in the Automation Industry, we look at our customer’s challenges and design high-performing solutions to overcome them. This is why we recommend the latest Core Product Range to our customers that require products with optimal price-performance ratios,” says Adrian Bromfield, Head of National Sales at Festo South Africa. The hallmark of the latest Core Product Range is the collaboration between design engineers

and production planners from Festo, who have worked closely together during the development of the range to ensure that the products meet customer needs.

According to research institution Meticulous Research, the overall estimated impact of COVID-19 in the Automation Industry is 7-8%. As leaders in this industry, Festo recognises the vital role of supporting industry through this pandemic. These products are one of the initiatives that the company is using to support its customers.



Some of the core range products, highlights and features that customers can expect from Festo are listed below.

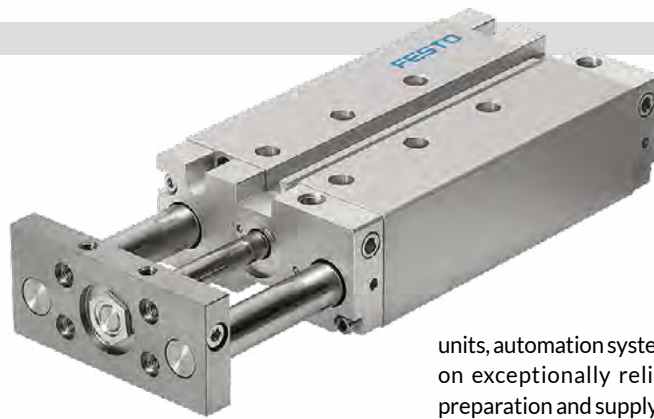
Smallest slide drive in the market

The Festo Mini Slide DGST is strong when it comes to precision, force, motion control, durability and reliability. The yoke and slide are manufactured fully automatically as a single part.

In addition, the developers successfully reduced the number of components by 60% compared with the previous model. This enables the DGST to be produced in large quantities with maximum efficiency and cost-saving.

Available in a twin-piston design with diameters from 6.0 to 25 mm and stroke lengths of 10 to 200 mm, the slide houses, the integrated guide and the endplate are all manufactured from a single part, eliminating torsion and misalignment to provide precise movement.

Impact shocks at the end of the stroke are reduced by integrated cushioning elements seated within the body length. With built-in stroke adjustment, the DGST eliminates the need for additional parts, saves space and ensures top application performance.



Festo DFM guided cylinders have the best price/performance ratios in the market and offer optimum guide characteristics for sturdiness and flexibility.

DFM guided cylinders: flexibly adapt to applications

Reliability is standard with the Festo DFM guided cylinder. This impressive guided actuator has the best price/performance ratio in the market and offers optimum guide characteristics for sturdiness and flexibility. It is reliable, adaptable and resilient – even with high torques.

With two different guide variants, the DFM can, on average, move loads that require over 100% higher forces than its competitors. It adapts flexibly to every application, thanks to a choice of assembly and air port options. The combination of its linear drive and powerful guide unit means that the DFM can reliably move high loads, even in tight spaces.

For example, the recent pandemic has resulted in a strong demand for mouth and nose protection masks worldwide. With Festo technology and pneumatic components from the Core Product Range, such as the attractively priced DFM, the mechanical engineering company Mikron has developed a system that allows practically anyone to produce masks themselves. The electrical and pneumatic components from the Core Product Range installed in the Mikron plant can be delivered quickly worldwide so the plant can be constructed at locations anywhere in the world.

Highly functional MS air service units

With its large product range, highly functional components and wide choice of services, the MS series fits perfectly in the Festo Core Product Range, offering a complete concept for compressed air preparation for simple standard applications as well as application-specific solutions with the highest quality requirements. Whether individual components, pre-assembled combinations, application-specific combinations or ready-to-install solutions are required, the Festo configurator ensures optimum dimensioning of every variant.

Thanks to the integrated pressure and flow sensors embedded into the MS series service

units, automation system operators can count on exceptionally reliable compressed air preparation and supply for their installations.

The VUVG solenoid valve: a compact powerhouse

Compact, high flow rate and low cost, the VUVG solenoid valve is ideal for small parts assembly and electronics and for use in the food and packaging industry. Electrically and pneumatically actuated, the VUVG valve can be used both as an individual valve and in a valve terminal.

One of the unique characteristics of this valve is its optimised footprint with an excellent size/performance ratio. Compact and made from lightweight aluminium, the VUVG saves space in the system and reduces weight. Its 10 bar technology ensures accelerated cycle times, smaller cylinder sizes and a higher energy density, while the patented cartridge principle makes the VUVG solenoid valve extremely durable and very reliable.

Festo PUN-HT transparent tubing

Suitable for compressed air and vacuum media, the Festo PUN-HT is of the most sought after tubing in the industry. It is water-resistant, making it ideal for applications in wet areas and in environments with high moisture levels. Not only is the tubing kink-resistant and easy to install, it is also resistant to hydrolysis and microbes.

PUN-HT tubing's transparent colour makes it easy to detect solid particles, moisture and oil. This feature ensures simple monitoring of compressed air quality, allowing for preventative maintenance measures.

2 200 Festo products

The Core Product Range includes over 2 200 components from every phase of the pneumatic and electrical control chain – from compressed air preparation, valves and cylinders to accessories, such as matching tubing and fittings. Several components marked with a star on the Festo website are typically in stock locally and ready to be ordered.

Products in the Core Product Range are of proven Festo quality with high logistics performance thanks to automated production at various decentralised locations. "We pride ourselves on offering products that give customers peace of mind in tough times, which allows them to concentrate on their core competencies," concludes Bromfield.

marketing.za@festo.com



The containerised Mikron mask production plant uses readily available components from the Festo Core Product Range to enable practically anyone in the world to locally produce COVID safety masks.

Integrated bearing and power transmission solutions for rotating equipment

SKF Power Transmissions product manager, Frans Odendaal, talks about the integrated nature of SKF solutions around the rotating shaft, which include bearings, power transmission products, seals, lubrication, condition monitoring and maintenance services.

SKF is globally renowned as a world-class manufacturer and supplier of a wide range of premium quality bearings. With an investment of over 100 years of experience, the company has evolved into a turnkey rotating equipment and technology solutions specialist, complementing its bearing offering with a wide range of power transmission, seals and lubrication products.

SKF South Africa's Power Transmissions product manager, Frans Odendaal, points out that SKF's complementary product portfolio shares a close connection with bearings. "So whether customers across sub-Saharan Africa require a bearing or a power transmissions product or both, it makes sound business sense that they should be able to conveniently find the best solution from a single source.

"Power transmission is not a separate business from our bearing business and customers can be assured of the same high quality in our power transmission products that our bearings are renowned for," continues Odendaal.

He notes that the manufacturing process is fundamental to product quality. SKF is equipped with the necessary knowledge to be able to improve quality and increase capacity and performance of the end product through material upgrades and alterations to the manufacturing process.

"A good example is our couplings; these are forged from C45 material, which we can upgrade to alloy steel that has been hardened, increasing the torque rating by 30% to 40%. Similarly, we can upgrade our standard V-belt and Extra Power belt to a different material to make the products easier to tension during installation and by making a change in the manufacturing process to deliver a 30% to 40% higher power rating."

SKF's quality-driven approach ensures that all products comply with a range of international standards. But Odendaal points out that the quality is not dictated by the standard, which means customers can expect more from SKF. He cites an upgrade by SKF of a key customer's elevator from sixty t/h to one hundred t/h as an example of SKF's power transmission quality.

"Whereas previously the customer experienced numerous failures, the elevator has now been operating failure free for

some seventeen months. "The highlight for me was when the customer told us the elevator operated so quietly, they had to stand close to it to make sure it was running!"

Another example of SKF's power transmission quality is the company's medium to high torque disc couplings, which are ideal for highly accurate drive and heightened temperature applications.

The couplings will operate seamlessly at high speed without backlash. In addition to a long service life as a result of the absence of friction between the components, these couplings require zero maintenance. For customers and end-users this means maximised uptime and reduced costs.

"Thanks to SKF's commitment to superior-quality products and service, customers are specifically requesting our power transmission products," says



SKF's complementary power transmission product portfolio shares a close connection with bearings.

Odendaal adding that key original equipment manufacturers and agriculture customers have specified SKF gear couplings and SKF chain for their equipment.

OK couplings, also part of SKF's extensive power transmission portfolio, incorporate the SKF hydraulic oil injection system, which makes them ideally suited for



SKF couplings are forged from C45 material, which the company can upgrade to alloy steel that has been hardened, increasing the torque rating by 30% to 40%.

propellers in large boats such as frigates. The hydraulic oil injection system makes for easier installation and removal which, in terms of cost saving, extended lifespan and increased productivity, is particularly beneficial for very

large sized grids or gear couplings. Odendaal says that although the boat market in South Africa is not very big, the application still holds value locally. "We can tap into SKF's global support network and expertise, and

combine this with our local knowledge and experience to add value for customers, putting them in a position to achieve and even exceed their productivity and profitability goals," he concludes. □

SKF Enlight ProCollect extends lubrication management support

SKF has extended the capability of its Enlight ProCollect portable data collection system to enable maintenance engineers to plan lubrication routes around a factory or process operation. The latest version includes a lubrication management tool to enable maintenance personnel to plan detailed manual lubrication routines for factory equipment.

Lubrication is vital to rotating equipment performance and needs to be carried out at regular intervals. The new enhancement to Enlight ProCollect will help manufacturing and process organisations to improve maintenance procedures, with the potential to increase uptime and reduce costs.

"This is a significant step towards integrating condition monitoring and lubrication data," explains Barrie Rodgers, product line manager for Mobile Solutions at SKF. "The extended scope of Enlight ProCollect allows users to create, schedule and carry out lubrication routes more effectively."

Enlight ProCollect is a portable condition-based monitoring system that helps companies adopt digitalisation into their

maintenance strategies. The new functionality, made possible by an update to the SKF ProCollect app, helps users to collect vibration data and carry out re-lubrication simultaneously.

When creating lubrication routes, maintenance managers can define the correct lubricant, amount, location and interval in advance. They can also document specific assets and their lubrication demands via a web-based cloud portal called SKF Enlight Centre. In this way, lubrication routes can be assigned to individual maintenance staff.

Technicians are alerted when each route is due, and the mobile app guides them through the correct lubrication routine. Lubrication data is entered directly into the app and automatically uploaded to allow documentation to be instantly completed and subsequent analysis of factors such as route verification and task trends.

This approach helps companies make better-informed decisions while giving maintenance managers peace

of mind. They know instantly that a lubrication route has been completed correctly and on-schedule, with greater visibility of overall maintenance activities, route status, team performance and asset health.

The latest SKF ProCollect app with the extended lubrication management capability is now available from online App Stores. □



SKF has extended the capability of its Enlight ProCollect portable data collection system to enable maintenance engineers to plan lubrication routes.

Clip-on indicator, configuration and data logging tool

WIKA has introduced the new PR 4512 clip-on, Bluetooth-enabled data logging and configuration tool for all of its PR 4000 and 9000 measurement devices.

The PR 4512 tool enables operators to monitor live process values and diagnostic information on an iOS/Android device running the free PPS application. Alternatively, measured values and/or configuration data can be accessed directly on the PR 4512's display.

Advanced data logging, including time stamped events utilising the built-in real-time clock, is embedded into the device. With its 100 MB onboard memory, the PR 4512 can log more than 2.75-million data points. This typically amounts to 30 days of recorded process data at one-second intervals – ideal for preventive maintenance.

While on-site, the tool makes it very easy to analyse real-time process data by uploading it to an iOS or Android device. Off-site, the data can be viewed in .csv format for convenient transfer and advanced analysis using computer-based condition monitoring/data analysis packages.

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Brittle fracture: what to watch out for



Tim Carter

Brittle fracture is characterised by its sudden onset, an almost complete lack of plastic deformation, and the loud sound that usually accompanies it. The noise is caused by the speed of propagation of a brittle fracture, which is usually at the speed of sound in the material fracturing.

Many materials are brittle, perhaps the best known is grey cast iron, as anyone who has taken a hammer to a grey cast iron component to drive it into place is aware. But grey cast iron does not fracture via a brittle mechanism. The carbon in grey cast iron is present as graphite flakes, each behaving like a tiny crack, leaving only a small area of the ductile matrix to sustain loads in tension. Thus, it cannot withstand much tensile loading before the ductile matrix fails. The graphite flakes contribute nothing to the strength of the material in tension, but comprise the bulk

of the load-carrying area.

Another non-metallic material generally accepted as brittle is glass, as many school-boys, aspiring to open the batting for their country at Lord's have discovered to their (or their parents') cost. If nothing else, it makes the trade of glazier one of the most secure.

It does not have to be so. By modifying the shape of the graphite in cast irons to spheres rather than flakes, it becomes very tough and fracture resistant in tension, while modern glass-making techniques have produced glass that can withstand the most aggressive batsman's stroke.

Brittle fracture in crystalline materials like steel operates by cleavage, where the grains cleave or split along preferred planes within the crystal. Hence grain size is an important factor. Coarse-grained materials are more prone to brittle fracture because the cleavage planes are longer, and it is for this reason they are avoided in most applications.

An exception is the core laminations of an electrical transformer, where coarse grained material is deliberately used for its electrical properties. It works well there, but the mechanical loadings on a transformer are low, static and primarily compressive.

Brittle fracture is nothing new. The mechanism is well understood, even to the point

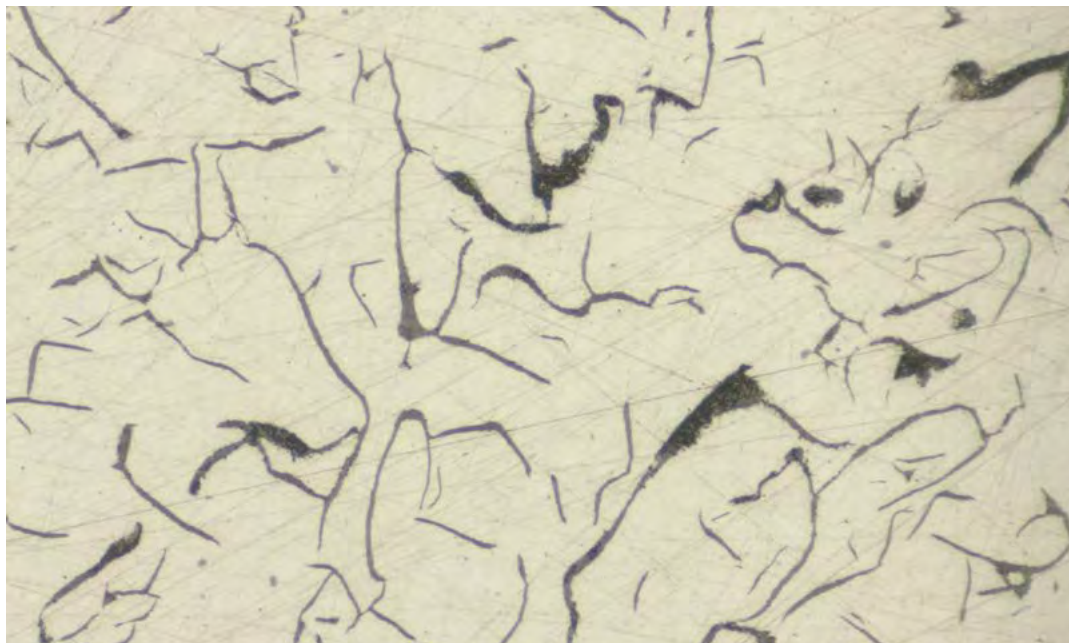
where materials that are inherently brittle can be made to behave in a ductile manner. Equally, ductile materials can be made to behave in a brittle manner. In the steels we use every day, reducing the temperature can induce brittle behaviour at a characteristic temperature known as the 'ductile-brittle transition', which occurs in steels at reduced temperature. Increases in strain-rate have the same effect, however.

To measure the brittle characteristics of steels, we use an impact test, where the strain rate is some 10⁶ times faster than a conventional tensile test, and frequently at low temperatures too. The values we get from such impact testing are, however, purely qualitative. They cannot be applied to the design of real-world components, but they are useful to compare materials and as a quality control test.

Cast iron, despite its weakness in tension, is immensely strong in compression, because the compressed graphite flakes sustain the load without separating from the matrix and cannot behave as crack-like defects. It was used to great effect in the construction of a cast iron bridge over the River Severn in Shropshire in England in the 1700s, in which every part is designed to be loaded only in compression. It stands to this day and is still

in everyday use, though only by people on foot and the odd bicycle. I doubt if it would survive a heavy 18-wheel truck driving over it, even if it were wide enough, which it isn't. It is situated in a place named, Ironbridge!

Unlike most metallic materials, conventional window glass is not actually a solid, but rather a super-cooled liquid. As such, it is not crystalline but amorphous. It will flow under load at room temperature, albeit very slowly. Several years ago, on a working visit to Richard's Bay, I observed that a glass shelf, used to hold glasses in the breakfast room of the guest house, ticeably. Seeing me examining

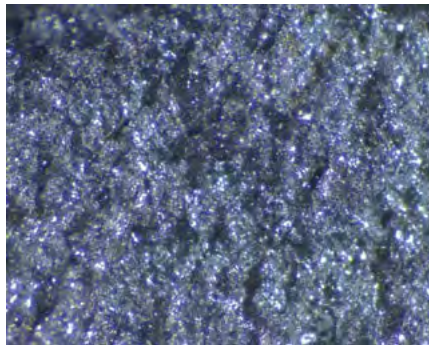


Cast iron is often thought of as 'brittle', but it does not fail via a brittle fracture mechanism. The graphite - dark flakes in this image - in grey cast iron behaves like tiny cracks, leaving only a small area of the ductile matrix to sustain loads in tension.

it, the guest house owner told me they were going to replace it. I advised her to invert the shelf and, when it had crept back to being flat, to add a third support bracket in the centre to reduce the load. Some months later, I noted that this had been done, and that the shelf was returning to its original state. The very low strain rate, many orders of magnitude less than that imposed by a well-struck cricket ball, caused a normally brittle material to behave in a ductile manner.

If we take a normal structural steel and cool it to below the ductile-brittle transition temperature, it will change into a brittle material. Some years ago, I was asked to look at a problem of cracking in mining equipment. The cracks were brittle, exhibiting all the features typical of cleavage, yet when tested in the laboratory the material was ductile.

A little digging showed that the equipment was found to be cracked on delivery to the mine. Situated in northern Canada, the mine was only accessible in winter when the normally swampy terrain was frozen hard enough to bear the weight of the truck. As the truck drove over the 'road', which was rather less than billiard table smooth, the trailer carrying the equipment twisted, passing loads into the equipment that was firmly chained to it and resulting in brittle fracture. A change to the



Left: Brittle fracture in crystalline materials like steel operates by cleavage, where the grains cleave or split along preferred planes within the crystal. **Right:** Brittle fracture is characterised by its sudden onset and an almost complete lack of plastic deformation. This man-hole cover, designed for foot-path use, was accidentally installed on an airfield apron, and failed when a jet taxied over it.

way the load was secured ensured that the trailer twisting loads were not transferred to the cargo, which cured the problem.

For many years, it was thought that the loss of the *Titanic* was due to brittle fracture when the vessel struck the iceberg. It wasn't, as samples recovered from the wreck by Dr Robert Ballard showed when they were examined by Dr Tim Foelke at the NIST laboratories in the US. The problem was poor rivets which 'unzipped' on impact, and an inadequate design of the water-tight compartments. Her sister ships, the *Olympic* and the *Britannic*, were subsequently modified. The *Olympic*

eventually went to the breaker's yard. The *Britannic* struck a mine in the eastern Mediterranean whilst serving as a hospital ship during World War 1. It took several hours to sink and the only casualties were the occupants of a life-boat that drifted into the still-turning propellers.

Failures such as these, whether from brittle fracture or not, are almost always possible to avoid given appropriate design and manufacturing workmanship.

The opinions expressed in this column are mine and mine alone.

timjcarterconsulting@gmail.com

A century of true impact.

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Specialist diagnosis and repair for Cat injection systems

Specialist expertise and equipment allow Reef Fuel Injection Services to accurately diagnose faults in Cat fuel injection systems quickly, and get these machines back on the road in double-quick time.

“Using advanced Cat fuel-system-specific equipment, we are experts in pinpointing the root cause of failure,” says Warren Hauser, manager at Germiston-based Reef Fuel Injection Services. “This essentially ensures that we are not trying to fault-find through a process of elimination at the customer’s expense.”

of a breakdown, for a workshop to replace the entire fuel injection system, including the diesel pump, injector and common rail to resolve an issue.

“With economic conditions becoming more difficult, it is unlikely that Cat owners can afford to replace entire diesel fuel injection systems, if this is not strictly required,” says Hauser. “We use our specialised diag-

nostic tools to zoom in, so that if it is only the injector that requires attention, we attend to that directly.”

The company’s field services team can even attend to the machine on site at short notice, often much quicker than the OEM. Using service exchange components, downtime can be significantly reduced. Should the customer choose, the fuel injection components can be removed on site and taken back to the Reef Fuel Injection Services workshop for comprehensive testing and a detailed report. The OEM is not equipped to conduct this level of investigation.

“Our advanced facilities allow us to provide a cost-effective remanufacturing service instead of simply replacing expensive components,” Hauser says. This factor becomes even more important for customers in times of rand volatility against the dollar, and in the face of potential disruptions to global supply chains for spare parts.

The Reef Fuel Injection Services message is clear: Cat owners can benefit considerably from correct diagnosis upfront, less downtime of equipment and the competitive pricing that comes with quality remanufacturing.

Reef Fuel Injection Services caters to the full range of Cat diesel engines.

www.reeffuel.co.za



Left: Specialist expertise and equipment allow Reef Fuel Injection Services to diagnose work-stopping faults in Caterpillar fuel injection systems quickly and accurately. **Right:** A remanufactured Caterpillar 920 sleeve metering on test at Reef Fuel Injection Services.

Bosch Rexroth SA’s essential hydraulic services

When Bosch Rexroth company, Hytec Secunda, was tasked with overseeing the urgent repair of a two hydraulic cylinders for a large regional customer, all the stops were pulled out to overcome COVID-19 lockdown challenges.

Working with fellow Bosch Rexroth South Africa Group company, Hytec Engineering, the cylinders were delivered and installed in just 10 days, despite the challenges of South Africa’s nationwide lockdown during the period, ensuring downtime on the associated important plant functions was kept to a minimum.

Hytec Secunda was responsible for all site work, as well as transport of the cylinders between the plant and Hytec Engineering’s cylinder manufactory in Johannesburg.

There, the 250/115x1060 FF filter press

cylinder was overhauled, including stripping, inspection, refurbishment, honing and testing. This cylinder works in a filter press that solidifies gunk and separates the liquid from the solids for further processing.

Hytec Engineering also manufactured a new cylinder for a flopper gate. An older cylinder is currently being repaired that will be used as the backup cylinder for this equipment in the future.

“Repairing an hydraulic cylinder can be far more cost-effective than purchasing a new one,” explains André Lindeque, Hytec Engineering’s general manager. “The challenge was to rapidly coordinate the service of this equipment

in line with the lockdown restrictions to minimise downtime of these essential plant processes.”

Hytec Engineering provides end-to-end hydraulic cylinders services for mines and industries across sub-Saharan Africa.

www.boschrexroth.africa



The cylinder repair work was executed during South Africa’s national COVID-19 lockdown to minimise downtime at the plant.

Surveys and condition monitoring of process valves crucial

BMG, which has been providing engineering support to essential service providers during the COVID-19 crisis, encourages plant operators not to neglect condition monitoring at this critical time.

“To ensure safety, environmental protection and high productivity at a plant, it is very important to monitor closely the condition of process valves. It is crucial that operators are aware a valve is leaking, or if there are any valve failures that could expose operators and the plant to unnecessary risks,” says Willie Lamprecht, business unit manager, Fluid Technology, Low Pressure at BMG.

“By combining condition-based maintenance products for process valves with planned maintenance programmes, downtime at a plant is reduced, and productivity and safety levels significantly improved. BMG Fluid Technology specialists offer customers valve condition monitoring services that ensure reliability, safety and efficiency of all processes.

“The risk of valve failure can be efficiently managed through correct and reliable monitoring and testing techniques. Condition monitoring enhances safety through the containment of process fluids. Valve failures, which are dangerous for personnel and harmful to the environment, also contribute to lost production, resulting from downtime.”

BMG’s field service technicians and trained branch personnel are available to conduct site and plant surveys in order to monitor the condition of valves and make recommendations for improved performance. Regular surveys enable BMG specialists to ensure that valves and automation systems function to exact requirements and also enable the team to identify equipment that should be included in scheduled maintenance programmes, to reduce unplanned plant downtime and loss of production.

A full range of valves is available from BMG outlets throughout Southern Africa, where specialists are on hand to ensure correct valve selection and to assist with problem-solving for customers and end users.

BMG’s range of Interapp butterfly valves, which is produced in Switzerland, is recommended for use in high-acid applications, while Desponia valves, which are manufactured in Spain, are available with different lining materials for reliability and extended service life in diverse industries. These include mining, water and wastewater works, sugar

plants, paper and pulp, food and beverage, and energy production facilities.

The locally manufactured BMG Klep Valves range include diaphragm, pinch and wedge gate valves, which are all designed for enhanced operating efficiency and extended service life in many sectors, including harsh environments. This range includes soft natural rubber-lined diaphragm valves, which are widely used in mineral processing and mining and slurry applications. Other lining materials include butyl, nitrile, jumbo (NAX), halar and hard rubber. Wedge gate valves are manufactured by BMG Klep Valves for Eskom for use on the fly ash lines.

BMG’s SAFi thermoplastic industrial valves are designed to efficiently handle corrosive and abrasive materials. The range, which conforms to stringent international quality specifications, incorporates ball, butterfly, diaphragm and non-return valves, as well as strainers and tank fittings – all manufactured from high quality non-corrosive materials.

SAFi’s lightweight polymer materials are integrated with a robust valve design for reliable performance, easy installation and low maintenance, reduced operational costs and extended service life.

Materials used include: glass reinforced polypropylene (GRPP) with excellent mechanical and UV resistance for use in water treatment and recycling, polyvinylidene fluoride (PVDF), which has a smooth surface that prevents the development of micro-organisms – a critical feature in food production, polypropylene (PPH) materials, for use in marine applications due to good chemical resistance, particularly to salts, acids and alkalis, PPH thermoplastic materials with carbon fibres, which are semi-conductive and compliant with ATEX specifications for safe use in hazardous environments and potentially explosive atmospheres.

BMG specialists recommend SAFi



BMG’s SAFi thermoplastic industrial valves are designed to efficiently handle corrosive and abrasive materials.

thermoplastic ball valves for use in on/off regulation applications. These thermoplastic ball valves are maintenance-free and have the ability to close faster, also ensuring extended service life.

BMG’s Pneumatic division specialises in pneumatic, electric and hydraulic valve actuation systems, with advanced process instrumentation, to ensure correct operation of valves on-site.

The company’s national branch network offers a technical advisory and support service to ensure optimum efficiency and the extended service life of every valve. A total process and lubrication management service is also offered.

www.bmgworld.net

BMG’s range of Interapp butterfly valves, which is produced in Switzerland, is recommended for use in high-acid applications.



Multotec advocates joining hands to advance process technology

The age of digital technology holds huge potential for equipment performance in the field of mineral processing, but Thomas Holtz, group chief executive officer of Multotec, cautions that little progress will be made if equipment suppliers continue to work only on their own.

The inclusion of today's technologies in mineral processing equipment, "demands collaboration on an unprecedented level," says Thomas Holtz, group chief executive officer of Multotec. "To begin with, we need outside specialists to help build digital technology into our existing products. But we also need to cooperate with other process equipment

suppliers to ensure we feed into common systems that make customers' plants more efficient," he adds.

He highlights the power of sensors, digital data communication and computer analytics to transform how mineral processes are monitored and optimised. Technology can make the plant a safer place and can run processes more efficiently. This includes monitoring wear life,



Thomas Holtz, Group Chief Executive Officer, Multotec.

helping mines plan for better maintenance and improved uptime.

"At Multotec, we have invested considerably in applying sensor technology – especially the use of accelerometers," says Holtz. "The real work, however, comes with the management and interpretation of the data these sensors generate."

For this reason, data analytics becomes the real value when applying this monitoring technology. He notes that this aspect of product development must generally be conducted with a specialist service provider over a long period of time. Even then, the process is usually arduous.

"Our technology journey to date shows how challenging it is to analyse the data we collect in a way that we can draw conclusions which are useful for our purposes," he says. "It is relatively easy to monitor vibration levels on a bearing and to generate a trend line on a graph. It is less simple, for example, to automate an operational response to that information."

Much progress has been made, he says. Through collaboration with a technology partner, Multotec is developing a machine learning process to analyse vibration data from a cyclone. Based on this real-time data, an artificial intelligence server generates alerts related to pre-defined condition levels. He makes the point, though, that each equipment supplier can only monitor those functions within a process circuit in which their equipment performs.

"To fully leverage today's digital technology, plant managers need equivalent information from every item of equipment operating in the circuit," he says. "This full range of data – coming in from all the equipment – then needs to be synthesised to optimise the run-



The challenge with the technology investment lies in analysing and interpreting data in such a way that it is useful and actionable.



Industry collaboration will combine small innovations into significant progress in the use of technology for mining customers.

ning of the plant.”

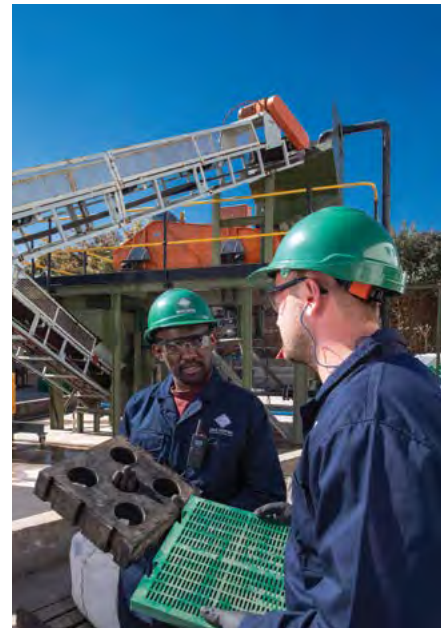
One immediate challenge is that most existing process plants were not built to accommodate the latest technologies. Especially under current cost pressures, retrofitting entire plants is seldom an option. Sadly, there are not many greenfield operations being opened that provide opportunities to apply new ideas and equipment from scratch.

Prevailing mindsets are also an obstacle, argues Holtz. Most suppliers jealously guard their intellectual property, frustrating any attempt at collaboration. “We need to work toward a new approach, in which each player brings some input based on their area of

expertise,” he says. “Many small innovations – when combined – can produce significant progress and generate a meaningful advance for our mining customers.”

He highlights that all the equipment in a plant needs to talk to a central system or ‘brain’ that will drive the innovation mines are looking for. Only in this way can mines gain efficiencies through technology and become more sustainable. This, in turn, provides the foundation for success on which their service providers can thrive.

In conclusion, Holtz emphasises the importance of gradual and sustained technological progress. Many new technology ideas are met



Technology can improve safety and can run processes more efficiently.

with unrealistic expectations, and people are disillusioned when these are not immediately realised.

“Closer and ongoing collaboration with all stakeholders – including mines and design houses – will allow us to achieve the important long-term benefits that technology can and must deliver to our industry,” he concludes.

www.multotec.com

New spiral for better ferrochrome recoveries

Following years of detailed test work in the ferrochrome sector, Multotec has successfully developed and proven a spiral concentrator that eliminates beaching and enhances recoveries in the 1 mm to 3 mm fractions of high density material. When compared to traditional spirals, the new spiral has shown extraordinarily higher metal recoveries, even for minus 1 mm fractions in ferrochrome slag.

“Our SC25 spiral concentrator features steeper angles that facilitate the flow of material and increase separation efficiency,” says Hlayisi Baloyi, applications engineer at Multotec. “It also widens the particle size range that can be treated by the spiral. Traditionally, spirals would struggle to efficiently treat material above 1 mm in heavy mineral applications, but this spiral can go well beyond that. The spiral has been a game changer even for the minus 1 mm size range where higher separation efficiencies have been achieved on chromite ore.”

Baloyi says that this innovation has provided the minerals processing sector with an exciting alternative to jigs in the minus 3 to plus 1 size range, which have been one

of the conventional methods of separating larger particles. The solution is cost effective as spirals use no electricity, and are easy to maintain. So attractive is the new model that the first order for the commercialised version has already been placed.

“Taking ferrochrome samples from a number of mines over a period of two to three years, we conducted extensive test work on these at our well-equipped testing facility in Spartan near Johannesburg,” he says. “Leveraging this data with our in-house engineering design capacity, we were able to develop the optimal solution and locally manufacture the new spiral concentrator.”

The economic benefits of the Multotec SC25 spiral for ferrochrome producers are substantial, as some plants were losing the value of their 1 to 3 mm material to the tailings storage facility. Many of those who used jigs to treat this fraction were also finding that their efficiencies were low.

“Ferrochrome is not the only commodity we have successfully tested,” says Refentse Molehe, process engineer at Multotec. “We have even seen improved recovery in heavy minerals below 1 mm, alluvial chrome and



Hlayisi Baloyi, applications engineer at Multotec, has been conducting extensive test work on Multotec’s new SC25 spiral concentrator using ferrochrome samples from numerous mines.

manganese slags, for example. There is also potential in industrial recycling, which opens up options for ‘urban mining’ – the recovery of metal particles from associated waste. Multotec has received a number of requests and conducted tests for recovery of metals from recycled electronic goods, and from customers who intend to recover metal from industrial scrap. □

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New life for FLS stacker reclaimer

An extensive refurbishment programme on an FLSmidth stacker reclaimer in South Africa is preparing this giant machine for another decade of sustainable productivity.

As OEM and intellectual property owner, FLSmidth is undertaking the mid-life refurbishment of a stacker reclaimer and tripper car for a customer in a large iron ore application. “The extensive work programme is being conducted over two shutdown periods – one in 2019 and another one this year,” says Buks Roodt, director of Mining Site Sales at FLSmidth.

The 2019 scope of work was carried out over three weeks, followed by commissioning and handover. After site access was authorised, the bucket wheel structure and componentry arrived on site and secondary structural steel fabrication was also completed timeously and delivered.

According to Gunther Guse, manager of Mining Site Sales at FLSmidth, structural integrity repairs were carried out alongside large-scale corrosion protection. To ensure life expectancy and maintain reliability, a range of components and systems was refurbished; these included items that would normally only be exposed to standard maintenance practices and services. The integrity of electrical components was also renewed.

In addition to the bucket wheel fabrication and replacement, the full programme scope included refurbishing the long travel drive assembly, rail clamps and end buffer, as well as the hydraulic system, lubrication system and water-hose reeler. Bucket wheel boom stay ropes were replaced, and the spillage conveyor was redesigned, fabricated and installed. “An important aspect of this refurbishment contract is the installation of technological improvements,” says Guse. “Our continuous improvement process at FLSmidth leads to the introduction of components that are more energy efficient, for instance, or allow greater ease of maintenance. We are incorporating these advancements as part of the scope, reducing the client’s cost per tonne loaded.”

These upgrades, when combined with regular maintenance, can also enhance the machine’s life expectancy, extending

its longevity even beyond the initial design life of about 30 years. Guse highlights that FLSmidth’s extensive capability in three engineering disciplines is being brought to bear in the project. This expertise covers mechanical and structural; and electrical, control and instrumentation engineering.

On the mechanical side, the work includes components and systems such as the open gear systems, gearboxes and hydraulic systems, as well as rotating and moving parts such as trunnions and car-clamps. Structural work includes wear liners, supporting structures and areas of possible structural damage. Also, maintenance detection is undertaken including non-destructive testing for fatigue fracturing. This is done in areas where access to certain structures is not normally possible while equipment is in service.

The electrical, control and instrumentation work includes panels and drives that are approaching the ends of their useful lives. As part of the scope, variable speed drives, motor control centres and the E-house will be refurbished. Where any equipment had become obsolete, newer technologies will be incorporated.

“Our FLSmidth site engineering team initially conducted a detailed site condition assessment,” he says. “We documented all our findings in three inspection reports – one for each discipline. These findings were used as the basis for the client’s final project scope.”

Roodt emphasises the relationship of trust between customer and OEM, which is vital to mitigate risk and ensure quality performance



New bucket wheel for the stacker reclaimer.

within demanding deadlines.

“As the OEM, FLSmidth was able to offer its premium technologies and leading process know-how and services,” he says. “The customer, with direct access to the designers of the OEM equipment, could also rest assured.”

A global track record of safe working practices, while complying to project timelines, also contributes to minimised risk and smooth implementation, competitively. The scope of work during the customer’s 2019 shutdown was completed without incident or any lost time injuries.

“The customer also valued FLSmidth’s commitment to B-BBEE, supplier development and integration with the local community,” Roodt says.

The second phase of the refurbishment is planned for in the third quarter of 2020, says Guse. “We are known for our expertise in large-scale upgrades, refurbishments and retrofit projects.

“This gives customers confidence in our methodology, risk assessment, engineering support and analysis. We are also experienced in project planning, scheduling and implementation, combined with quality assurance and control, commissioning and close-out,” he concludes.

www.flsmidth.com



The new reclaimer bucket set for the stacker reclaimer.



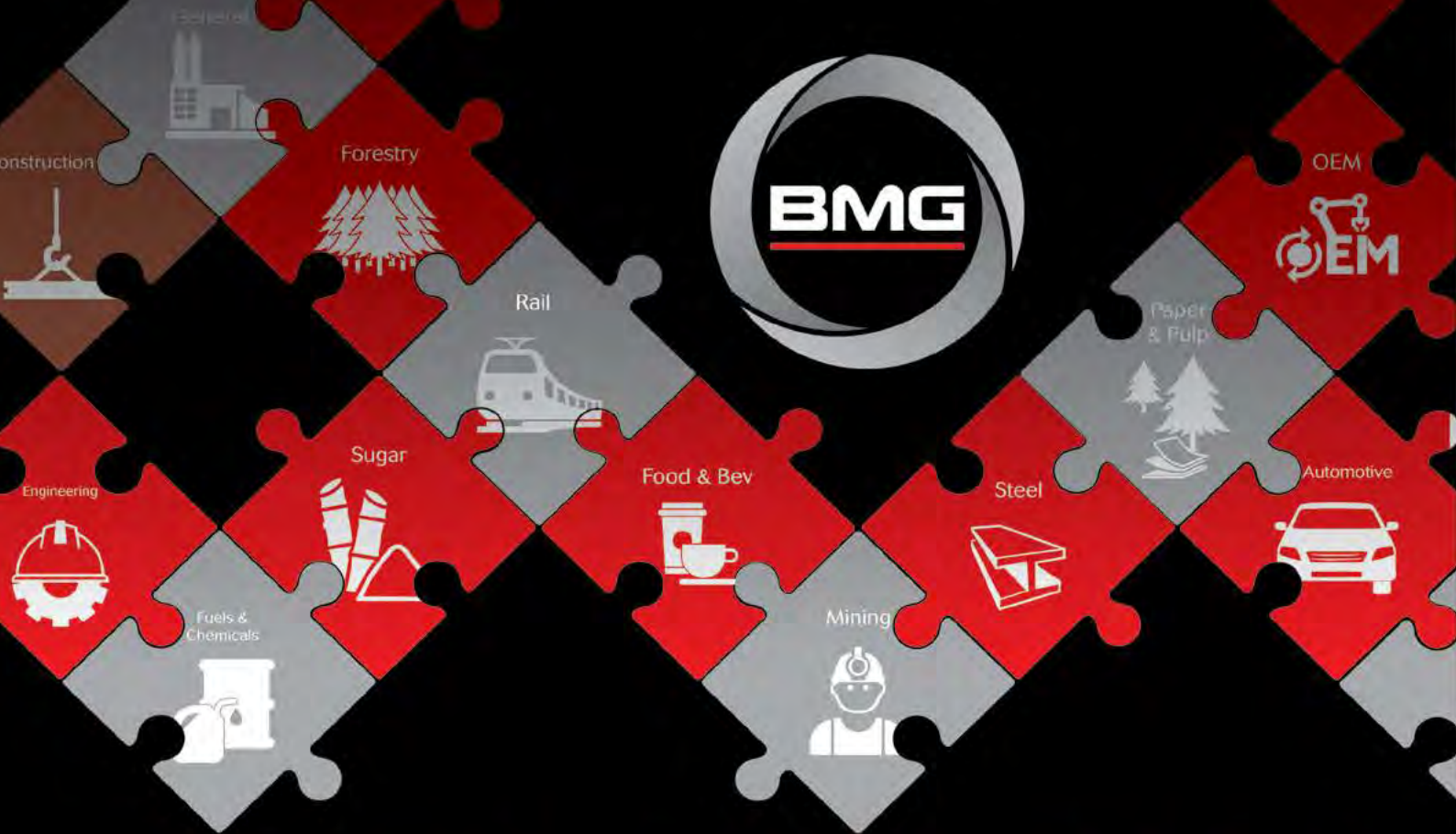
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Trio® crushers boost capacity in Oman

In a demanding application involving hard, coarse-grained gabbro for use as construction aggregate, a Trio® TP350 cone crusher supplied by Weir Minerals Africa has raised production by 30%.

When one of the largest crushing operations in Oman needed to raise its production by 30%, Weir Minerals knew that a Trio TP350 cone crusher was the answer.

It was a demanding application, involving the crushing of hard, coarse-grained gabbro for use as construction aggregate. Gabbro has a high compressive strength of 220 to 230

MPa and an abrasion index of 0.45. The existing crusher was running at 270 to 280 tonnes per hour with a closed side setting of 38 mm.

“The operators wanted to increase the crushing plant’s capacity to over 300 t/h,” says Tiisetso Masekwameng, general manager for comminution at Weir Minerals Africa. “This could not be achieved without overloading the existing crusher, leading to machine trips

and excessive wear.”

Running for 10 hours a day, seven days a week, the operation needed to be efficient. It could not afford excessive downtime caused by unexpected stoppages or frequent maintenance. Masekwameng highlights that the rugged Trio TP range is specially designed for heavy duty crushing, and the Trio TP350 model was ideal for this application.

“After detailed discussions with the plant’s general manager to understand their needs, we recommended this model,” she says. “With its capacity of 340 to 370 t/h at the same closed side setting of 38 mm, we were sure it would deliver the right result.”

Not only did it achieve the required output, but it also reduced downtime by 50%. Installation was straightforward, requiring only an adaptor motor base to accommodate the larger 250 kW electric motor. Noting the crusher’s ease of maintenance, the customer was also pleased with its consistent performance and reliability.

“Our Trio TP cone crushers feature a steep crushing chamber angle and a large crushing stroke,” says Masekwameng. “They operate at an optimum speed to deliver a high-quality product through increased inter-particle comminution.” She adds that the crushers are also designed to allow for maximum mobility without sacrificing versatility or crushing force.

The Trio crusher range is compatible with Weir’s Synertrex® technology for remote monitoring. Synertrex is an industrial internet-of-things (IIoT) platform that monitors mining equipment for peak reliability and performance.

www.global.weir/industries/mining



Trio TP cone crushers feature a steep crushing chamber angle and a large crushing stroke. They are optimised to deliver a high-quality product through increased inter-particle comminution.

Base model carbon steel flexible screw conveyor

Flexicon has introduced a new base model 1450 flexible screw conveyor with a 115 mm OD polymer conveyor tube and low-cost carbon steel floor hopper and discharge housing.

Round, square, flat or bevelled flexible screws in any length from 3.0 to 12 m are offered to convey virtually any free- and non-free-flowing bulk materials, including products that pack, cake, seize, smear or break apart.

Key innovations include:

- The only moving part contacting the material is the inner screw, which self-centres as it rotates, providing ample space between the screw and tube wall to minimise or eliminate grinding. The lower end of the screw requires no bearing, while the upper end is driven beyond the point of discharge,

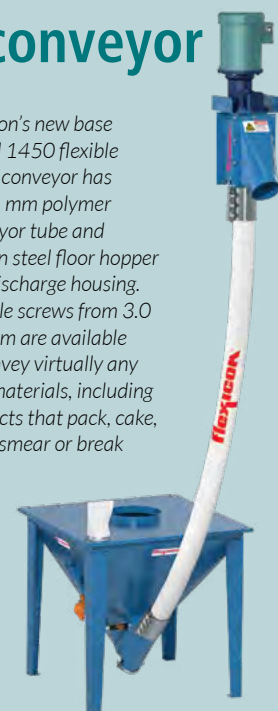
preventing material contact with bearings or seals.

- Fully enclosed, the conveyor tube prevents product and plant contamination, while the gentle rolling action imparted by the screw prevents the separation of blends.
- Flexicon’s Model 1450 is available with an optional start-stop control panel and a range of flow-promotion devices.

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

www.flexicon.co.za

Flexicon’s new base model 1450 flexible screw conveyor has a 115 mm polymer conveyor tube and carbon steel floor hopper and discharge housing. Flexible screws from 3.0 to 12 m are available to convey virtually any bulk materials, including products that pack, cake, seize, smear or break apart.



Stainless steel: the cost competitive corrosion solution

Columbus Stainless, the only fully integrated, technologically advanced, single site stainless steel producer in Africa, outlines the common stainless steel grades and uses and highlights the value of the material for the manufacturing industry.

When choosing metals for longevity and low maintenance, stainless steels become the obvious choice. This is because of their characteristic corrosion resistance, giving long life in various aggressive environments whilst maintaining their original properties and aesthetic appearance.

Corrosion can be defined as the gradual destruction of materials through chemical reactions with the environment. Corrosion degrades the useful properties of metals and structures, compromising strength and structural integrity as a result of mass loss and eventual perforation.

Most metals and metal alloys tend to revert back to their natural stable states on exposure to moisture in air. For example, carbon steels are made up of iron and a combination of other alloying elements. Without any surface protection, the corrosion reaction tends to form a coating of rust (iron-oxide), which is brittle and exfoliates, exposing a new fresh surface of steel to be attacked by the surrounding environment. If this cycle is allowed to continue, it will have a destructive effect on equipment and structures.

Stainless steel has a unique advantage in that a thin, tenacious and self-repairing passive chromium oxide layer forms on the surface of the steel. This oxide layer gives

the steel its characteristic corrosion resisting properties in most environments. Due to its corrosion resistance, stainless steel, which must contain a minimum of 10.5% chromium for a passive layer to form, is mainly used with an uncoated mill finish, since no additional protective coating systems are needed for corrosion protection.

Columbus Stainless produces the three main families of stainless steel standard and utility: ferritic, austenitic and duplex stainless steel, as outlined below.

Ferritic steels and 3CR12

Ferritic stainless steels are commonly known as plain chromium steels. Ferritic stainless steel grades contain at least 10.5% chromium, with additional alloying elements for improved corrosion resistance, strength and weldability added for the various grades. Common grades include 430, 409, 441 and 444.

Standard ferritic grades such as 430 are used mainly for aesthetic applications, cutlery, cookware as well as applications roofing, cladding and decorative trims. Grade 441, which contains additional alloying elements such as niobium and titanium for stabilisation and higher strength at high temperatures, is mainly used in robust applications – in the automotive industry for exhaust pipes and

catalytic converters, for example.

Molybdenum containing ferritic grades such as 436 and 444 exhibit higher pitting and general corrosion resistance. Because ferritic stainless steel grades are resistant to stress corrosion cracking, they are used in applications where their austenitic equivalents (eg, 304 and 316) cannot be used, hot water systems being an example.

The utility ferritic stainless steel, 3CR12®, is a low cost utility ferritic stainless steel developed by Columbus Stainless and used widely throughout the South African mining industry as a cost effective solution to corrosion in a wide range of structural applications. It has excellent properties in wet-abrasion conditions as a result of its superior strength, moderate corrosion resistance and good slideability.

Applications are widespread and include materials handling environments in mines and coal washing plants. It is used for applications such as ore cars and wagons, chutes and launders, as well as shaft steel work, chimney stacks, ducting, roofing and cladding; poultry and piggery buildings; walkway products, including grating, hand rails and stairs; electrical boxes; and security fencing. It is also widely used in sewage processing plants and for municipal water storage tanks.

3CR12® coal wagons and life cycle costing

In 1985, trial coal wagons were manufactured out of 3CR12 with a hot rolled and annealed (HRA) surface finish. These wagons are used





to transport coal between Ermelo and Richards Bay. They have a payload of 80 t and make the journey roughly five times a week.

Before 3CR12, the wagons were made from Cor-Ten, but these only lasted 8-12 years, with refurbishment required after five years. Over the years, many inspections of these coal wagons have been conducted. Of particular note is a study done in 2012, after 27 years of service. The wall thickness of the coal wagons was measured using extensive ultrasonic thickness measurements. Steel wagons recorded corrosion-abrasion wear rate of 160 $\mu\text{m}/\text{yr}$, while a metal loss of 10 $\mu\text{m}/\text{yr}$ was recorded for 3CR12 wagons in the same application.

From these measurements, these 3CR12 coal wagons have a predicted total life of 65 years, while steel wagons have to be replaced roughly eight times in this period, significantly increasing costs and potential lost production time.

Austenitic and duplex stainless steel

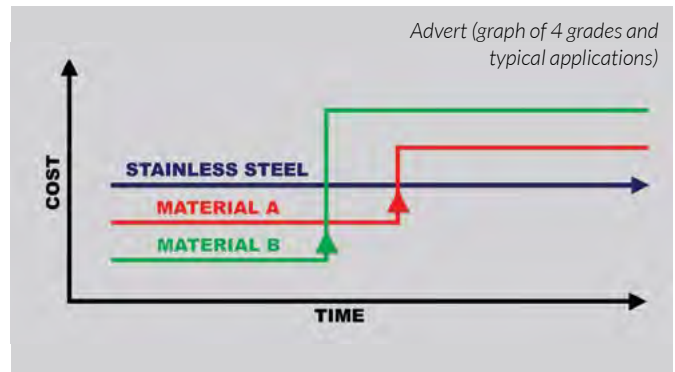
Austenitic stainless steel grades are a family of steels that contain iron alloyed with chromium and nickel for improved properties. They have excellent formability and fabricability and exhibit good strength properties under cryogenic and very high temperature conditions. These grades are used extensively in the food and beverage and petrochemical industries for high temperature applications, for their excellent oxidation resistance.

Standard austenitic grades contain high contents of chromium and nickel. A typical example is grade 304, which is very successful in applications demanding high hygienic performance, such as in agriculture, for abattoirs, dairy processing and meat handling equipment; food and beverage storage tanks; catering and hospitality utensils, food processing equipment and cold storage facilities; and health care applications for medical equipment and surgical tools. The regulatory safety requirement in these industries is that there must be no measurable chemical reaction between the metal surface and the food-grade product, that is, the product may not be contaminated with any metallic constituents or corrosion products.

Molybdenum containing austenitic grades, including 316, exhibit increased general and localised corrosion protection and are used in more aggressive environments. Main applications include the manufacture of tank containers for the bulk transportation of chemicals, gases and corrosive liquids; processing tanks in the chemical and petrochemical industries, and pressure vessels.

Heat resisting austenitic stainless steels (309 and 310S) contain much higher chromium and nickel contents than standard austenitic grades for improved high-temperature oxidation resistance and they can maintain reasonable strength at very high temperatures. They are successfully used for heat exchangers and heating elements; burners and combustion chambers, and electrical elements.

Duplex stainless steel grades contain a mixed microstructure of austenite and ferrite. They have characteristic high strength, resistance to stress corrosion cracking and superior corrosion resistance. Popular grades include the lean duplex, 2304, and the standard duplex grade, 2205. These are successfully being used in the paper, pulp, chemical,



petrochemical and mining industries for various processing equipment and storage tanks. Their superior corrosion resistance can withstand even harsh marine environments.

Stainless steel for local manufacturing

South Africa boasts a wide variety of large industries, including power generation, mining, farming and manufacturing. Fundamental to supporting these diverse industries is the steel industry. Stainless steel has proven itself to be a multi-functional and adaptable metal and a successful choice in many application where it offers excellent value to the manufacturing and end-user industries. Stainless steel remains a cost competitive, low maintenance material that contributes to long-term sustainability; being manufactured using mostly recycled metals and 100% recyclable at the end of its life. Columbus Stainless is proud to have contributed to the development of this material over five decades and will continue to do so as Africa and the world grows. Indeed the future of manufacturing is Stainless. □

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Pump systems and training: a new and better normal



Harry Rosen

In response to lockdown and the associated rise in remote communication and webinar solutions, Harry Rosen – UNIDO International Pump Expert, founder of pump monitoring service company, TAS Online, and of 2KG Training – discusses the emerging ‘new and better normal’ for training pumping specialists in South Africa.

2 KG Training’s traditional pumps and other industrial training offerings have long been based on seminars presented by experts, where a formal training course is organised at a conference hotel and a well-known specialist/expert is flown in to deliver that course. “In most cases it involves all the participants travelling to a hotel for a few days, and an expert is flown in, often from overseas, to deliver the course. The course material is prepared and packaged in books and the seminar is largely topic centred,” says Rosen.

This model is obviously a non-starter at present, with conference and hotel venues being closed and travel being restricted, particularly for overseas visitors coming into South Africa. “We at 2KG Training have, therefore, had to rethink how we do training, with several very positive consequences,” he adds.

The simplest alternative is to transform the seminar model into a webinar, which can be remotely delivered. “We believe, however, that the pre-recorded webinar is simply too rigid and inefficient with respect to experiential learning. Key to the expert model is that participants have direct access to a highly experienced professional who can offer direct advice about the problems people are experiencing on their plants.

“So, at the very least, the expert trainer delivering the webinar must be presenting live online, and two-way communication must be in place to enable participants to interact directly with the trainer,” Rosen argues.

By using a live online trainer, the expert can be based anywhere in the world, while still being able to present an interactive course, where training can be stopped at any stage of the presentation for questions, just as if at a traditional seminar.

This live online approach comes with advantages.

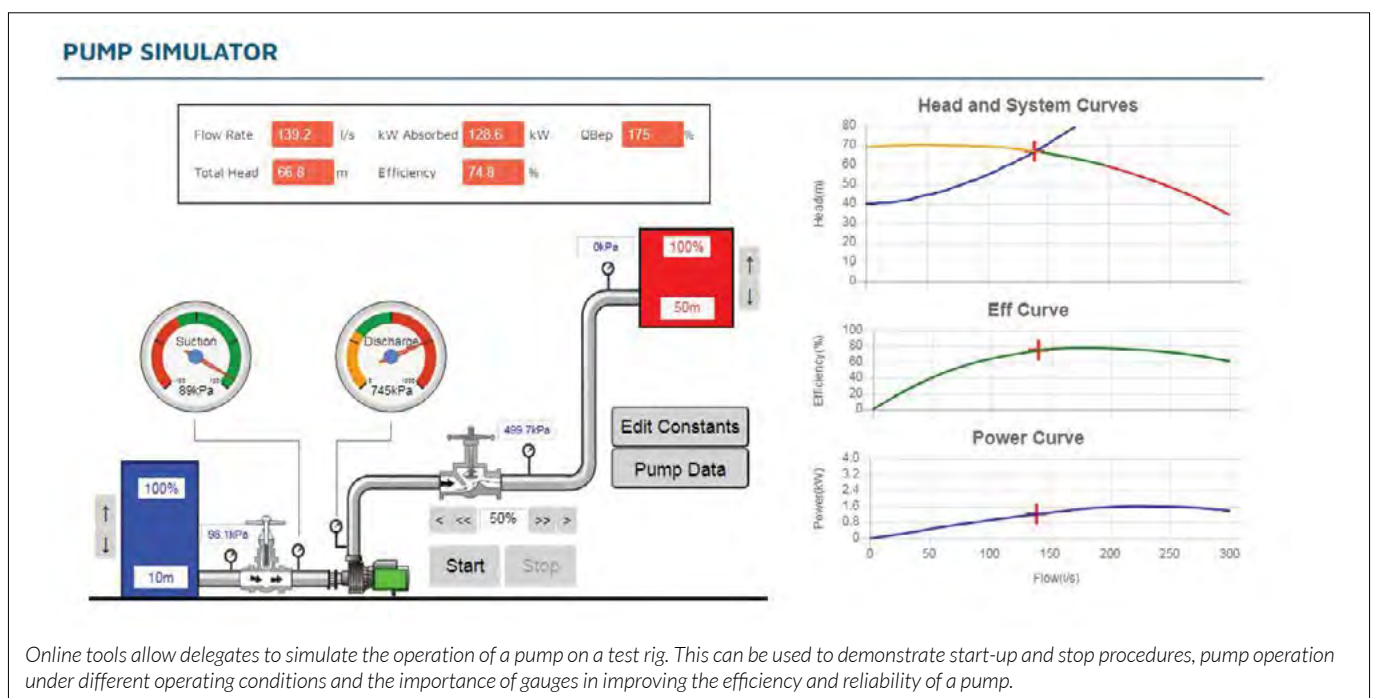
First, a number of add-ons can be included if the online educational platform is well chosen. Reference links can be accessed immediately, via screen sharing or by individual participants, for example, and the presenter

can make catch up modules or information pertinent to an enquiry instantly visible and permanently available to those in attendance.

The course material can be distributed beforehand for people to pre-prepare, and the whole experience can be recorded so participants can go back at any time after the event to check up on something they may have missed. “We can also include online tests, which can be taken multiple times to ensure ultimate success for each candidate,” says Rosen.

In addition, he continues, much traditional industry-based training has been certificate of attendance-based. There is often little to prove to the company paying for the training how its staff has benefitted. “They may have come to a hotel for a pleasant four day stay and been given presentation notes and a nice, informative book to take back to the office, but this often proves nothing in terms of new learning and competence,” he says.

“For a while, now, we have been proposing to our key clients that such courses be more interactive and much more closely tied to real requirement at the workplace. The training ‘course’ is simply one small part of a much bigger experience. We not only assess what



Online tools allow delegates to simulate the operation of a pump on a test rig. This can be used to demonstrate start-up and stop procedures, pump operation under different operating conditions and the importance of gauges in improving the efficiency and reliability of a pump.

participants have learned during the course, but we also validate and raise their levels of competence, usually via a highly relevant on-site project conducted in the months following a course," he explains.

After a course, participants are sent back to their plants with a self-identified assignment to do. For this, they get support and resources online and they can upload the report online when they have completed the assignment – at their own pace in manageable chunks. "Most important is that the assignment/project is work related and of direct benefit to the company's plant performance," Rosen suggests.

During the course, participants will be guided to identify areas of improvement that relate to pump assessment type work, future work that can be readily identified and specifically customised. "Ideally, this enables long-term efficiency improvement projects to be specified, costed and implemented as a direct consequence of the initial training and part and parcel of a course's competence outcomes," Rosen tells *MechChem Africa*.

"We have long been taking course participants through how systems at their plants should be functioning: from a pump performance and energy efficiency point of view, to pump maintenance requirements: identifying why pumps fail, the processes for removing a pump from a system, and so forth. This is not based on theory from a plant in a country far away, but on real systems using existing pumps at local plants.

"Live online course delivery enables this approach to be further strengthened. Instead of having to have 40 people in each class, of which five are active, 10 to 15 interested and 15 to 20 people really not getting much benefit, we can cover the lower course costs more easily and present more focused courses with fewer trainees.

"People from a refinery no longer need to listen to course content about slurry pumps, or vice versa. We can present a specialist course on pumping for a coal mining application, for example, still delivered by a high calibre global specialist but without the need to cover the travel costs of bringing the expert to South Africa or his or her sustenance costs for the duration of the stay.

"For us, this used to mean we had to have a minimum of 35 delegates to break even. Post COVID-19, this will dramatically reduce," Rosen assures. "We foresee smaller groups of ten or so people focusing on more specific content: bearing or mechanical seals failing prematurely, for example, or ways of optimising specific energy for a pumping system. During the course, participants will be equipped to go back to their workplace to collect data and compile a project report. Based on that, we can assess exactly how much they understand – about pressure, flow, pump curves, etc – and give a verifiable competence certificate.

More relevantly, if these reports are adopted for action at respective plants, pump performance, energy and electricity savings and maintenance improvements can be achieved, helping to justify and finance the costs of ongoing training.

2KG Training recently signed a



Accessing information remotely is all part of the modern plant's infrastructure. SCADA or DCS systems can be accessed from home or during online training.

partnership agreement with the American Society of Mechanical Engineers (ASME) to present the hugely popular standards and codes training courses via an online environment, including the ASME B31.3 Process Piping Design Code course.

In addition to providing training from the top accredited trainers worldwide, ASME will also give 2KG Training access to its online training portal. Based on the leading online training environment, Docebo, this portal utilises Zoom for its online classrooms, but also offers several additional tools for delivery of education and training course materials.

"Inside the ASME/Docebo platform, we will be able to create a rich classroom environment for technical training. Not a downgraded pumps or valves seminar, but a more instructive, better presented, more personalised one, where we can incorporate a wide variety of richer resource materials and hands on activities.

"Coupled with the link to post course competence assignments, we feel the approach is likely to lift training quality to a new level, where every participant's work competence can be measurably raised, improving the performance and efficiency of the plants they work at and the competitiveness of their industries," Rosen concludes. □



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Advanced and integrated pumping solutions deliver operational efficiency objectives



Darryl Macdougall

The paper, pulp and board manufacturing industries are key economic contributors to the South African economy. Direct contributions are measured in gross domestic product (GDP) and trade earnings, where according to the Paper Manufacturers Association of South Africa (PAMASA), the country's paper, pulp and board manufacturing industries are valued at around R28-billion. And this value is potentially significantly more when we also consider the indirect and knock-on impact of socioeconomic benefits in job creation and local economic activities., which can be tracked back to industrial activity linked to farming, milling and manufacturing, for example.

In recent years, however, these industries have faced significant societal pressures – particularly surrounding concerns over the impact on the natural environment. As a result, many businesses in these industries have undergone considerable restructuring in terms of – but not limited to – focusing on their operations and cost management, industrial diversification in some cases, exploring more circular-economy thinking and approaches to the products they produce, and adapting to the evolving waste management legislative environment and growing market demand for recycled paper and tissue paper, for example.

As these businesses are undergoing restructuring, they should also consider advances in equipment critical to the manufacturing process that can bring immense value in improving the operational efficiency potential.

For example, it is well understood that manufacturing paper is a resource-intensive process, even if using 100% recycled material. Shredding wood, paper and textiles to the right size, creating the pulp, and then pressing it into paper is a process that requires the right equipment, including pumps to move the slurry. Also, paper and wood pulp can be

Based on the expanding needs of board, paper and pulp manufacturers, Darryl Macdougall, managing director of Verder Pumps South Africa, argues the case for choosing trusted and reputable brands for the pumping solutions needed to support operational efficiency objectives

extremely abrasive to pumps, and chemicals used in the bleaching process can be very corrosive.

In this context a poorly designed pump system may lead to lags in production due to premature wear or failure of components in the processing production line – as this is not isolated to the pump itself – and can impact instrumentation, piping, valves and ancillary equipment too. There is also the risk of work-stoppage or excessive breakdowns, over and above routine planned maintenance. Any of these possible scenarios are guaranteed to hamper operational efficiencies and production outputs, not to mention potentially increasing labour costs and spares inventories, all of which lead to operational expenses being driven up.

On the other hand, the right advanced and integrated pumping solution can support the drive towards operational efficiency objectives. As these solutions are fit-for-purpose, not only are they suitable for pumping sensitive, abrasive or high viscous fluids, but while doing so also bring added benefits in terms of water and energy efficiency, and savings, that is, such solutions support the businesses operational efficiency objectives.

Navigating the technical obstacles of selecting the right pumping solutions for specific applications can be complex. Yet, the effectiveness of a manufacturing plant partially depends on the longevity of pumping equipment – where lower lifetime cycle costs of the equipment translate into higher efficiency and greater productivity and cost savings for the customer in the long run.

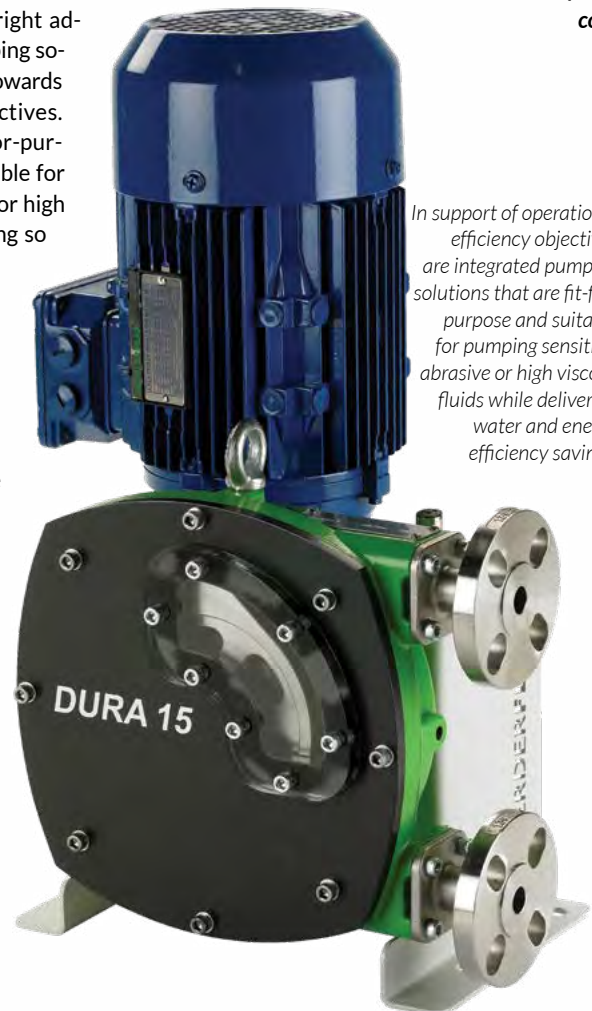
Paper and pulp manufacturers, there-



The Verderflex Rapide 5000 industrial hose pump

fore, need to look to a trusted and reputable brand that can offer not only a wide range of pumping solutions, but solutions that are long-lasting, cost-effective and energy efficient – because they are 100% fit-for-purpose for the application – and for every step of the manufacturing process.

www.verderliquids.com



In support of operational efficiency objectives are integrated pumping solutions that are fit-for-purpose and suitable for pumping sensitive, abrasive or high viscous fluids while delivering water and energy efficiency savings.

Wear life improvements for Warman AH pump

Using a novel integrated design approach, Weir Minerals engineers have developed the Warman® WRT® impeller and throatbush combination, which delivers significant wear life improvements in Warman® AH® pumps.

Weir Minerals engineers have developed a new WRT® impeller and throatbush combination for its Warman® AH® pumps, which delivers significant wear life improvements.

It began with an extensive research and development programme by Weir Minerals engineers, aimed at better understanding the wear characteristics at the inlet and outlet of centrifugal slurry pump impellers. This was done as part of Weir Minerals' drive to reduce total cost of ownership on its range of products. The culmination of the project resulted in a new impeller and matching throatbush design, which provides Warman AH pump users with significant advantages.

Leveraging years of wear data on the popular AH pump design, the design engineers compared 'real world' data with computational fluid dynamics (CFD) simulation. This allowed them to obtain a correlation between predicted and actual results for standard five vane slurry impellers.

The resulting design for the new impeller incorporates a unique vanelet on the back shroud that streamlines the flow through the impeller outlet. This improvement also provides higher efficiency and therefore lower absorbed power, along with improvements in the net positive suction head (NPSH).

Put to the test recently on a gold mine

An exploded view of the Warman AH pump with WRT impeller and throatbush combination.



with significant clay content in its slurry feed, the WRT impeller and throatbush combination excelled. The high clay content leads to increased slurry viscosity. Also, the clay contained sharp, coarse quartz particles that caused high impact wear on the leading edge of the impeller vane in the installed pump.

The mine needed to increase its throughput, but the incumbent competitor impeller was unable to maintain the required level due to the viscosity of the slurry. The Weir Minerals team recommended the new WRT impeller and throatbush combination, which were retrofitted into the Warman pump.

After installation, the impeller worked so well that the variable speed drive (VSD) was able to reduce pump speed whilst delivering the same throughput, due to the lower NPSH characteristics of the new impeller and its ability to pump the viscous clay slurry without cavitation.

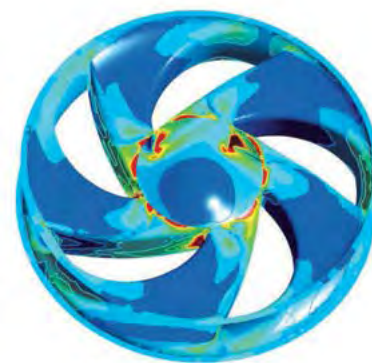
The pump was inspected after 1 200 hours of operation with the Warman WRT impeller and throatbush. The impeller showed some wear on the vane's leading edges, but practically no wear on the front shroud. The Warman pump with WRT technology went on to achieve 1 500 hours of wear life, an improvement of 125% on the average wear life of 670 hours for the competitor's impeller.

This achieved a considerable saving for the mine, due to the higher efficiency of the impeller, less solid recirculation, longer wear life of both

items and fewer pump rebuilds. The technology also facilitates savings in energy costs as the pump consumes less power.

New WRT parts are interchangeable and can be retrofitted into all current Warman AH pumps. This can be done during a normal maintenance shutdown, when the two standard parts can be removed and the new impeller and throatbush installed. All setups, fitment and general maintenance remain the same, no pump speed change is necessary, nor are any specialised tools for fitment required.

www.minerals.weir

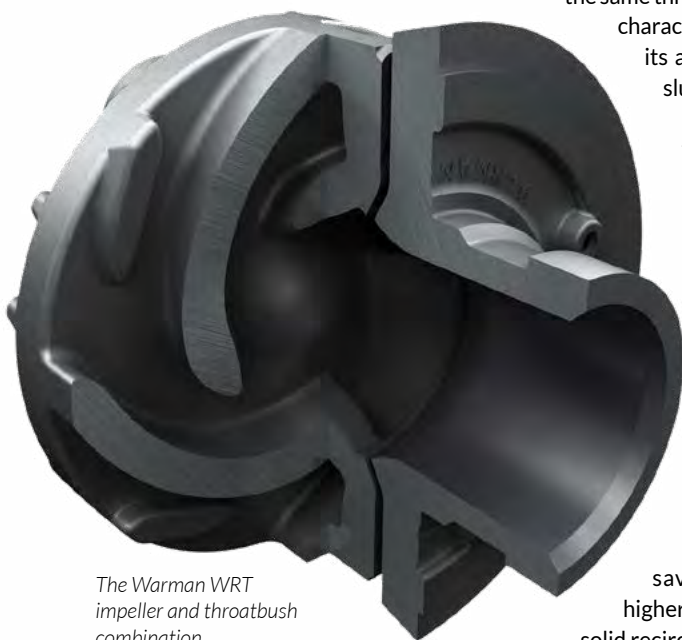


Warman® 5 vane design



WRT® design

A comparison of the Warman 5-vane design and the new WRT design.



The Warman WRT impeller and throatbush combination.

Urgent dewatering solutions during lockdown

Responding quickly with the right solutions, Integrated Pump Rental has continued to operate as a secondary emergency supplier throughout the lockdown, including helping to dewater a coal mine in northern KwaZulu-Natal.

Integrated Pump Rental has continued to operate throughout the lockdown, including helping to dewater a coal mine in northern KwaZulu-Natal. “The customer urgently needed fit-for-purpose dewatering equipment to prevent flooding in its open pit,” says Henru Strydom, operations manager at Integrated Pump Rental.

The unexpected failure of one of the mine’s own pumps came at a bad time. The national coronavirus lockdown meant it would be some time before pump repairs were possible. Some heavy downpours aggravated the situation, demanding that there be no delay in dewatering the pit.

The answer came in the form of a Sykes HH130 high-head diesel-driven pump. The rugged, five tonne unit was promptly delivered to site by truck, and transferred to an on-site trailer for easy mobility. The six-inch pump is capable of pumping at a head of over



Integrated Pump Rental supplied a Sykes HH130 pump to dewater an open pit in KZN during the lockdown.

140 m at a flow of between 80 to 90 l/s.

“From our experience of the mining sector, we know that water in a coal mine is acidic,” Strydom says. “The complete pump-end we supplied was, therefore, of stainless steel construction to resist corrosion and ensure reliability and uptime.”

Lockdown regulations allowed those coal mines supplying state power producer, Eskom, to continue their operations during Alert Level 5, even as most business activity came to a standstill. Rainfall across much of the coal-producing province of Mpumalanga raised the risk of flooding and led to Integrated Pump Rental delivering solutions to a number of its other customers there during the lockdown.

Strydom emphasises that, in addition to maintaining their vital dewatering activities, mines gain other benefits from renting pumps. There is no large capital outlay, for instance, and running

costs can be controlled.

“The renting option means that we handle the maintenance, so mines can better control their costs,” he says. “We also ensure the pump’s optimal performance, so mines don’t risk costly downtime.”

www.pumprental.co.za

Improve the efficiency of all pumps, urges expert

With difficult economic conditions only getting worse during the COVID-19 pandemic, pump users need to make the most of their operational inventory, even pumps that may be considered redundant.

Pump expert Lee Vine, managing director of specialist companies Integrated Pump Technology and Integrated Pump Rental, says all industries can benefit from improved pump efficiencies.

“In our daily contact with pump users, we ensure not only that the pumps we sell and rent are looked after,” Vine says. “We also repair and refurbish other brands customers have on their work sites.”

Their depth of technical capability is based on combined experience within the companies of some six decades in the pump business. While Integrated Pump Technology specialises in Grindex and Faggiolati slurry pumps and Leyboldt vacuum pumps, the Integrated Pump Rental business focuses on its locally produced SlurrySucker dredging system, Sykes diesel driven pump sets and the Grindex submersible range. “To support our product ranges – and keep our own rental fleet in optimal

condition – we invest continuously in our quality-accredited workshop facilities,” Vine says. “This includes extensive testing capability, with a test tank that can accommodate motors up to 150 kW.”

Workshop manager Fred Slabbert, a master electrician and millwright, highlights the value of optimising assets to cost effectively promote operational efficiency. “With our experience of various pump brands, we make sure that all work is done to original equipment manufacturer (OEM) standards,” he says. “This gives customers peace of mind, and allows us to give a six-month warranty on repairs and refurbishment.”

Slabbert says pump reliability is now more important than ever, as mining and industrial operations must optimise uptime to remain profitable in these challenging economic times.

“We conduct professional assessments on any pumping equipment – even redundant units – for

customers,” he says. “On the basis of a detailed condition report from us, along with a competitive quotation, companies can assess the refurbishment option – which usually makes good business sense all round,” Slabbert concludes. □



Integrated Pump Technology invests continuously in its quality-accredited workshop facilities to support its products.

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Chemical pump that sets the global standard

Since its introduction more than two decades ago, KSB's MegaCPK pump has changed the way chemical companies throughout the world pump dangerous and volatile materials.

The standardised KSB MegaCPK chemical pump, proven to DIN EN ISO 2858/ISO 5199 and Directive 94/9/EC (ATEX), is especially chosen for use in handling aggressive liquids in the chemical and petrochemical industries to provide a safe and reliable fluid transfer. The pump's energy efficiency is also noteworthy and the series punches well above its weight in terms of output efficiency, which means



KSB's MegaCPK chemical pump is especially chosen for use in handling aggressive liquids in the chemical and petrochemical industries.

that identical operating data and conditions are achieved using smaller KSB pump sizes.

According to Dylan Mitchell, this is as a result of impeller trimming for energy savings, which results in up to 10% improvement in efficiency. With a wide range of sizes and variants, users are highly likely to find the pump that exactly meets their requirements.

He says the range has a modular design system with a variety of pump sizes, materials and components. Gland packing with single and double standardised mechanical seal or cartridge seal also available.

"We even have a choice of 'medium duty' bearing bracket designs with a cylindrical roller bearing as a radial bearing and a double angular contact ball bearing as a fixed bearing. Alternatively, users can specify our 'economy' bearings, which are arranged as floating ball bearings. Hydraulic systems are available for standardised

flow rates or high-performance variants depending on the customer specifications, Dylan says.

He adds that KSB's MegaCPK has been designed for maximum operating reliability and ease-of-maintenance, with a back pull-out design for quick and easy access – a milestone in standardised chemical pumps. These and other features and benefits of the pump series are the reason why the MegaCPK has become the basis for numerous standards.

"The wide range of sizes, materials and features are suitable for almost any application: Temperature extremes, high volatility of the media being pumped and widely differing chemical compositions, making the MegaCPK make the Gold Standard in the industry. Combined with KSB Pumps and Valve's service and support, as well as long track record of service in the industry, this makes it the obvious choice for standardised chemical pumps in South Africa and across the globe.

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Smarter pumping and dosing solutions from Grundfos



Bennie Thiart.

MechChem Africa talks to Bennie Thiart, general manager for Grundfos' Southern African region, about the company's iSolutions offering, including smart pumps and dosing systems for water treatment, and the company's ongoing success at the Nootgedacht Water Treatment Works in Nelson Mandela Bay.

With dedicated regional offices in Kenya to service the East African region, Nigeria for West Africa and Johannesburg for Southern Africa, Grundfos has restructured in recent years to take full advantage of the growing need for water infrastructure across Africa. "As well the three dedicated African regions, we have also introduced three different business sectors – Building Services, Industry and Water Utilities – which we feel enable us to comprehensively cover the continent's most urgent needs," says Thiart.

"Water treatment is an application that bridges all these segments, including the building sector. Globally, Grundfos develops solutions for treating the water in storage tanks on top of buildings, for example, to neutralise bacteria such as legionella, which causes Legionnaires' disease in buildings, particularly hospitals."

On the industrial side, he continues, the food and beverage sector is a key industry, where additional treatment is required before water can be used for food processing. "In Africa we often treat ground water, which has to be fully disinfected if being used directly in food and beverage production. But there are other applications too, such as clean in place (CIP) that has different water quality standards.

"In some cases where deep bore-hole water is available, the water is already very pure and not much needs to be done, but quality monitoring in some form or another is always required to ensure that any water entering the closed circuit inside the plant is fit for purpose," he points out.

In SA, however, Grundfos' biggest market involves municipal water treatment. "Together with our key partners, we assist water boards with design, supply and installation of customised dosing and disinfection solutions on their water treatment plants. The Nootgedacht Water Treatment Plant is an example of this. We can supply various solutions including

transfer pumps, mixers, dosing and disinfection systems as well as control equipment with multiple communication protocols required in these plants to link our equipment to the operating system," Thiart tells *MechChem Africa*.

Dosing success at Nootgedacht

Describing Grundfos' collaborated success with key water treatment partner, Aquatechnica, on dosing and disinfection solutions for the Nootgedacht Water Treatment facility for Nelson Mandela Bay, he says that all Grundfos solutions are bespoke designs that depend on the water treatment process for the specific feed water characteristics and the output quality requirements. General treatment steps include coagulation, flocculation, sedimentation, filtration and disinfection. "Different dosing solutions are needed at various stages of the treatment process, depending on the water quality that comes in; this makes every plant unique," he adds.

The Nootgedacht scheme treats water

from the Gariiep Dam on the Free State-Eastern Cape border. The water flows via the Orange-Fish River tunnel and a series of connected rivers, from where it is piped, via the treatment works, to areas including Port Elizabeth and Nelson Mandela Bay.

Thiart says that traditional mechanical dosing involves using dosing pumps with manually adjusted cams to measure out known quantities of an additive. This type of pump has a turn down ratio of only 10:1, while if operated via a motor with a variable speed drive (VSD), a turn down ratio of around 100:1 can be achieved.

"By using stepper-motor technology in our new Grundfos advanced SMART Digital XL dosing pumps from our iSolutions range, we are able to offer turn down ratios of 1 000:1 and up to 3 000:1 on certain models. The SMART XL range also expands our dosing capacity from 30 l/hr to 200 l/hr with the latest release," he notes. This makes the dosing accuracy of these pumps between 100 and 300 times better than standard cam-driven



A close-up view of Grundfos Smart digital XL dosing pumps like the ones being used at the Nootgedacht Water Treatment Plant.



Left: Grundfos XL CR systems combine hydraulic efficiency with high efficiency IE3 motors making them ideal for use in water treatment plants and pressure boosting stations. **Right:** For high flow applications, Grundfos can also supply large multiple pump solutions of up to six pumps, and each pump will only run at the speed required to meet demand.

solutions," he estimates.

In addition to their accuracy, integrated flow monitors in each dosing pump provide feedback about the actual flow in comparison to the set point, which is used to continually adjust the stepper motor rate to maintain dosing accuracy.

At Nooitgedacht, 16 DDA60-10 FCM SMART Digital XL dosing pumps were installed in a duty/standby arrangement with eight systems active at any time. These are plug-and-pump dosing systems that are expertly designed, aptly equipped and easily wall mountable.

The solution also included 16 Grundfos communication interface units (CIUs), which enable plug-and-pump communication between the PLC and pumps via Modbus TCP – and Grundfos CIUs offer communication options via many different protocols.

Also incorporated into the system is AutoFlowAdapt, which is able to compensate for environmental changes so the required target flow rate, smart chemical management and required water quality are always achieved. In principle, AutoFlowAdapt automatically and continuously compensates for fluctuating system pressure to ensure dosing accuracy is maintained.

"Digital control gives these devices the ability to add treatment doses in really fine and very accurate increments. It means our systems can now accommodate a wide range of treatment needs, while quickly responding to changes in the input water quality," Thiert notes.

"Many years ago one of my mentors told me, in Afrikaans, that *om te meet is om te weet* which means 'to measure is to know'. This is what modern digital dosing pumps bring to our systems.

Digital measurement technology enables us to control our dosing processes much more accurately, to produce a consistent treatment process and output stream of water at the precise quality required," he tells *MechChem Africa*.

Pump solutions for water transfer

Also newly released as part of the iSolutions initiative are the redesigned extra-large versions of Grundfos' CR vertical inline multistage pumps, which have been delivering best-in-class reliability and efficiency for more than 45 years.

"The new CR XL range's improved design combines hydraulic efficiency with high efficiency IE3 motors to deliver improved performance, making these pumps ideal for use in water treatment plants and pressure boosting stations. The CR XL range can deliver flows from 80 m³/h to 200 m³/h per pump," he says.

Larger vertical spindle pumps are an ideal substitute where larger flow capacities previously meant only end-suction or split casing pumps could be used. "At the top of the range are our CRE pumps with integrated frequency drives that can accurately regulate performance for constant pressure of flow solutions in pump systems," Thiert explains.

Multistage vertical spindle pumps are superior to end-suction pumps on the maintenance side, too. A seal on a small CR pump can be changed in under a minute, while for the largest, it might take three minutes more. A vertical design also minimises plant footprint, which reduces the infrastructure required on the ground. And several pumps can be combined in parallel as a booster set to enable larger flows to be accommodated without sacrificing efficiency or flow/pressure control accuracy.

Grundfos MPC booster sets for water treatment transfer pump stations typically consist of three or four CR 155s on a common base frame, complete with parallel manifolds, valves and pressure sensors connected to a control cabinet with MPC controls. Such a station could supply 300 to 400 m³/h, without compromising pressure sustaining or flow characteristics required by the system.

"For high flow application we can also supply large multiple pump solutions of up to six pumps, and each pump will only run at the speed required to meet demand. In the

middle of the night, only one pump might be running at half speed. As people wake up and water demand increases, this pump will first speed up until it reaches its best efficiency point, then a second pump will kick in and ramp up, then a third, and so on, until as many pumps as necessary are running. Most systems include a standby pump to accommodate maintenance requirements. This is permanently connected to the system so it can be switched on in an instant should another pump need to be taken offline," Thiert explains.

The Grundfos CRE pumps and booster sets offer up to 40% energy savings compared to conventional end suction solutions running at full speed. In addition, maintenance on these units is easy as the majority of pump components are made from stainless steel to reduce corrosion problems and significantly extend pump life. "Because the motor is mounted above the pump, access to the seal and the wet-end components is relatively easy – at eye level on the larger pumps."

"When a pump's efficiency starts to drop, which we can monitor remotely via our GRM systems, we can schedule an on-site service that can, in most cases, quickly and easily return the pump to its original efficiency – and this can be done while the pump is installed at a pump station." "With respect to manufacturing, we rely on local manufacturers for our base plates and pipework and we assemble entire pump system locally at our assembly facilities. We then deliver modular plug-and-play systems that have already been assembled and tested, to site.

"And by adding GRM and service level agreements (SLAs) to an installation, treatment plant and booster pump station operators can be sure that the system's condition and performance is being constantly monitored for potential problems and that we at Grundfos will be on hand to intervene should any potential problems emerge," Thiert concludes. □

Good water management for profit and performance

Xylem is on a mission towards creating a more sustainable world by enabling customers to optimise water use and better manage dwindling resources. Xylem Africa's managing director, Vincent Chirouze, argues that all business and domestic users should take a proactive, detailed and holistic view to achieve this.

Water is a vital and scarce resource. Many businesses, particularly in sectors such as manufacturing, mining and agriculture, use water as part of their core output processes. Practically every business relies on water to help maintain it, from flushing toilets to boiling kettles to cleaning services. Water is an inextricable business cost.

Yet when it comes to the management of water, it's often not treated in that way. To illustrate the point, Xylem Africa's managing director, Vincent Chirouze, compares water to electricity:

"Everybody talks about the electricity crisis. The thing about electricity is it's either

there or not. It's very easy to determine and quantify the amount of electricity you need, its quality and so forth. But water is very different. Everybody seems to be getting access to some type of water, but they often assume the quality and cost are the same, regardless."

This attitude goes some way to explain why water management is a much lower priority than managing power, rent and other business costs. Nonetheless, companies are realising the importance of looking more closely at water, particularly from a holistic and strategic point of view.

Water's new value

The primary reasons for this change include

lower operating costs, securing water supplies and ensuring the quality of water. Contrary to how we view clear water as clean water, numerous quality variables impact water's uses. Water contaminated with heavy metals is unfit for drinking, while saline water is not suitable for crops.

Water is under pressure from growing populations, urbanisation, climate shifts, and changing watersheds. Water is becoming scarcer and more expensive, so a once-abundant vital resource now requires much closer cost- and management scrutiny.

"We have to become smarter about water," says Chirouze. "The pressures on water translate into pressures on companies.





But this also means that good water management can improve business profit and performance.”

A new approach to water management

Yet many will object: they do manage water, they look at their consumption bills, and they ensure there aren't leaks on their facility's pipes. While such actions are commendable and proactive, they only scratch the surface. Effective water management runs a lot deeper.

“A big problem with water is, again, we think of it as similar to electricity. The supply and quality are quite stable, so we only look at our consumption. But that approach ignores a lot of cost factors. One never sees what we call the ‘true cost of water.’”

For example, water might be pumped

water from a private source such as a borehole. But are power consumption or the maintenance costs of the pumps being factored in? Is the sustainability of the water source included and can money be saved by helping to rehabilitate it? How much is being spent treating the water and can money be saved by recycling it, rather than simply releasing it back into the municipal sewers, storing it in wastewater ponds or, much worse, releasing it into local river systems.

Answering such questions can lead to some creative solutions, such as the Thakadu Nickel Purification Plant in South Africa's North West province. This site reuses crude wastewater from a nearby mine to extract nickel for batteries and other uses.

A full, detailed picture

Companies often treat water too broadly, but also too narrowly. Water costs are frequently determined at site-specific levels, only focusing on very water-scarce sites. But numerous studies, including work conducted by the US Department of Energy, show that this neglects multiple factors that contribute to water costs and, crucially, negates the need for a company-wide water management strategy. It is telling that most organisations don't have a dedicated role for water management, even when water is a considerable responsibility.

“Managers should develop a business-wide water management strategy, then focus on site-specific issues. Water is an integrated resource and it is surprising to see just how

much and where a business uses water. So a detailed, complete picture is needed.”

Can't technology help? In this age of digital excellence, won't a few smart meters do the trick? Chirouze cautions against this kind of thinking. Yes, smart technology is very effective, but technology on its own won't lead to sustainable solutions.

He equates the necessary strategy to a pyramid: “Smart technology is the top of the pyramid, but it will collapse if supporting layers underneath are not factored in. We have the technology but we don't always have the social etiquette, in the sense that people don't value water. If people have water access, what's the problem? Why should we care where it's going to? It's only when our water supply dries up that it becomes a problem,” argues Chirouze.

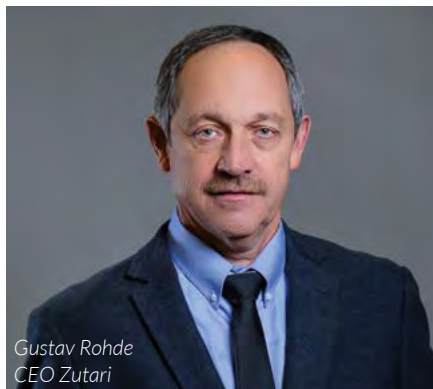
Fortunately, as is typical with underestimated costs, if one focuses on a water management strategy, there are near-term and long-term wins to be had. Major companies that have focused on water have comfortably realised cost reductions of between two and three percent within a year, and even more as they tightened their strategies.

On one hand, water management is a survival imperative as the resource grows scarcer and less predictable and demand for it rises. On the other, water is a poorly managed resource that will pay dividends once it's brought under clear and proactive control. However one looks at it, good water management leads to greater profit and performance.

www.xylem.com

Zutari: co-creating Africa via solutions that matter

Zutari, formerly known as Aurecon, was officially launched in July 2020 as a 'proudly African' company with the renewed intention of delivering fit-for-purpose infrastructure solutions in close partnerships with clients across the continent. Zutari CEO, Gustav Rohde, outlines the company's Africa vision.



Gustav Rohde
CEO Zutari

The African continent requires a minimum of US\$130-billion annually for infrastructure development and preservation. Highlighting this number recently, the African Development Bank also pointed out a financing gap of around US\$68-\$108-billion.

On 10 July, the ANC's Economic Transformation Committee officially launched a discussion document titled *Reconstruction, Growth and Transformation: Building a New, Inclusive Economy*. This proposes a massive, infrastructure-led economic recovery that will include expanded public-private partnerships and a strengthening of the District Development Model at local government level.

Earlier in June, African Union Chair President Cyril Ramaphosa underlined the importance of infrastructure as a growth driver at the Sustainable Infrastructure Development Symposium of South Africa (SIDSSA) in Sandton, Johannesburg. He said that SIDSSA represented "a new beginning for infrastructure development - a new beginning that promises inclusive growth, development, transformation and, above all, hope for a better tomorrow for all our people."

Barely a month after this historic symposium, a 'new' player is auspiciously launched in the infrastructure space. A company whose primary focus is Africa and which believes all infrastructure projects must be engineered to have an impact.

Zutari CEO Gustav Rohde is quick to point out that the 'new' company is really one of the oldest in the industry on the continent. Formerly known as Aurecon, it was the merger of Africon, Connell Wagner and

Ninham Shand in 2009. The latter can trace its history in Africa back to 1932 - operating for almost nine decades.

In October 2019, the owners of Aurecon Africa took the bold step of deciding to demerge from the global business, headquartered in Melbourne, Australia. The process subsequently culminated in Zutari, a name is derived from the Swahili for 'invent' and 'nectar', namely *mzulia* and *nectari*.

Back then no one could have predicted that the beginning of 2020 would see the emergence of a global pandemic, with COVID-19 having a devastating impact at macro-economic and community levels. Rohde, however, highlights that in September 2019 management could already see the winds of change pushing back against globalisation.

"We could see the market changing, and so decided to demerge from the global company to be proudly African. It is interesting how the pandemic has accelerated the trend towards localisation, especially as borders remain closed and international travel continues to be restricted. The fact that we are a private, management-owned company with African owners makes our commitment real - we have a vested interest in our clients' success."

It answers the question of whether launching a new company in the current business environment is either an audacious or a risky move. Instead, it is the culmination of a well-planned journey towards Zutari, which is committed to Africa because it believes passionately in its future.

About 75% of its nearly 2 000-strong multi-disciplinary employees are professional engineers, technologists or scientists. "I think there are very few companies that can match our local capacity, long-standing presence and understanding of the challenges required to operate successfully across this continent," stresses Rohde. It is this deep skills base and long-standing presence on the continent that Zutari taps into to make a tangible difference in Africa.

"It is all about making a difference. This refers to responsible infrastructure projects that generate employment and improve local communities," he explains. Zutari aims to achieve these goals by partnering with its clients in a process of 'co-creation' to derive at "joint solutions that matter."

Elaborating further, he says: "We work in conjunction with our clients, rather than going away and designing what we think to be the answer and then presenting it as a fait accompli. Here it is important to factor in the social impact of design."

"Ultimately as engineers we are trained to focus on the technical aspects, but our solutions have both a social and an environmental impact. The best way to embrace these is through co-creation, where we also look at the end user of infrastructure to deliver impactful engineering."

Infrastructure development must also be sustainable, which is why Zutari is a leading player in Africa in renewable energy solutions such as solar and wind power. Rohde stresses that true sustainability for any asset owner or operator focuses on responsible development.

This includes social and environmental factors, as well as embracing appropriate new technology. "It is also about well-rounded operations and a safe and motivated workforce."

The 'new normal' ushered in by the COVID-19 crisis saw the entire company using its digital technology investments to transition successfully to remote working in March - a week before the hard lockdown came into effect. Zutari is now uniquely positioned to take on the challenges of working in Africa, where many project sites are remote and access is difficult.

As a final message, Rohde asserts that the new company will focus exclusively on "solutions that are appropriate for the continent. What might be feasible for highly-developed markets such as the US or Australia may not necessarily be affordable, let alone viable here. It is our vision and our commitment to achieving the full potential of Africa."

Rohde sees the main infrastructure deficit on the continent as revolving around basic amenities such as water and wastewater services, transportation and energy.

"Infrastructure has been rightfully identified as a catalyst for growth and development. Many global companies who attempt to enter the African market do not know the best way to tackle its problems. We are right there at the coal face, where we can make the biggest impact possible," Rohde concludes.

www.zutari.com



Brent Frazer

Li-ion batteries: the cost-effective retrofit

Brent Frazer of Chase Technologies talks about the advantage of using Li-ion batteries for lifting equipment, such as electric forklift trucks, as a replacement for lead acid battery technology.

Chase Technologies was founded in 2017 as a supplier of lithium-ion (Li-ion) battery units for industrial forklifts and other heavy lifting applications. “We have since put about 190 battery units into forklift trucks, cleaning equipment, and access platforms across South Africa. We can accommodate any brand of equipment and, as long as we know the size of the battery tank, can retrofit any electrically driven industrial vehicle with a Li-ion battery solution,” Frazer tells *MechChem Africa*.

Li-ion batteries have a modular nature, which makes it easy to package a battery pack to fit into most forklift truck battery tanks. The company’s units are ideal for replacing lead acid battery technology and, because these have higher energy density than lead acid batteries, more amp-hours (Ah) of energy can be stored using the same physical space. This makes retrofitting to Li-ion almost as easy as swapping out the lead acid batteries, which has to be done on a regular basis, anyway.

“Swapping from lead acid technology to Li-ion has become a no brainer. While the units are a little more expensive, Li-ion batteries offer 12 000 hours of maintenance-free operation and they come with a five years warranty. Other advantages of switching to Li-ion include:

- **Fast charging:** A Li-ion battery pack can be fully charged within about 90 minutes using a standard (100-200 A) charger, and a 50% charge can be added in 30 minutes. Fully charging an equivalent lead acid battery may take up to eight hours plus a further few hours for the batteries to cool. If using Li-ion, fast

charging enables clients to run their forklifts 24/7, because they can be sufficiently charged during routine break times.

- **Maintenance free:** No standby batteries are needed and less time and labour is involved in swapping out lead-acid batteries to keep machines operational, or for routine battery servicing.
- **Better energy efficiency:** A lead-acid battery loses much more energy to heat. A Li-ion battery offers energy efficiency of about 15% higher than lead acid, saving on electricity bills and reducing CO₂ emissions.
- **Substantially lower total costs:** Together, longer life, better energy efficiency and substantially lower maintenance costs add up to massive cost savings in the long term.

“Li-ion technology really comes into its own for multiple shift operations, where the

machine can be handed over directly to the new operator without having to swap out the depleted battery pack for a fully charged one,” says Frazer.

With Chase Technologies’ latest technology units, the built in battery control system is constantly informing the operator about the state of the battery, and the battery maintenance system in all of these units is fitted with a SIM card for connectivity. “We are able to log-in and remotely monitor the performance of any of the units we have installed. If there is a problem, we can determine exactly what is going on and quickly give advice as to how to overcome it,” he says.

The company’s solutions are already highly successful in the rental market, particularly in Cape Town where there is a seasonal demand in pack houses for fruit and vegetable produce from the region. “The reliability and the maintenance-free nature of the technology makes it very attractive for rental companies and operators, as both can get better duty-cycles and more cost effective and hassle-free use from the equipment,” Frazer informs *MechChem Africa*.

“We have also developed a solution for cold storage use at temperatures down to -20°C, which is proving to work exceptionally well. These units are insulated and include an integrated heating element that is used to maintain the battery temperature above the minimum required threshold,” he explains.

“We guarantee a five year maintenance-free life and, after that, while the capacity may have deteriorated a little, these units will still have a functional life of a further five years, albeit at a lower duty-cycle or in a lower power application,” he explains.

“In these increasingly lean times, clients are looking more closely at securing the future of their businesses. At the end of the day, an investment in Li-ion is easily recoverable in relatively short payback times and, after having paid back the investment, substantial savings become available,” he concludes. □



Chase Technologies was founded in 2017 as a supplier of lithium-ion (Li-ion) battery units for industrial forklifts and other heavy lifting applications.

E+H strengthens Patent Rights Incentive programme

Innovative products are essential to the success of a technology company. That's why the Endress+Hauser Group has been paying special attention to the protection of intellectual property for two decades now. The most recent figures confirm the success of this initiative: 318 initial applications in 2019 and a portfolio of more than 8 000 patents and patent applications worldwide mark new highs.

For 20 years now, a separate department at Endress+Hauser has been dealing exclusively with the protection of intellectual property. In 1999, the company merged and realigned all activities in this field. Today, 30 employees – 26 in Weil am Rhein, Germany and four in Greenwood, Indiana, USA – take care of patent issues, trademark protection and related contracts. The Patent Rights Incentive Programme was launched at the same time. It encourages the Group's employees to submit invention disclosures.

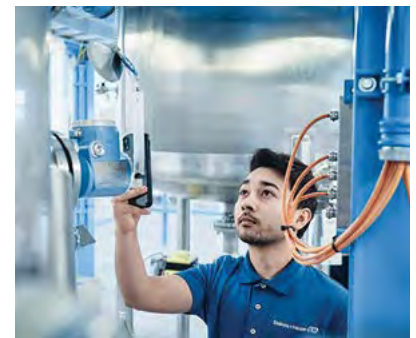
"If we want to protect ourselves from unauthorised imitators, we need to be

aware of all relevant developments," says Angelika Andres. The physicist and patent attorney has headed the Group's IPR department since 1999. Her team determines whether the submitted inventions are worthy and eligible for protection. This applies in four out of five cases. The specialists then draft a patent application that grants comprehensive protection for the invention.

In 1999, Endress+Hauser submitted 55 initial patent applications – in 2019 there were an impressive 318. "We took a leap forward in the first year after the introduction of the Patent Rights Incentive Programme and registered almost twice as many patents," says COO Dr Andreas Mayr. "Since then the numbers have been growing steadily." The share of patents related to digitalisation is increasing, and the field of analytical technology – a strategic focal point – is also gaining importance.

Endress+Hauser was granted 677 patents worldwide last year, protecting the company's products in all major European

markets as well as in China and the USA. Today, the Group's entire IPR portfolio comprises more than 8 000 patents and applications. This is mainly due to the work of the more than 1 100 employees in research and development. "But any employee can file an invention disclosure," emphasises Andreas Mayr. "Innovation is not limited to certain areas," she adds.



Digital change: At Endress+Hauser a growing number of patents concern developments for the Industrial Internet of Things and Industry 4.0.

Mobile disinfectant trailer to fight COVID-19

In a bid to fight the COVID-19 pandemic, thyssenkrupp Industrial Solutions South Africa (tkISSA) has locally engineered, designed and manufactured a custom-designed, portable Sodium Hypochlorite disinfection trailer unit for spraying disinfectant in COVID-19 hotspot areas to help curb the spread of the virus.

The primary way that the extremely contagious SARS-COV-2 virus spreads is from person to person but because the virus attaches to surfaces, infection can also occur when people touch their faces after touching an infected area. The World Health Organisation (WHO) suggests using sodium hypochlorite, commonly known as bleach, for effectively disinfecting surfaces potentially infected with SARS-COV-2. For safety reasons, chemicals should be used at the lowest possible effective concentration. WHO recom-

mends a 0.5% Hypochlorite solution to kill the virus, which is achieved by dissolving one part household bleach – commonly available at a 3.5% concentration – to seven parts water. This dilution is as good as the alcohols used in hand sanitisers.

thyssenkrupp has designed the trailer unit for effectively spraying the recommended 0.5% hypochlorite concentration over large street, pavement and vertical surfaces. The company is globally renowned for its engineering capabilities when it comes to machines and equipment for the mining, minerals processing and cement sectors as well as for its cutting-edge technologies such as solar and biomass. "By combining these proficiencies with our local fabrication expertise, we have produced this robust and cost-effective trailer," says Neville Eve, GM for Chemical Process Technology at thyssenkrupp.

Equipped with a 500 l easy-to-refill concentrate tank, the Hypochlorite trailer can spray 50 000 m² per day with only water replenishment required for the dilute liquid tank. The unit is fitted with four spray nozzles allowing four operators to efficiently spray both sides of a street simultaneously.

Weighing 1 600 kg (gross), the trailer is easily towed by a bakkie or light utility vehicle and is ideal for use by local municipalities, health departments, industrial cleaning companies, etc. Thanks to the smart modular design, multiple units can be manufactured with very short lead times. Philipp Nellesen, CEO of thyssenkrupp Industrial Solutions Sub Sahara Africa says: "Through the development of this Hypochlorite trailer we are able to give back to our partners and to the regions that have supported us so well."

www.thyssenkrupp-industrial-solutions.com

New WIKA check valve with redundant sealing

A new model CV check valve from WIKA has been designed for a wide range of applications in the process industry. Its sealing system with a self-centring piston reliably prevents backflow of liquid and gaseous media. The reliability of the new instrumentation valve is mainly due to its redundant sealing, consisting of an O-ring and a metal cone. Its leak tightness has been tested in accordance with BS6755/ISO 5208 leakage rate A. The solid-

machined, robust design of the model CV ensures high repeatability and a long service life, even in heavy-duty applications. The pressurised parts correspond to the safety factor of 4:1. For the new check valve, WIKA offers an application-specific assembly with a measuring instrument. Such an instrument hook-up is delivered ready-to-install and leak tested.

www.wika.co.za

Cable carrier systems for heavy loads in harsh environments

BMG's extensive portfolio of Tsubaki Kabelschlepp cable carrier systems and safety cables includes S/SX steel cable carriers, which have been designed to carry heavy mechanical loads in harsh environments, including corrosive conditions.

"The S/SX series comprises robust steel cable carriers, with a chain-link sandwich design, consisting of two plates welded together for high stability," says Carlo Beukes, business unit manager, Power Transmission division, BMG. "This link design, with optimised geometry, allows contaminants found in harsh environments to fall through the system when the cable carrier is in motion. Dirt build-up, which normally causes blockages of the stroke system, is prevented to ensure continuous free-running operation.

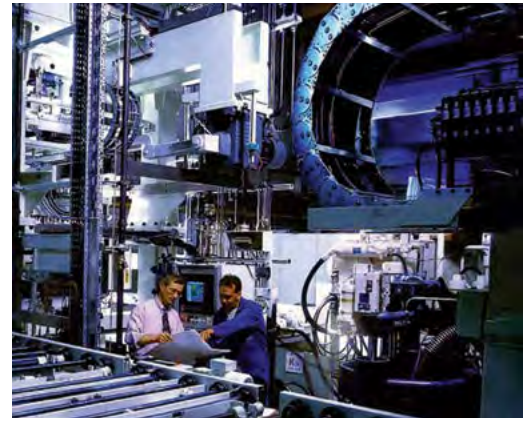
"With conventional cable carrier systems, large amounts of foundry sand,

corundum or scale tend to block the cable carrier's stroke system, resulting in failure of the cable carriers and subsequent downtime."

The design of the S/SX series allows for increased unsupported lengths and large additional loads without sagging, when perfectly sized to the application. The stroke system, with special bolts and locking rings, is designed for extended service life.

Plastic or steel dividers maintain neat cable separation and an aluminium cover system or covers with a steel strip, enhance cable protection. This series is available from BMG with a galvanised finish or Stainless Steel construction, in different dimensions to suit exact requirements.

BMG's Kabelschlepp range of cable carrier systems and safety cables – known for high productivity, minimal mainte-



BMG's Tsubaki Kabelschlepp cable carrier systems include S/SX steel cable carriers for carrying heavy mechanical loads in harsh environments.

nance requirements and reduced downtime – extends from standard individual components to complete system solutions. These cable carrier systems are available in heavy-duty steel (S) and corrosion resistant stainless steel (SX) as well as in durable, lightweight plastic materials.

www.bmgworld.net

GEMÜ valves to combat COVID-19

GEMÜ is supporting the development of a new pragmatic solution, which will double existing ventilation capacities by enabling two patients to use the same ventilator.

The Institute for Manufacturing of Cambridge (IfM) – which is part of the University of Cambridge's Department of Engineering – and the Royal Papworth Hospital in Cambridge are collaborating to develop a method for splitting a ventilator's air flow so that two COVID-19 patients can be treated simultaneously with one ventilator. Such a device would make it possible to double the capacities for the safe ventilation of patients for short periods.

One requirement imposed by medical professionals was that it had to be possible to individually measure and control the air flow to each patient. This was intended to ensure that a deterioration or improvement in the breathing of one patient would not affect the air supply or monitoring of the other patient.

In order to accomplish this, the IfM has developed a read-out meter, which makes

it possible to measure the tidal volume for each patient in real time and monitor both the overall pressure and the air flow on the device. The individual fine adjustment of the air flow for each patient requires valves that can ensure the air/oxygen mixture is precisely metered and are also easily accessible.

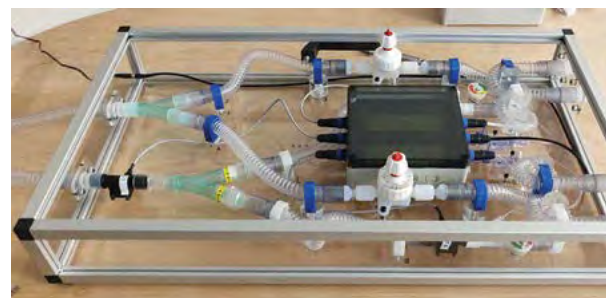
To find a solution for these two challenges, the scientists collaborated with specialists from valve manufacturer GEMÜ. They calculated the optimum flow rates for the air/oxygen mixture and recommended that GEMÜ C67 valves in the DN8 size range be used, as these valves allow for a high air flow and simultaneously provide good manual controllability thanks to their low flow resistance.

The design of the GEMÜ valves also plays an important role, as the handwheels are the only parts of the newly developed device located outside the housing, allowing doctors to individually adjust the air flow for each patient.

Tests of the 'splitter' with artificial lungs have so far yielded very promising results, so that the first details about the apparatus, which was developed as a portable device, are now freely available on the IfM website. The website will be updated with the complete details of the design and testing once the device has been approved for use.

This will make it possible for the sharing device to be copied across the world so that it can be used as needed, particularly in countries that do not have enough ventilators.

www.gemu-group.com



GEMÜ C67 valves are being successfully used in a device for splitting a ventilator's air flow.



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Real time monitoring of hydrogen in transformer oil

Pretoria-based RTS Africa Technologies, (RTS) is now able to provide dissolved gas analysis (DGA) analytical instruments designed specifically for real time monitoring of hydrogen in transformer oil.

RTS is an Africa agent for H₂scan, a leading provider of proven, proprietary hydrogen sensors and technologies for utilities and industrial markets. The company recently announced the increased availability of its Gen5 System, developed specifically for transformer oil DGA for distribution transformer monitoring.

H₂scan has increased production capacity of the Gen5 System to accommodate the increased worldwide demand as utilities begin implementing real time measurement on lower cost assets.

The Gen5 System is a unique hydrogen sensor package based on H₂scan's application specific Integrated Circuit (ASIC) technology, which makes these instruments compact, cost-effective and ideal for use on distribution transformers.

The Gen5 System enables real-time hydro-

gen monitoring for reduced risk of explosions and catastrophic failure and is ideal for use in distribution transformer applications, especially those located in populated areas such as suburbs, under streets and in industrial sites. The ASIC-based system delivers very high accuracy sensing at a dramatically reduced price while still being as reliable a hydrogen sensing element as those delivered worldwide since 2012. Over 15 000 hydrogen sensor systems have been installed, without a single need for replacements or recalibrations.

The sensor system works with oil immersed transformers and offers real-time or step-change monitoring to report hydrogen levels as they fluctuate. The unit's high accuracy sensor head can track hydrogen levels in the transformer oil from 25 ppm to 5 000 ppm at oil temperatures up to 105 °C. The real-time monitoring is ideal for smaller transformers where power overloads can cause higher temperatures that can quickly drive up hydrogen levels.

The Gen5 System incorporates H₂scan's patented auto-calibration technology, requir-



H₂scan's Gen5 System for dissolved gas analysis (DGA) of hydrogen in transformer oil, which is now available in South Africa from RTS Africa.

ing no maintenance or re-calibration for up to 10 years. Total install or retrofit time of the Gen5 System is less than one hour. The instrument is IP68 rated and can withstand 14 days submersion in water to a depth of up to 10 m, making it ideal for underground vault transformers.

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SKF invests in ball bearing manufacturing

SKF is making further investments to strengthen its ball bearing manufacturing footprint in China. The investment is in-line with the Group's region-for-region manufacturing strategy.

In June 2019, the Group announced a SEK370-million investment in a new factory in Xinchang. With the factory now operational, a further SEK400-million is being invested in expanding the site.

Patrick Tong, president of Industrial Sales Asia, says: "We have made great progress in China, the world's largest market for deep groove ball bearings, over the past two years, thanks to our engineering competence and the first investment phase in Xinchang. The next phase of the investment will allow us to serve our customers even better, across wider applications and with a wider product range."

Kent Viitanen, SKF's President of Bearing Operations, says: "This investment is part of our strategic ambition to develop our regional manufacturing footprint. Following our successful initial investment in Xinchang, expanding the site is a logical next step in strengthening our ball bearing capabilities in China."

The second phase of the factory in Xinchang is expected to be operational during the end of 2021.

www.skf.com/africa/en



SKF is making further investments to strengthen its ball bearing manufacturing footprint in China, the world's largest market for deep groove ball bearings.



Mesura's PRODIGI ultrasonic smart gas meters



Mesura's PRODIGI ultrasonic smart meters from Energas are mainly used for large-scale housing developments.

New to Energas Technologies' comprehensive offering is a range of gas meters from Mesura Metering, a Cavagna Group company from Italy. PRODIGI ultrasonic smart meters, explains DeWet Ras of Energas, are ultrasonic smart meters mainly for large-scale housing developments such as complexes, apartments and estates, as well as business parks and shopping centres.

Commenting on the key features and

benefits of the range, Ras says current installations in South Africa use diaphragm meters to measure the volume of gas passing through them. "A diaphragm meter has a mechanical counter and, as the gas passes through the meter, the counter turns relative to the volume of gas used," he says. The Mesura PRODIGI ultrasonic smart gas meter uses ultrasonic pulses transmitted through the tube of the meter in the direction of the gas flow and in the opposite direction. The difference in transmission time between the two ultrasound signals gives an accurate indication of the gas flow rate.

The other main feature of the Mesura gas meter range is that it is 'smart'. The GSM/NB-IoT communication module installed inside the Mesura meter ensures all data captured by the meter can be transmitted remotely via GSM network infrastructure to gas providers. The communication module also has the capability

of sending data from electronic devices to suppliers and customers through Internet of Things (IoT) cloud solutions.

Another important feature of the new meter, adds Ras, is that it can measure very low flow rates. "During our quality assurance analysis, Energas conducted tests where we connected a normal diaphragm meter and the Mesura UFM meter to a small single-plate gas stove and left it running. Over the two hour test period at very low flow rates, the Mesura meter registered higher flow volume (0.052 m³) compared to the standard diaphragm meter (0.042 m³).

Ras makes special mention of the automatic gas shut-off valve installed inside the Mesura meter, which also allows the gas provider to remotely open or close the gas flow. In addition, the range comes fitted with metrological or transmission grade lithium-ion batteries, which can last up to 15 or seven years, respectively, under standard conditions.

www.energas.co.za

Diagnostic videoscopes for troubleshooting, maintenance and repair

While videoscopes are commonly used in many applications, industrial inspections require a powerful, high-resolution videoscope that clearly displays the condition of internal equipment components. High-resolution videoscopes allow industrial maintenance teams to quickly identify equipment issues and schedule preventive maintenance measures to avoid costly unplanned shut-downs.

Comtest is now offering the 800x600 resolution Fluke DS701 Diagnostic Videoscope and 1 200x720 resolution DS703FC high resolution version – built for industrial maintenance troubleshooting and quality assurance testing, which is designed to stand up to challenges of a rugged environment. Features include:

- High definition probes with dual-view cameras, allowing the videoscope to take images and video either forward or to the side to capture the images in difficult or hard to reach locations.
- 7-inch LCD screen for easy viewing.
- IP68 rated probe (imager) for protection against dust and water projected from against a spray nozzle.
- Engineered to withstand a two metre drop.
- Incorporates Up® technology, which rotates the display screen to allow for appropriate image display, regardless

of the orientation of the probe (available with selected probes).

- Macro to micro zoom function.
- Adjustable lighting to capture the best image.
- Processing speeds that render a smooth, clear and consistent image.
- Intuitive user interface with easy-to-navigate button technology.

These rugged videoscopes are designed for a variety of industrial applications, such as: production – inspection of bearing surfaces and lubrication, and gear helix inspection; aircraft maintenance – blade inspection, engine hot section contamination; automotive quality assurance – testing of casting goods, inspection for cracks,

chips, and contamination in HP chambers; heavy-duty maintenance – inspection of clogged pipelines, corrosion in rotors and stators; and much more.

The Model DS703FC videoscope offers wireless synching of images directly to the Fluke Connect® system, which are then attached to an asset record or work order. Having access to maintenance records simultaneously at the inspection site and from the office or an off-site location enables faster decision making and real-time collaboration between team members. Live images or videos can also be streamed from the Scope to a smartphone or computer.

Scan the QR code to watch a YouTube video about the use of Fluke DS701 & DS 703FC Diagnostic Videoscopes.

comtest.co.za



High-resolution videoscopes allow industrial maintenance teams to quickly identify equipment issues and schedule preventive maintenance.

Cogeneration: the smart move for process heat users



Leandro Magro Zest WEG

According to Magro, traditional coal power plants are built around steam, but when considering the current price of renewables such as wind turbines and solar PV, along with the environmental consequences of carbon emissions, building steam-based coal power plants to generate electricity doesn't often make sense anymore.

But for companies that already have boilers to produce the process heat they need, such as sugar, chemical, food, oilseeds

Leandro Magro, manager for steam turbines at Zest WEG, argues that cogeneration for plants that already have boilers producing steam for process heat is the smartest move towards electricity cost savings. The addition of a TGM WEG turbine generator system to a steam process plant offers energy security, lower utility bills and the potential to sell excess power to local municipalities.

processing and paper plants, the addition of a steam turbine generator that can produce some or all of the electricity they need can be a huge benefit. "This is the niche application for our Zest WEG steam turbine business," he tells *MechChem Africa*.

Opportunities for cogeneration mostly involve industries that use steam: for heating, drying, moisture control and sterilisation, for example. "In the paper industry steam is used in the cooking process, to control the pulp moisture content and then to dry the paper. At sugar mills, there is a high demand for steam in the evaporators, where the sugar juice is boiled off to make sugar crystals," Magro explains.

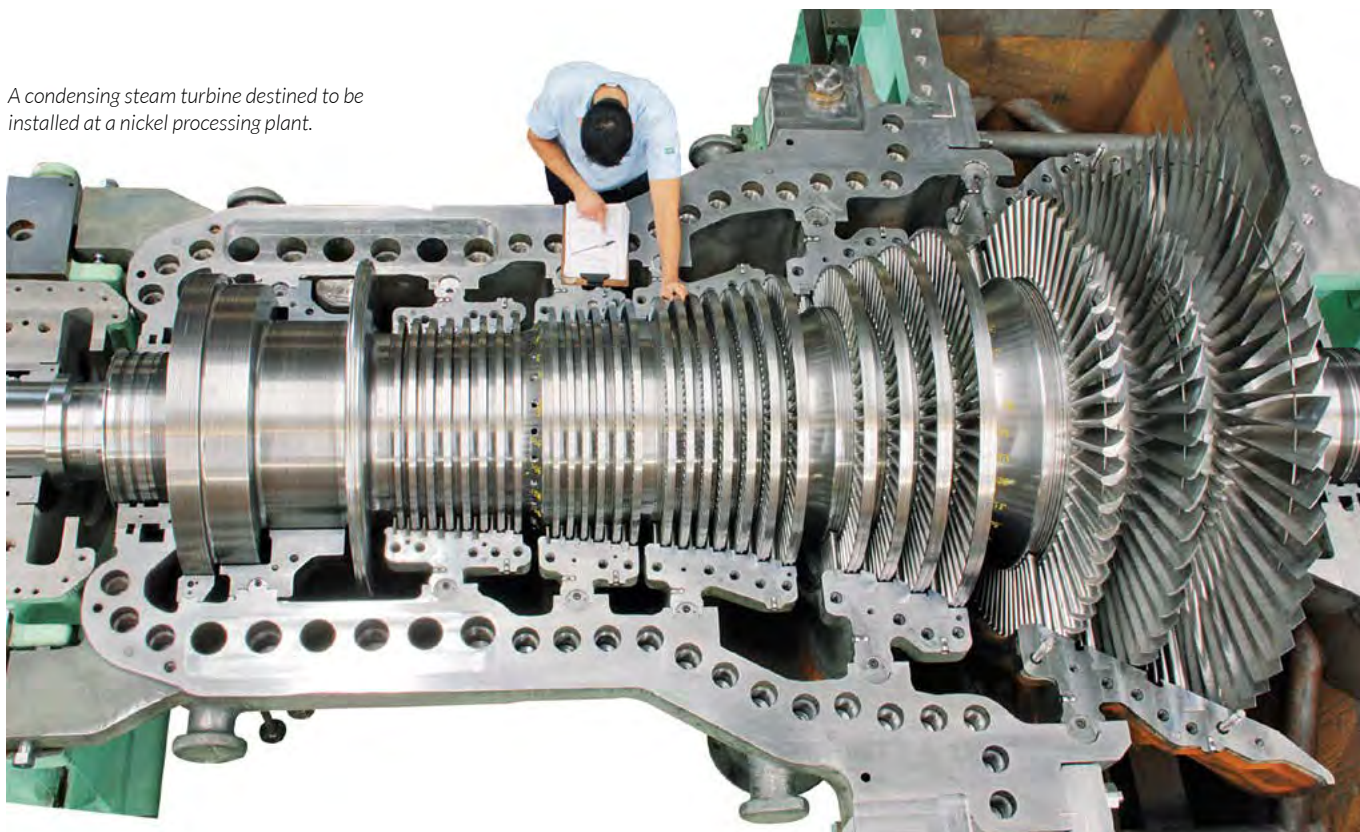
These industries use boilers to produce the process steam they need. But the pressures and temperatures of the steam coming out of these boilers has to be reduced to match the specific process requirements. In numerous cases, this is achieved by passing the steam

through a pressure reducing station, which consists of pressure reducing valves and water injection systems that are set up to deliver the steam pressure and temperature needed by the process.

"In terms of energy use, this is very inefficient," Magro explains. "Each stage of the process may need different pressures and temperatures, for evaporation, sterilisation or drying processes, for example, and each time the pressure and temperature is reduced, some of the thermal energy of the steam is lost."

To condition the steam to meet process requirements in a more efficient way, Magro suggests installing one of TGM WEG's steam turbine generator solutions, which can recover the thermal energy (enthalpy) of the steam that is not required in the process, by converting it, first into mechanical energy through the turbine, and then into electricity through a generator spinning on the turbine

A condensing steam turbine destined to be installed at a nickel processing plant.





A backpressure turbine generator for a sugar mill.



TGM WEG steam turbine generator sets at a sugar mill.

shaft. "Cogeneration is also called combined heat and power, since these systems are constantly delivering the process heat (via steam), while converting any surplus heat (enthalpy) into electrical energy via the steam turbine generator set. Plant operators continue to get the heat needed for their process, while also generating some 'free' electricity for their internal needs or, when generating excesses, for export to an external grid.

"The basic principle is simple: whenever an enthalpy drop is required to reduce process steam pressure and temperature, there is an opportunity to extract this enthalpy via a suitably sized turbine generator set, and to convert it into electricity," he explains.

"Our TGM WEG cogeneration solutions help plant operators to better benefit the steam they are already producing – and even with small pressure drops, we can cost effectively produce ac power. Saw mills across Africa, for example, have a lot of waste biomass at their disposal, and they already operate steam boilers to condition their wood products. We see potential to install steam turbine generator systems that can help these plants to generate their own electricity and, in many cases, to export excesses to power-hungry local towns," he informs *MechChem Africa*.

"At Zest WEG, our integrated solutions offering includes entire cogeneration systems that sit between the boilers and the process steam flange, including the associated electrical network of controllers, transformers, switchgear and transmission lines to enable the electricity generated to be safely and efficiently used," he adds.

The benefit for process heat users is that an easily installed TGM WEG system add-on can transform any operating steam supply line into an ultra-efficient cogeneration heat and power plant. "A carefully sized turbine generator set can control the enthalpy delivered to the process very accurately, by channelling the amount of steam and enthalpy through the turbine exhaust or controlled extraction pathways. Depending on the steam availability, a condensing extraction steam turbine plus a steam condensing system can be added

to recirculate boiler feed water. We can also convert most of the available enthalpy into electric power at times when no process steam is required," he says.

TGM WEG has more than 11 GWh of turbine generators installed around the world. In Africa, Zest WEG has already installed 130 MWh of TGM WEG cogeneration systems, in countries including South Africa, Zimbabwe, Angola and Algeria.

The TGM WEG steam turbine generator range embraces a power range from 50 kW to 150 MWh and "cogeneration can benefit all industrial segments that use process steam, from small to large operations. Even smaller plants such as food processing plants that make deep fried foods or use sterilisation processes will find that systems in the lower end of the range are viable, particular in the 500 kW to 5.0 MW range."

From a payback perspective, Magro says the investment in a steam turbine generator system is typically between R5 000 and R10 000 per kWh installed at plants that already have a boiler producing process steam. "If working for 8 000 hours per year, which is typical, and if assuming a cost saving of only R1/kWh from the utility, a typical system can generate electricity cost savings of R8 000 per kWh installed per year, giving a payback

time on the initial investment of between 7.5 and 15 months. This is surprisingly short and makes for an excellent business case," argues Magro, particularly where grid electricity prices are becoming increasingly difficult to afford. As well as promoting higher energy and production efficiencies, the energy security benefits of adopting cogeneration are invaluable, resulting in more reliable power that is less susceptible to grid-wide fluctuation or outages. Plants become much less dependent on diesel-driven gensets in emergency situations and overall plant reliability is likely to improve.

From a jobs perspective, there are also benefits, because operating a small power plant inside a process plant offers direct employment opportunities and supply chain expansions, which promote localisation.

Adding a cogeneration steam turbine generation system to an existing process steam circuit also benefits the environment, since it results in the most efficient possible conversion of the fuel being burned into useful power, maximising efficiency and minimising plant CO₂ emissions.

"So for anyone already producing process steam, it makes total sense to add a cogeneration system to convert the excess heat into electricity," Magro concludes. □



A condensing extraction turbine generator at a paper mill, which enables condensed steam to be recirculated as boiler feed water.

Mobile and intelligent 'cobots'

Maciej Kuczynski of Omron Industrial Automation describes how collaborative robots (cobots) are helping factories to deal with highly mixed, low-volume production runs by using flexible assembly lines that allow for rapid changeovers.

Collaborative robots that can work safely with people in the same environment have an important role in enabling flexible manufacturing and creating a competitive advantage. A new generation of 'cobots' is emerging with the evolution of classical industrial robots in response to the needs of Industry 4.0.

In applications where flexibility – as opposed to maximum production speed – is key, collaborative robots are filling the gap in the robotics market with their extremely user-friendly software tools and integrated sensory functions, which now include machine vision systems, location capabilities and integration with warehouse systems.

Although lightweight, the Omron Techman TM14M robot, for example, can lift goods up to 14 kg. Compliant with the ISO 10218 safety standard, which describes the interaction of robots and humans, industrial collaborative robots are now becoming team members in production and logistics environments thanks to their lifting capabilities. This brings innovation to the factory floors through true harmonisation and collaboration of humans and machines.

Collaborative robots can be deployed in a wide range of applications. For example, it is possible to support people in assembly processes at those stages where precision and repeatability are key. These robots can apply adhesives and seals with simultaneous quality control. Thanks to repeatability, they are also perfectly suited for automating complex quality tests. Being able to do heavy lifting, they can also be used as palletisers, with proper safety equipment.

The new generation of collaborative robots can easily be integrated with mobile robots. This cooperation is made more accessible thanks to the low weight of the latest robots, as well as the possibility of building



The Omron Techman TM14M robot can lift goods up to 14 kg. It brings innovation to the factory floor through true harmonisation and collaboration between humans and machines.

mobile platforms onto mobile robots, such as the Omron LD autonomous intelligent vehicle. Collaborative robots can now be a natural part of a flexible, constantly evolving production environment in which the re-deployment of machines, line changeovers and conveyors are needed.

Cobots are just beginning to enable innovation and competitiveness for manufacturers. High versatility and a wide range of possibilities, including the ability to carry out tasks currently performed by standard robots, are all easily configurable by local engineering staff. If we additionally consider a much easier implementation resulting from the reduced need to provide typical robots security measures and incomparably greater flexibility of operation, the return on such investment can be surprisingly positive. Forecasts for a significantly increased share of cobots in the industrial robot market should therefore not come as a surprise.

If machine vision capabilities are added, combined with artificial intelligence, the possibilities are limitless. A collaborate robot can have a built-in intelligent vision system that

provides totem pairing, object position, bar code identification, colour differentiation and other vision functions. You can use gestures to guide the robot and the task by hand, as well as change the degree of freedom of the hand-guide function freely according to different conditions.

The interactive tennis table robot, Forpheus from Omron, gives a clear sense of the possibilities of artificial intelligence (AI) combined with collaborative robots. As well being able to play against a human, the system can evaluate the human player's ability level and adjust its game accordingly.

Omron and Techman Robot Inc, the world's leading company for collaborative arm robots that work together with people, recently signed an agreement to form a strategic alliance in the area of collaborative robots.

Omron and Techman will provide collaborative robots that can be used for a wide variety of applications such as electronics assembly, product testing and inspection, helping modern factories to establish innovative manufacturing environments where humans and machines work in harmony. □

Manufacturing Indaba 2020 goes virtual

The 2020 edition of the Manufacturing Indaba will be hosted as a virtual conference on 9 and 10 December 2020. This is as a result of the COVID-19 pandemic and to ensure the safety of participating manufacturing companies.

The virtual event will be free of charge to conference delegates and companies, while clients will have opportunities to interact directly and safely with each other

to keep their business goals rolling. "All the Provincial Manufacturing Indaba events and the East Africa edition have been postponed to the second half of 2021. Our top priority is to provide a safe environment for everyone involved: our customers, attendees, partners and colleagues," says Liz Hart, managing director.

However, there remains a growing demand for manufacturing industry news and

discussion, especially with respect to the impact the pandemic has on manufacturing.

Key issues that will be discussed include: How to Future Proof your manufacturing business; The Africa Continental Free Trade Agreement; Lessons Learned in the era of COVID-19, and the Growing Importance of Localisation.

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