MechChem AFRICA
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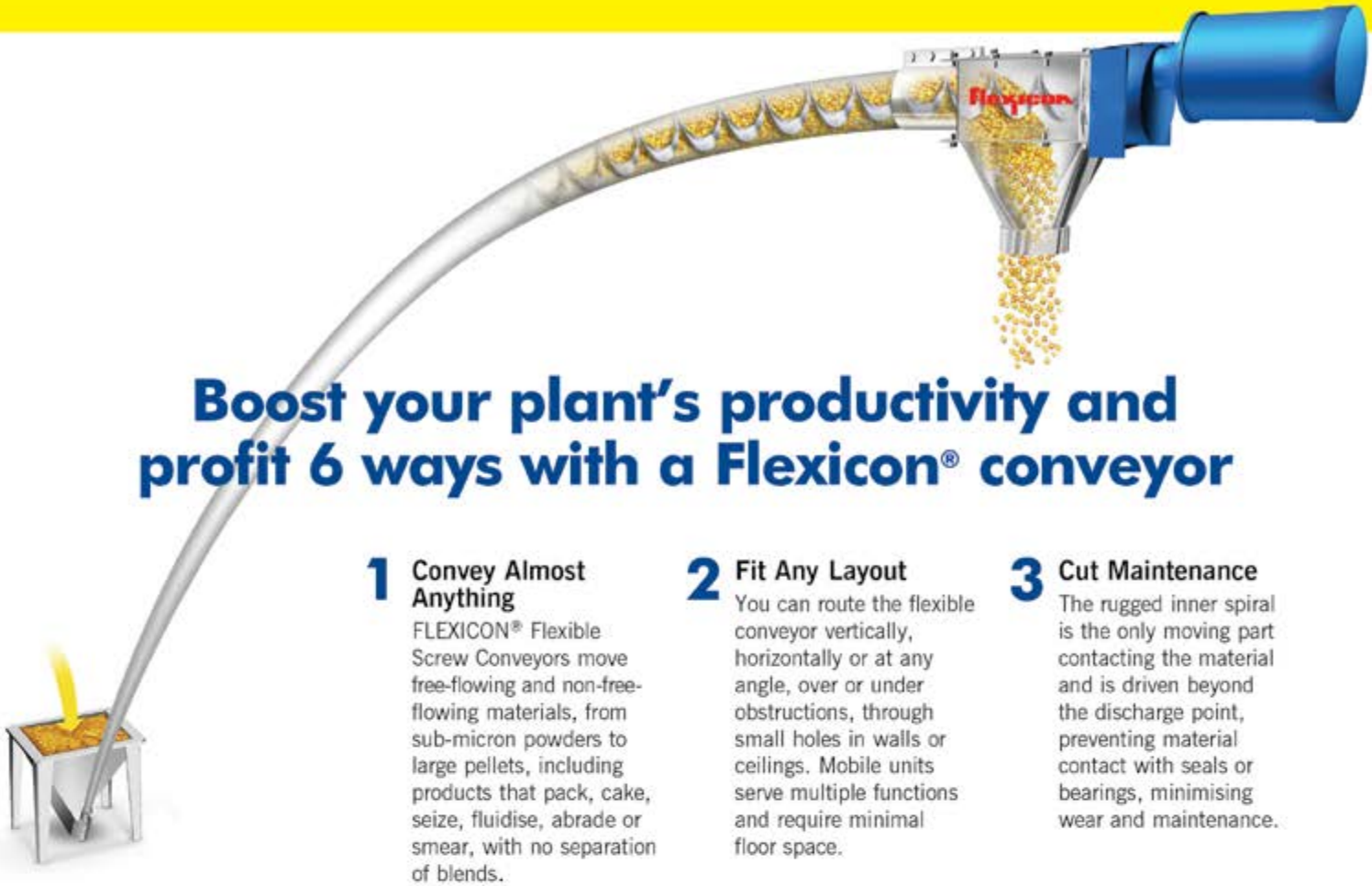
CROWN PUBLICATIONS

WEIR Minerals

Manufacturers of Warman Mill Circuit Pumps

This month:



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Tipping points, optimisation and the environment

Peter Middleton

COMMENT

Over the past 18 months, I have been one of those guilty of routine 'doom scrolling', tracking the COVID numbers across the world in a vain attempt to somehow feel 'in control'; perhaps to get some sense of when it all may end. We have all been subjected to the graphs of exponential growth: the rapid rise; the slowing down of the infection as lockdown measures start to take effect; the peak of the curve at the highest rate; and the turning point, when infection rates begin to fall again.

I still remember my school mathematics, where we learnt how to differentiate polynomials to determine the maximum or minimum y-values of a curve. Would it be comforting if the COVID Pandemic followed a predictable polynomial path? Perhaps not. At least we know we can influence the infection rates and their peaks by changing our behaviour and developing vaccines.

I also vaguely remember having to study linear programming and optimisation modelling, which involve finding the best output value for a problem or situation that could be framed as a mathematical relationship. Minimising total costs and maximising profit is a common example. Optimisation, and I am sure the principles involved, are now part and parcel of the IIoT, data analysis, machine learning, artificial intelligence and diagnostics, where the pursuit of optimum efficiency, productivity, reliability and a host of other industrial success imperatives becomes the key goal.

Another graph I remember well was presented back in 2006 by the ex-vice president of the US, Al Gore, in his campaign to educate people about global warming. Al Gore stood on a ladder to highlight how fast and how high the CO_2 concentration in our atmosphere had risen. I confess to have rolled my eyes at the theatrics of his presentation, but the documentary was extraordinarily successful in highlighting the problem.

Yet in the 15 years since, little has changed.

At the recent G7 summit of the world's seven largest 'advanced' economies in Cornwall, UK, it emerged that CO_2 is now at a higher level in the atmosphere than at any point in the last four million years – and greenhouse gas emissions are still rising. The summit identified "a dangerous tipping point: if the world fails to act now, the future will be changed beyond anything the coronavirus pandemic has brought about".

Climate economist, Lord Stern believes that, in terms of recovery from the COVID pandemic: "This is a crucial moment in history. Either we recover in a strong and sustainable way, or we do not. We are at a real fork in the road. This decade is decisive."

According to latest global warming science, greenhouse gas emissions must be halved by 2030 if the world is to stay within the 1.5 °C global heating threshold, beyond which extreme weather will take hold with "swathes of the world facing water stress and heatwaves".

Stern also notes that, while the cost of renewable energy has plunged and technology such as electric vehicles has increased, progress on cutting emissions overall has been painfully slow and: "…this next decade could be just as bad or worse, if we make the wrong choices".

In spite of all the urgency to mitigate against global warming, Ian Fraser writing in this issue on behalf of the African Hydrogen Partnership (AHP) has found himself having to refute ongoing attacks on the green economy. Arguing in favour of hydrogen as an energy carrier and a future fuel, he notes that "once the hydrogen economy is ubiquitous, the energy to mine materials and to manufacture, provide and transport the support equipment will all also come from renewables, via the green hydrogen economy. It should be noted that virtually none of these materials will be consumed and almost all will be recyclable."

Innovative Engineering in this issue also features hydrogen as a key aspect of the transition to a green economy. Gravitricity MD, Charlie Blair, describes an extension to his company's gravity-based energy storage solution, which involves sealing the mine shaft used to create a pressure vessel to store hydrogen gas. "Renewable energy generation is already creating periods of surpluses of energy … so grid-connected wind turbines are routinely being turned off to keep the grid balanced. Instead of turning these turbines off, we believe surplus electricity could be redirected into hydrogen electrolysers to make 'free' hydrogen fuel instead of wasting the generation capacity," he explains.

Like the COVID infection rate, CO_2 emissions can be mitigated by a combination of behaviour change and technology development. We have all of the analytical tools necessary to predict the consequences of neglecting to act, and to accurately track the effects of our combined actions.

All we need to do is to reset our data analytics and optimisations criteria towards optimising the health of our Environment. This may seem like a huge mindset shift from the economic recovery imperative, but our economic wellbeing will surely and predictably be bleak should we fail to act. ❑

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Warman® mill circuit pumps: a global flagship

Following over 80 years of continual development and innovation, Weir Minerals' Warman® Mill Circuit (MC) slurry pumps are the company's global flagship product for the mining sector. Product manager for pumps, Marnus Koorts, outlines some of the modern features driving this success.

"Mill circuit pumps are often described as the beating heart of a mine's minerals extraction circuit. They sit alongside every grinding mill, pumping newly ground mineral slurries up into the cyclones, which separate the coarse and the fine material, sending coarse particles back for further milling and the fines on for minerals extraction," begins Koorts

"Slurry pump wear rates are directly related to the volume and size of the particles. Larger pieces of rock from a primary mill impacting on the pump's throat bush, impeller and volute liner cause much more rapid wear than the micron-sized fine abrasive particles being pumped out of the end of the mill circuit by the tailings pumps," Koorts explains.

A typical centrifugal pump on the tailings end of a mill circuit, he suggests, might last for many months before wear components such as the liner, throat bush or impeller could need replacing, while a mill circuit pump can have a wear life of months, and possibly only weeks, if the installation is not optimised.

"The problem, of course, is if the primary mill's circuit pump stops, the whole mill circuit must stop and minerals extraction, often for the entire mine, comes to a standstill. This immediately impacts production, with direct consequences for the income stream of the entire operation," he points out.

"Our value offering at Weir Minerals is to produce mill circuit pumps that are not only reliable, but also have the maximum possible life between wear component changeouts," Koorts tells *MechChem Africa*.

The Warman® MC: the industry benchmark

Weir Minerals reported an R&D investment of 1.3% of total global sales in its 2020 Annual Report. According to Koorts: "A high percentage of that spend goes to advancing our flagship Warman® MC pumps. We have, over the years, developed a long list of ground-breaking innovations that are unique to us. We invented the adjustable throatbush, for example, and we have been advancing that technology ahead of our competitors for many years," he continues.

Explaining how this works, he says that material from the sump of the grinding mill goes into the pump at the throat and is propelled by centrifugal forces through the impeller to the outer volute of the pump casing. The throat bush sits around the inlet side of the pump creating a small gap between the rotating impeller and the casing. It is important to minimise this gap, as it minimises recirculation of material from the high pressure outlet side of the pump back to the inlet side.

"This gap, therefore, directly affects the pump's efficiency: the less fluid that recirculates, the better the efficiency. As the impeller and the throatbush wear, however, the gap widens and more and more of the slurry is able to recirculate. By adjusting the throat bush gap back to the minimum specified, we are able to reduce recirculation and routinely restore pump efficiency to its best possible," Koorts explains.

The electricity costs of driving a large multi-kilowatt motor on mill pumps far outweigh the initial investment costs, so if a couple of percentage points of the pump efficiency can be recovered by minimising recirculation – on a 1.6 kW or larger motor, for example – this quickly justifies the investment on a Warman® pump with this capability.

Pointing to a second innovation on the throat inlet, he highlights the small pre-swirl vanes that guide the material flow through the eye of the impeller, which prevents direct impacts of large particles onto the impeller blades.

Deep expelling vanes have also been added on the high pressure side of the throatbush to reduce the formation of eddies. This minimises turbulence, prevents the formation of

Left: *A Warman MC slurry pump under test during developmental stages at one of Weir Minerals' numerous test facilities.* ***Right:*** *A Warman MCU 350 slurry pump being assembled at the Weir Minerals facility in Alrode.*

vortices, reduces recirculation and further improves hydraulic efficiency. In addition, the expeller vanes prevent localised scouring on the throatbush face, further improving the pump's wear life.

From a maintenance perspective, Koorts assures that Warman MC pumps are designed for easy, rapid and safe repair. He cites the quick change-out system of the pump's wet-end as a key innovation: "The entire wet-end of our MC pumps can be unbolted and removed from the bearing and drive assembly shaft. This may sound basic, but it makes maintenance of these large pumps a far easier task, taking hours off the time needed to replace wear parts," he explains. "Also as part of our extended safety offering, all of the assembly bolts, even on the biggest pumps, are designed to be easy to handle," he adds.

Another core area of innovative leadership for Weir Minerals is on the materials side of pump design. "We have developed the widest selection of materials for lining our impellers and pump volutes and for our throatbushes. Most slurry pumps on the market use high chrome metal for all of these. We can offer a wide range of high chrome and various rubber compounds, along with a hybrid MCR-M option, which is a metal lined volute that can be interchanged with a rubber lined volute if required.

"In Africa, there are several copper and gold applications with quartz bearing ores, for example, and we have found that in some cases our rubber compounds offer better wear life for these specific ores. Being able to change over, however, takes away the risk of making the wrong liner choice. It gives the flexibility to exactly match the lining material to the ore being mined, which might change depending on the specific location of the ore body," Koorts explains.

Weir Minerals has also purpose-developed several other niche metal alloys for use in key areas of its pumps. "Ultrachrome® A05 is our high-chrome alloy, which is good for resisting impact wear from large particles. But we also have an alloy called Hyperchrome® A61, which is far better for fine particle abrasive wear. We can use A05 for an impeller and volute, while using A61 for the throatbush, for example, to give the best of both. Only fine particles are able to recirculate through the narrow throatbush gap, so impact is not a problem, making A61 ideal.

"With our R55® rubber available for the volute, we have multiple optimising opportunities. No other slurry pump manufacturer can offer this level of life-optimisation flexibility," Koorts tells *MechChem Africa*.

Low flow volute liners are another innovation, enabling the rated flow of a pump to be reduced by 15 to 25% depending on where the pump operates. This is an ideal solution for mine start-ups, where a lower initial capacity is needed until the mine is fully established, after which the low flow liner can be removed, and a full-sized impeller installed to deliver full run-of-mine production capacity.

Weir Minerals improved the wear life of pumps by 140% at Evolution Mining by installing a Warman MCR 550 slurry pump.

Weir Minerals service staff work closely with customers to ensure their plants run optimally.

"Warman® Mill circuit pumps are typically very large and involve intensive capital investment. Having flow flexibility on a big mill circuit pump makes a lot of sense for future proofing the investment.

"Speed (RPM) is a very important factor in our design philosophy. We believe that a larger pump is better for wear life, efficiency and total cost of ownership. Small impellers need to turn a lot faster than larger ones to deliver the same flow. A slower RPM translates into better wear life. It might be cheaper to buy a smaller pump, but the costs in terms of wear components and increased downtime will far outweigh the cost of a bigger pump. This means it is extremely beneficial to buy a pump bigger than needed and to then use a reduced flow liner to optimise the efficiency for low production periods, if one wants to expand in the near future," Koorts argues.

To achieve the full benefits of these Warman® MC pump innovations, the company employs its own optimisation team to model the improvement that can be achieved by installing a best-match solution for the mine's needs. "We make use of 3D scans of the mine environment to see where everything flows to. We do a Computational Fluid Dynamic (CFD) analysis of the slurry flow, from the sump to minimise dead spots and settling, into the pump inlet and right through the impeller and volute. We then model the pump wear for different material options and configurations.

"Once we have chosen an optimised pump for the mill circuit in question, we are happy to manage and fund an installation on a trial basis, on the understanding that if our solution delivers the savings we predict, we can then recoup the costs. To date our optimised solutions have enjoyed great success with no rejections. We have always managed to deliver measurable savings," Koorts reveals.

"This year, we are celebrating 150 years of innovation within the Weir Group and are very proud of the legacy that has followed. We believe we now have the most efficient mill circuit pump solutions available: pumps that are more efficient, use less water, are safer, easier than ever to maintain and with the longest possible wear life of the wet-end components," Koorts concludes. ❑

MOVIGEAR: The all in one mechatronic drive

In light of a recently completed and highly cost-effective implementation at a bottling plant in Nigel, SEW-EURODRIVE sales manager Willem Strydom talks about the latest innovations embedded in the company's MOVIGEAR® mechatronic drive technology.

"WhatsetsMOVIGEAR apart is that it is a decentralised drive system with the electronic drive and communications built into the gearmotor itself. It is the ultimate mechatronic system, combining highest efficiency IE5 motor technology; a simplified and efficient gearbox, an advanced electronic variable speed drive and all of the common digital communications protocols. These units are typically interconnected using our hybrid-power communication cable, for example, which runs the communications at high frequency along the 400 V ac power line," Strydom begins.

Citing a recently completed expansion project for a beverage bottling plant in Nigel, he says that SEW-EURODRIVE has installed 53 MOVIGEAR units for an additional line. "These highly advanced units are now driving the main line conveyors and all of the in-feed and out-feed conveying systems," he says.

At the start of this project, a comprehensive survey of one of the existing lines was completed to identify exactly what was needed in terms of the number of drives required and the specific speeds and torques needed at each drive point. "The conventional system we examined was using 13 different standard gearmotor variants. We were able to deliver all the speeds and torques required to control every point on the system using only three variants of our MOVIGEAR solution," Strydom tells *MechChem Africa*.

"This level of flexibility enabled spares stockholding to be substantially reduced. Where 13 different geared motor versions were used, we are down to two different mechatronic models: MOVIGEAR 2 and MOVIGEAR 4, and only one of these requires a different gear ratio," he says, adding that, in total, only three different part numbers need to be managed by the spare's store.

Explaining how this is possible he says SEW's MOVIGEAR units use servo drive technology, which offers constant torque across the speed range, from zero to full rpm. "With standard gearmotors driven by asynchronous motors, the torque is dependent on speed, so more gearing has to be incorporated to ensure the motor can deliver enough torque at the required speed," he says.

"The constant torque of the servo motor enables us to achieve a number of different speeds and output torques with a single gear ratio," Strydom explains.

On the mechanical side, the MOVIGEAR has an exceptionally efficient gearbox that also contributes to the IE5 efficiency rating of the unit. "The MOVIGEAR 2 offers up to 200 Nm of torque, while the MOVIGEAR 4 delivers up to 400 Nm."

These are state-of-the-art units and, according to Strydom, it took some convincing for the company to adopt a system with a cost premium compared to a standard asynchronous gearmotor solution. "But while the upfront capital expenditure is larger, we were able to make a like-for-like comparison with respect to the energy savings that would accrue if using MOVIGEAR.

"The latest MOVIGEAR has an IE5 efficiency rating, the highest of any SEW-EURODRIVE products. Compared to the installed conventional system, we are

MOVIGEAR technology is ideal for conveying and packaging lines in the food and beverage industries, as well as a host of other light and dynamic production line applications.

achieving a 38% energy saving on this project, not only due to the efficiency of the servo technology and the gearbox, but also because the electronics sit inside the unit, there is far less cabling, resulting in lower energy losses. Considering the electricity cost savings and reduced installation costs, the amortisation was estimated to be just under 13 months – based on the plant's own estimation. This completely obliterates the argument that modern MOVIGEAR systems are expensive compared to conventional systems," Strydom points out.

While there is a size limitation with respect to torque output, MOVIGEAR technology is ideal for conveying and packaging lines in the food and beverage industries, as well as a host of other light and dynamic production line applications. "We have even had some success in the fruit packaging industry, which is notoriously price sensitive," he adds.

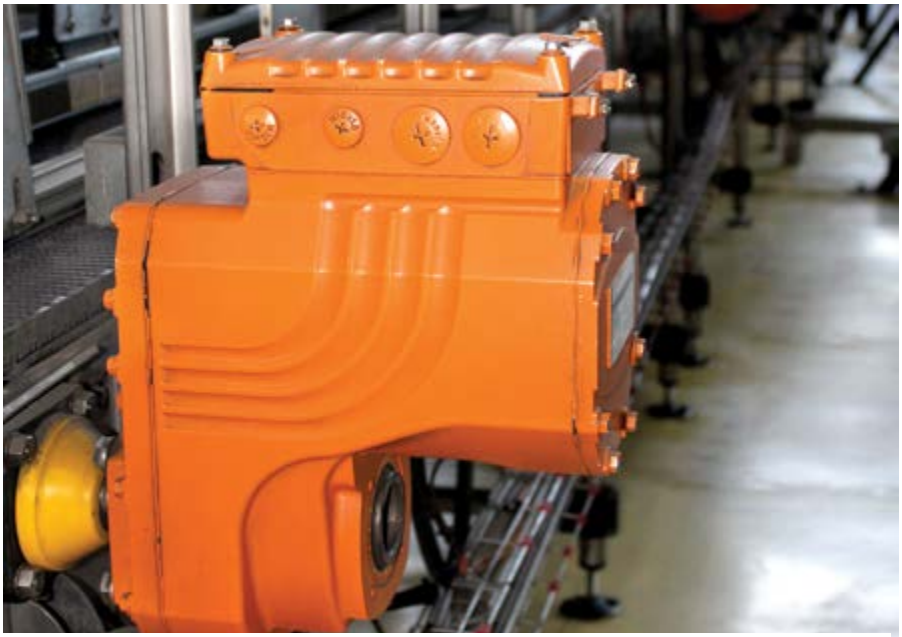
A summary of the key features embedded in this integrated drive solution include:

- Simple to install: MOVIGEAR comes with a universal mounting system that enables the unit to be mounted in any position without having to worry about oil levels or angles.
- Compact design: The motor, gear unit and electronics are combined in one mechatronic drive system with a single line network Installation. Only one cable has to be installed for energy and information transfer.
- Simplified system planning and design.
- Reduced number of variants due to the wider setting range and universal mounting positions, which lowers stockholding costs.
- High degree of protection with IP65 or IP66 ingress protection available.
- Hygienic surface design using SEW-EURODRIVE's HP200 coating for applications in hygienic areas.
- No air, dirt and germ swirls.
- Reduced energy costs due to the high efficiency of all interconnecting components (gearbox, motor, electronics and comms).
- High degree of reliability due to systematic development of all components.
- Reduced total and operating costs of the conveying/handling system.
- Flexibility in terms of communications with a built in safety stop (STO) technology.
- Embedded encoders to assist with accurate positioning – within a few microns – which is ideal for quality control lines, for example.

"These are 100% sealed units, so very little maintenance is generally required. We tend to recommend an oil analysis check once every two to three years, but we have MOVIGEAR units that have been running maintenance-free for over seven years. In terms of clean-in-place compatibility, IP65 units are being used in Nigel, and are suitable for the plant's water-based wash down procedures, while our IP66 version with the HP200 coating can tolerate pressure washing, which is being successfully done on 28 units at an abattoir in Vereeniging," says Strydom.

The future? "As a well-established global standard to many large brands, we are currently in the process of negotiating contracts with a beverage group that could secure even wider use of SEW-EURODRIVE MOVIGEAR units for bottling lines across the African continent," he concludes. ❑

At a beverage bottling plant in Nigel, SEW-EURODRIVE has recently installed 53 MOVIGEAR units for an additional line.



SEW's MOVIGEAR units use servo drive technology, which offers constant torque across the speed range, from zero to full rpm.

Industrial solutions for the cement industry

Sharon van Niekerk, business development leader for Cement, Pulp and Paper and Chemicals at Bearings International (BI), talks about the company's success in the cement industry.

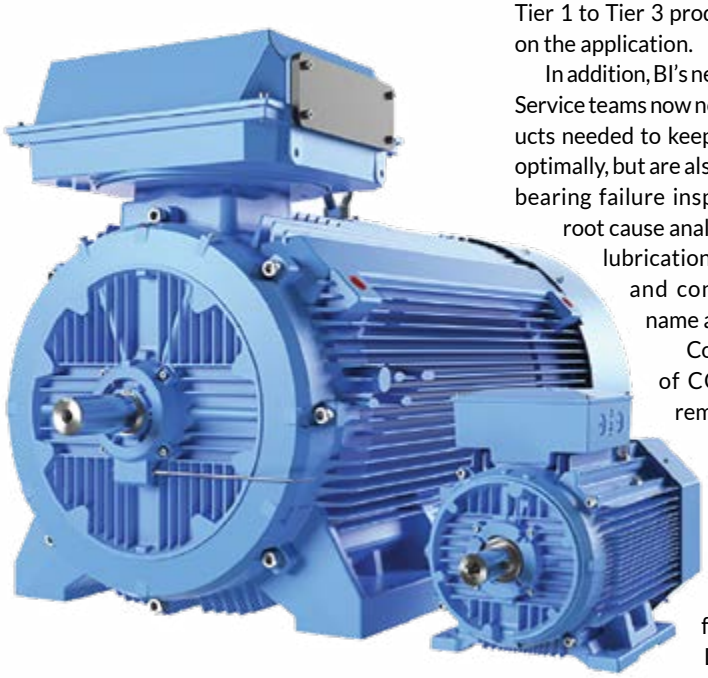
The wholesale value of building and construction materials sold in South Africa has seen an increase of over 40% since January 2020. "Cement remains a major focus. In turn, this has fuelled our own growth and we do not expect it to plateau anytime soon," says Sharon van Niekerk, business development leader (BDL) for Cement, Pulp and Paper and Chemicals at leading supplier Bearings International (BI).

BI offers a full range of products and services for the cement industry. "We really do offer a 'one-stop shop' for all client requirements in this important sector," says van Niekerk. Products range from bearings and seals to chains and sprockets, electric motors and drives, gearboxes and couplings and pulleys, belts and lubricants to assorted tools.

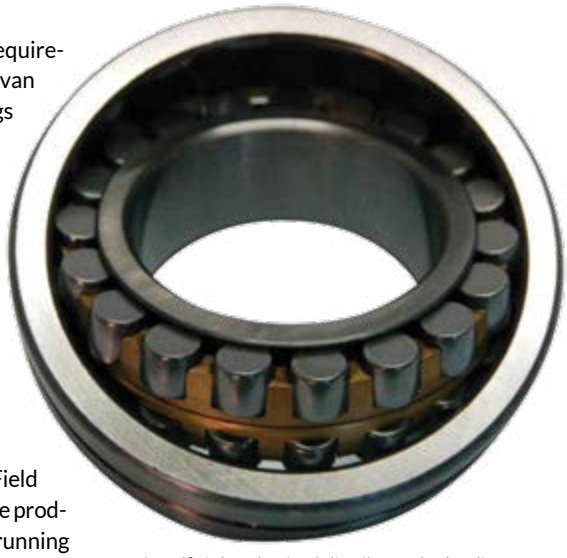
As the official authorised distributor for leading global brands such as FAG, KOBO, Rexnord, ABB, Craft and Koyo, BI has the flexibility to be able to offer everything from Tier 1 to Tier 3 products, depending on the application.

In addition, BI's newly established Field Service teams now not only offer all the products needed to keep cement plants running optimally, but are also available to assist with bearing failure inspections, reporting and root cause analysis, on-site installation, lubrication surveys and solutions, and condition monitoring, to name a few.

Commenting on the impact of COVID-19, van Niekerk remarks that it has been an exciting and challenging time. "However, as an essential service provider and in true 'always there making it work' form, we were fully operational from Day 1 of the hard lockdown, servicing our customers' needs. This commitment to service excellence and having the right product available at the right price resulted in phenomenal growth for us last year."



BI has sufficient stock of IE1 motors from ABB Africa to be able to supply the local cement and other industries.



BI, the official authorised distributor for leading global bearing brands such as FAG, KOBO, Rexnord and Koyo, offers a full range of bearing installation and fault-finding services.

Looking to the future, the recently established projects team, which is collaborating with the larger Hudaco Group, is expected to provide the necessary leverage to engage with other cement producers in Africa.

"This will certainly form part of our focus going forward. As for the second half of 2021, we remain cautiously optimistic that we will once again prove our value proposition, not only in the cement industry, but across all the major industry sectors, as the leading industrial solutions provider," concludes van Niekerk.

www.bearings.co.za

Measuring viscosity is now as easy as 1,2,3!

WearCheck has recently launched a quick, cost-effective viscosity test kit known as the WearCheck Rheo-stick. "The Rheo-stick got its name from the word 'rheology', which is a branch of physics that deals with the study of the deformation – and specifically the flow – of substances such as lubricating oils," says Steven Lumley of WearCheck.

"The most important rheological property of a lubricant is its viscosity, or a fluid's resistance to flow. Viscosity is a property of significance as it affects tribological qualities such as friction and wear between interacting metal surfaces," he explains.

If oil is too thick for the operating conditions, the machine is forced to work harder, thereby generating extra heat and using more energy. This results in unnecessary wear and tear on the components. The opposite is also true: if a lubricant is too thin, the film may not be thick enough to prevent friction. This also creates unnecessary wear and tear.

Suitable for oils with a viscosity range from 32 cSt to 680 cSt at 40 °C, the Rheo-stick is a user-friendly visual viscosity comparator intended to monitor changes in the viscosity of lubricating oils.

The viscosity comparator test requires a 5.0 ml sample of the used oil in question and a 5.0 ml reference sample, which can be taken using the syringes provided in the kit. When at room temperature, these samples are transferred to the used-oil and the new-oil reservoirs on the Rheo-stick. By tilting the stick to allow the oil to run down the channels, then returning the Rheo-stick to the horizontal at the half way point, the two samples run down the channels at different rates, giving a clear indication of any viscosity difference.

While the Rheo-stick is an effective on-site viscosity comparator, it does not measure the physical viscosity of the oil in centistokes and cannot give an indication of the chemical composition of the oil or identify specific contaminants or degradation by-products.

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Remote diagnostic services: a stitch in time

SKF's Remote Diagnostics Centre (RDC) manager, Zulfikar Umar, talks about the role played by SKF's Remote Diagnostic Services in assisting customers to realise the benefits of integrated data collection, diagnostics and reporting to establish world-class predictive maintenance (PdM) programmes with minimal capital investment.

A well-planned predictive maintenance (PdM) programme with its related and documented benefits of optimised asset performance, reliability and availability, is fundamental to a plant's operational efficiency and subsequent sustainability and profitability. SKF's Remote Diagnostic Services offer specialised integrated data collection, diagnostics and reporting solutions to assist customers in realising these benefits by establishing world-class PdM programmes with minimal capital investment.

"We have the necessary state-of-the-art technology and analytical expertise to unlock customers' PdM programmes to their full potential, whether they are in the early stages of programme implementation or are looking to derive more benefits from well-established programmes," says SKF RDC Manager, Zulfikar Umar. "As part of our value proposition, customers have direct access to SKF's analytical expertise, which includes SKF's professional machine condition data analysis, advanced analytical tools, leading-edge cloud-based technology, specialist knowledge and years of experience.

"SKF's powerful and professional diagnostic and analytical capabilities include the use of patented diagnostic algorithms to transform asset data into reliable, actionable intelligence. With real-time access to machine data, asset condition and SKF recommendations – anytime and anywhere – timely changes can be made to avoid catastrophic machine failure and unplanned downtime," Umar adds.

Recently, SKF's Remote Diagnostic Services were instrumental in assisting a Paper Mill customer based in the Western Cape to continue production while waiting for replacement bearings, thereby avoiding costly downtime. The customer noticed high vibration whilst changing one of its paper mill rolls following a bearing failure, and decided to contact SKF Authorised Distributor, West Cape Bearings, for assistance.

During a site inspection, SKF's Remote Diagnostic Centre Analyst, Jonathan van Rooyen, recommended a full inspection on all oil lubrication systems at the Paper Mill, upon which SKF would base a list of proposed interventions.

Van Rooyen explains: "When we inspected the oil flow line as well as the pipes for any leaks, we identified a serious lubrication fault. We recorded that the flow meter was showing oil flow, but no oil was going to the bearing and this lack of lubrication had caused secondary bearing damage. By collecting vibration and temperature readings every few hours to monitor and trend the condition of the fault, we were able to assist our customer to continue with production until a new replacement roll and bearings arrived on site, thus optimising uptime and productivity levels."

The Paper Mill consequently requested West Cape Bearings that supply two remanufactured replacement bearings.

Establishing or enhancing a customer's PdM programme requires a few straightforward and cost-effective steps. Once the machine condition data has been collected, either via an automatic on-line system or a manual process using hand-held devices, certified SKF analysts based at the Remote Diagnostic Centre (RDC) in Jet Park, Johannesburg, apply the most advanced, cloud-based technology and proprietary SKF signal analysis tech-

SKF's Remote Diagnostic Services assist customers to establish world-class predictive maintenance (PdM) programmes.

niques to interpret and report on the data.

Umar points out that because the service is cloud-based, installation is fast. "Operational availability can generally be achieved within days and critical software updates or functionality upgrades can be quickly and automatically uploaded." SKF's global cloud adheres to ISO/IEC 27001, an international standard commonly used in the IT industry for information security management system (ISMS) certification.

The next step is the generation of customised, easy-to-understand reports which Umar explains are forwarded via e-mail. Alternatively, customers can log into a secure SKF-hosted web server to view a summary of their machinery status, key performance indicators (KPIs) and actual vibration data plots. "However, if the situation is urgent, SKF experts will contact plant supervisors directly," he notes.

SKF recommendations embody decades of in-depth application knowledge and proven engineering solutions that combine expertise in bearings, seals, lubrication and condition monitoring technologies. SKF's flexible hardware and software solutions can be adapted to customers' specific needs and application challenges. In addition to standardising machine condition analysis practices, customers can share these solutions plant- or even enterprise-wide for informed business and technical decisions that will realise additional operation and maintenance savings.

An added advantage is that customers can avoid the costs of in-house experts and software maintenance. SKF's Remote Diagnostic Services solutions are ideal for facilities with shortages of skilled people trained in predictive maintenance techniques or for remote operations where service access is difficult.

SKF is currently responsible for monitoring and/or maintaining more than 700 000 assets world-wide across virtually all industries – from oil and gas, railways and off-shore wind farms to marine, metals and mining operations.

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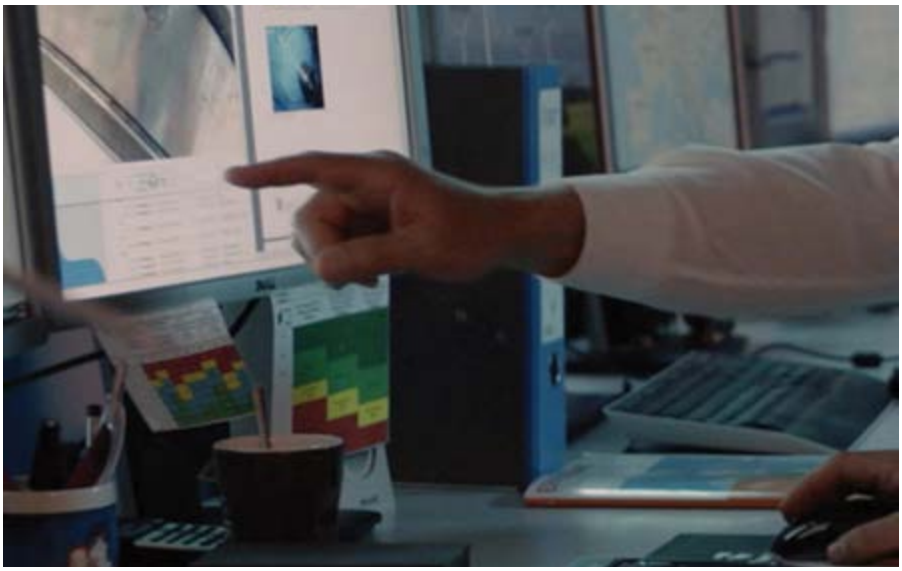


SKF analysts at the Remote Diagnostic Centre (RDC) apply advanced, cloud-based technology to interpret and report on data.

The advantages of flooded suction wastewater solutions

MechChem Africa talks to KSB Pumps and Valves' Frikkie Botma (left), Market Area Manager for Water, Petro/Chemicals and Energy; and Hugo du Plessis (right), senior project engineer for wastewater in Southern and sub-Saharan Africa, about the need for the wastewater sector to go back to specifying the right pump for the right application.

"Globally, KSB's strength lies in its ability to supply customised solutions, products and/or systems that best meet the needs and wants of customers. From a pump perspective, we don't only sell boxed products, which may satisfy the basic requirements but are seldom the best solution available. Instead, we also offer engineered and customised solutions that are tailored to the needs of the application," begins KSB's Frikkie Botma.

In Southern and sub-Saharan Africa, KSB Pumps and Valves strives to use its engineering expertise, its local manufacturing capability and the extensive range of product solutions developed across its 150-year history to develop pumping solutions that go beyond market norms. "We have an extensive range of standard pumps for most market sectors – Water, (incl. Wastewater), Energy, Petro/Chemicals, Mining, Building Services and General Industry – and these are purpose designed for the extraction or distribution of water, chemicals, hydrocarbons, slurries, sludges and a host of other media.

"But, within that range, we have access to alternative design options and materials that can be applied to enable us to customise specific pumps to make them more energy efficient, more reliable and longer lasting when pumping the specific media in the local environment. Ultimately, our goals are to increase reliability and reduce the lifecycle cost of solutions and, to do this, there has to be a very good match between pumps and the pumping systems into which the pumps are installed," Botma argues.

In addition, through KSB's SupremeServe after sales pump and valve service offering, spare parts for current and discontinued models; onsite installations, service support, assistance and problem solving; and workshop-based pump repairs and refurbishments are available to pump and valve users across the region.

Best-fit solutions for the wastewater sector

With a view to restoring a market leading position in the Wastewater sector, KSB in Southern and sub-Saharan Africa has identified experienced people such as Hugo du Plessis to focus specifically on the sector. "The Wastewater sector is a very active market and there are many competing solutions out there, not all of which, we believe, are sensible," says Du Plessis.

Du Plessis is finding that the pump installations being preferred by local wastewater consultants, contractors and end-users are every so often inefficient and non-practical. "We at KSB can offer state-of-the art equipment for the wastewater segment, and we believe our solutions are more enhanced than those of the opposition, because they incorporate new developments that have become benchmark standards in almost all markets of the world outside of Southern Africa," he informs *MechChem Africa*.

"End users are favouring unsuitable installation methods because they are convenient with respect to maintenance, but the downside is that they are less efficient with respect to energy and may also be damaging in some instances, such as RAS and WAS pump stations where delicate handling impellers are required, and they are not more reliable or durable, either. We believe the local market needs to better understand which pumps are most suitable per application and are, therefore, more appropriate for that installation," he adds.

Giving an overview of wastewater pumping in Southern Africa, Du Plessis says that along the coastline from Cape Town to Richards Bay and beyond, the wastewater sector is mostly serviced using submersible wastewater pumps. These pumps are fully submersible with the motor and impeller close-coupled into a single unit. They are used to transfer wastewater from underground sumps into main sewer lines and on to wastewater treatment plants.

"Submersible pumps are simply dropped into a flooded sump and, because they are submerged, they do not require self-priming.

A KSB end suction pump with a back pull-out design on a baseplate with slides. IP55 or IP68 electrical motors can be used.

Also, the modular design means they can be purpose designed, built and tested in a factory so they arrive on site ready to drop and pump. State-of-the-art submersible technologies such as these offer low capital and installation costs with high energy efficiencies and reliability, which make for low lifecycle costs if sized and customised appropriately," he says.

Du Plessis highlights KSB's Amarex submersible pumps as an ideal submersible wastewater solution: "For wet wastewater installations, the F-max free-flow vortex impeller or the open single-vane impeller (D-max), are ideal for passing the solids typically found in wastewater," he says, adding that in and surrounding Cape Town, there are over 600 pumps stations using submersible pump technology and over 400 in the Durban area of KZN.

However, inland in the Free State, Limpopo, North West and, to an extent, Gauteng, Du Plessis reveals that many wastewater system operators have moved to using surface mounted dry-installed self-priming pumps. "This is where we feel change is necessary. We do not believe this technology is the best choice for flooded suction applications. Self-priming pumps are designed for above-ground installation and, while they are useful where it is difficult to incorporate an underground pump chamber or sump, it makes no sense to use them underground or when an underground chamber can be built," he notes.

The key advantage of dry-installed self-priming pumps over submersibles is that the pump itself is easily accessible for maintenance. "Our argument is, if any of the two pump models – submersible or self-priming – has to be unblocked or serviced, the operator still has to handle the pump physically. Maintenance, screening of solids into the sump and correct pump selection is key when operating any sewage pump station."

From an energy efficiency, reliability and lifecycle costing perspective, however, Du Plessis argues there is a far better option which offers all of the convenience with few disadvantages. "We believe that using end-suction pumps in flooded suction installations, which also offer dry access to the pumps themselves, is far better," he notes.

With flooded suction installations, a horizontal end-suction pump is used with the pump inlet, impeller volute and motor installed below ground in a dry underground chamber alongside the wastewater sump, with an inlet suction pipe passing through the wall separating the flooded sump and the dry chamber.

In these applications, self-priming is unnecessary, because the head of the flooded wastewater in the sump provides the suction pressure (Net Positive Suction Head or NPSH). "But we are seeing more and more self-priming pumps installed underground in flooded suction applications. While these are still centrifugal pumps, there is no advantageous reason to install these pumps in flooded-suction applications," stresses Du Plessis, adding: "In a dewatering applications from the surface, where clogging and fouling are less problematic, self-priming pumps may sometimes be a better choice, but they does not make sense for flooded suction wastewater applications."

Botma continues: "Self-priming pumps are being seen as a universal solution for all problems. This is not the case. They may be convenient to work with, because a surface pump can be accessed and cleaned more easily. These advantages are not nearly reason enough to use them routinely while disregarding specific application requirements. Compared to flooded-suction or submersible wastewater pumps, self-priming pumps are considerably less energy efficient and more expensive with respect to Capex. We argue that people should think about efficiency and operating cost first and convenience later," he suggests.

With respect to convenience, KSB's end-suction pumps have a back pull-out design, which makes access to the wet-end of the pump in a dry underground chamber as easy as, if not easier than, surface mounted self-priming alternatives. "By simply removing four bolts, the whole volute can be slid back on its rails to give access to the wet end of the pump. On the suction side, we also have a cleaning and inspection hatch to give easy access to the suction of the pump. So why use an inefficient and expensive self-priming pumps underground?" asks Du Plessis.

With flooded suction installations, a horizontal end-suction pump is installed below ground in a dry underground chamber.

In addition, KSB end-suction pumps are purpose designed for sludge. On the KSB range end suction pumps use the same hydraulics as submersibles, so the same vortex or single vane delicate handling and clog-free impellers can be used. This transfers all the efficiency and reliability advantages of submersibles to flooded suction installations, but with the additional cleaning convenience of dry access and easy maintenance.

"Globally, energy efficiency and sustainability are what KSB stands for. We believe in being responsible to the environment and society. Core to achieving this, though, is persuading the pumping market to go back to specifying the right pump for the right application, which will be better for all of us in the long term," Botma concludes.

www.ksb.com/en-za

Integrated intelligence to solve wastewater challenges

Thanks to Xylem's new Flygt Concertor® pumping system, selecting the right pump for a pump station just got a lot easier. A single Flygt Concertor® pump can be programmed to self-adjust or it can be adjusted to fit changing conditions – without changing the impeller diameter or resizing the motor. Chetan Mistry, strategy and marketing manager of Xylem Africa outlines the development.

Xylem's new Flygt Concertor wastewater pumping system with integrated intelligence takes expectations to new levels of technology and thinking for 1-10 kW pump stations.

"Aging infrastructure, global urbanisation, increasing energy costs and the need for sustainable solutions are making cost reduction an urgent priority for everyone," begins Chetan Mistry of Xylem Africa. "By 2050, an estimated 70% of all the world's population will be living in cities, which poses an urban wastewater challenge on a scale we've never seen before," he suggests.

Xylem's response to these challenges is not more products and complexity but intelligent, flexible and leaner solutions. "For decades, we've been dedicated to developing sophisticated wastewater pumping solutions that boost efficiency while dramatically reducing equipment footprints and costs of ownership. It's a complex challenge that only the most innovative and integrated designs can solve," Chetan says.

For more than 60 years, Xylem's Flygt brand has continuously raised industry standards for compact, trouble-free pumping. Ever since introducing the world's first submersible pumps, the focus has been on integrating technologies to reduce complexity and costs. The breakthroughs that have emerged along the way have been a huge benefit to wastewater pumping stations all over the world. "At the end of the day, peace of mind is the true measure of our success. And we remain as determined as ever to raise expectations for smarter, more reliable and user-friendly pumping systems," Chetan tells *MechChem Africa*.

Xylem's new Flygt Concertor wastewater pumping system with integrated intelligence takes these expectations to new levels of technology and thinking for 1-10 kW pump stations.

A fully integrated pumping system, Flygt Concertor's system design works in harmony with the external pumping system to reduce total costs of ownership while delivering the highest quality and reliability. This new wastewater pumping system senses the operating conditions of its environment and adapts its performance in real time to provide feedback to station operators.

The name Concertor relates to the harmony between built-in software functions and state-of-the-art hardware, which brings remarkable benefits. Concertor combines a fully integrated control system, IE4 motor efficiency, Xylem's patented Adaptive N-hydraulics and intelligent pumping system functionalities. The control system automatically adapts to the changing pumping environment to deliver optimal performance at the lowest costs. The built-in intelligence also makes it easier to set up and operate, as well as allowing for a significantly smaller footprint," notes Chetan.

Concertor's benefits cover four main categories: efficient asset management; trouble-free pumping; energy savings; and reduced investment.

In terms of pump asset management, because of the wide range of pump curves that can be accommodated, the need to identify real pumping design requirements before sizing and choosing suitable pumps is removed. One self-adjusting pump can efficiently replace several differently sized pumps, reducing inventory by up to 80%.

This makes product selection much easier, with adjustable performance curves that can be fine-tuned remotely or on site, reducing backup inventory, making spare part handling easier and reducing delivery lead times.

For trouble-free pumping, built-in features such as clog-free operation reduce the need to call out vacuum cleaning trucks by up to 80%. "Cleaning out sludge, sand, grease and other debris from a sump tank can be an unpleasant and costly task. While standard pumps are designed to combat many of these issues, Concertor takes trouble-free pumping to an entirely new level," says Chetan.

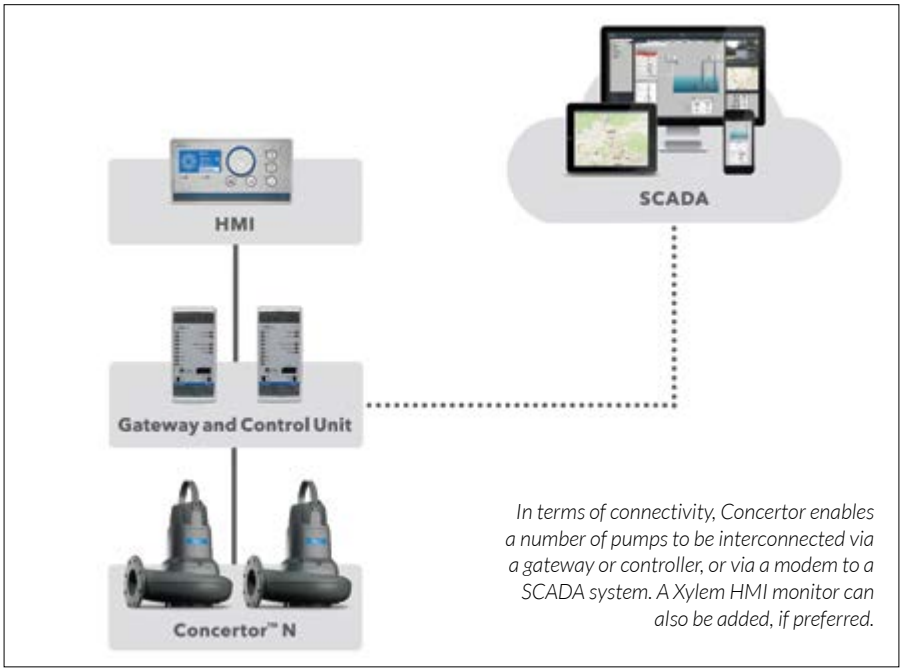
With built in sump, pipe and pump cleaning, as well as automatic clog detection and phase rotation correction, the new Flygt Concertor system's self-cleaning hydraulics and self-monitoring functionality are ideally placed to protect key system components, using the VSD and its control electronics in a stable submerged environment.

From an energy perspective, the system delivers up to 70% energy savings compared to conventional wastewater pumps and controls. "Studies show that energy accounts for 34% of the total life cycle cost of a typical wastewater pumping system. Concertor is a true energy-saver, with the potential to cut municipal electricity bills by up to 70% compared to conventional wastewater pumping," Chetan says.

Concertor reduces energy use in several ways. For example, Xylem's patented self-optimising Energy Minimiser automatically ensures that all working pumps at any station are running at their most efficient duty points. The pump's motor complies with IE4 efficiency standards, while Xylem Flygt's adaptive N-hydraulics in high chrome Hard-Iron™ guarantee sustained efficiency on the hydraulics side.

Installation investment is reduced because the cabinets required for the system are up to 50% smaller, compared to direct online pump controllers. Concertor achieves this by including variable frequency drives (VFDs), integrated intelligence, control electronics and climate control equipment into the pump to give a single, pre-engineered and configured pumping system. This frees up space in both existing and new cabinets, allowing for full monitoring functionality without the larger cabinets that would traditionally be required.

Being fully integrated means that no additional climate control equipment is required; the system is factory configured and tested and, on installation, requires only a connection to small cabinet to give access to the simple installation wizard and the built in supervision and monitoring functions.



In terms of connectivity, Concertor enables a number of pumps to be interconnected via a gateway or controller, or via a modem to a SCADA system. A Xylem HMI monitor can also be added, if preferred.

"Concertor is a breakthrough innovation based on Flygt Dirigo™ technology. The new system is enabled by integrating a processor, software, sensors, power electronics, a synchronous electric motor and self-cleaning hydraulics into a submersible shell. This 'intelligence' gives the Xylem Flygt Concertor system the ability to automatically deliver optimal pumping performance while reducing total costs of ownership in the most arduous of wastewater environments," Chetan concludes. ❑

Another Sykes pump added to solve mine flooding

The tried-and-tested Sykes XH150 dewatering pump from Integrated Pump Rental once again came to the rescue of a Northern Cape mine following heavy rains in the region. The mine, which already had one of these units in operation, signed a long-term contract for a second unit.

When heavy rains flooded a Northern Cape mine recently, it was the tried-and-tested Sykes XH150 dewatering pump from Integrated Pump Rental that once again came to the rescue.

The mine, which already had one of these units in operation, signed a long-term contract for a second unit – replacing a competitor's product on site. In response to the rains, the pump was required to dewater a flooded area at a 100 m static head pumping a distance of 1.8 km though a 250 mm pipeline.

"The ingress of water into the mine could cause major issues, so effective and efficient dewatering is critical to ensure productivity and safety," says Andre Strydom, rental development manager at Integrated Pump Rental. "The Sykes XH150 has an established reputation as a hardworking, reliable dewatering pump, which is a key reason why many customers in the mining sector specify this pump for challenging dewatering applications."

A second Sykes XH150 dewatering pump has been set to work at a mine in the Northern Cape, dewatering a flooded area at a 100 m static head pumping a distance of 1.8 km though a 250 mm pipeline.

Known for its rapid response to urgent calls from customers, the Integrated Pump Rental team was able to deliver technical assistance and ensure an appropriate pump solution for the application.

Known for its rapid response to urgent calls from customers, Integrated Pump Rental was able to deliver technical assistance and ensure an appropriate pump solution for the application. Both Sykes dewatering pumps provided to the mine are mounted on double-axle, heavy-duty site trailers, allowing for rapid transportation to site and quick installation.

"The Sykes XH150 pump offers automatic priming and solids handling capability," says Strydom. "It also has one of the best shaft stiffness ratios of any automatic priming pump on the market."

The pump can be primed with long suction hoses and can manage suction lifts of up to 9.0 m. Low fuel consumption is another important benefit, adding to the pump's cost effectiveness when used for dewatering over extended periods of time.

"The pump's ability to operate in 'snore' conditions accommodates applications where suction levels fluctuate," he says. "It can also run dry for extended periods, thanks to the oil bath mechanical seal assembly."

www.pumprental.co.za

Innovative sewage pond dredging for sugar producer

The recent upgrade of sewerage facilities at an Eswatini sugar producer required more than the dredging of a sewage pond – but Integrated Pump Rentals was up to the demanding task.

Cleaning a settlement pond usually involves pumping high solids material to another nearby dam. In this case, however, there were no containment areas for the sewage on the customer's site. According to Ruaan Venter, rental development manager at Integrated Pump Rental, an innovative solution had to be found to capture and store the sewage.

"The pond in question was close to the company's sugar cane fields, so absolutely no spillage was permitted onto those lands during our cleaning process," says Venter.

At the heart of the cleaning operation was Integrated Pump Rentals' well-proven SlurrySucker mobile dredging unit. On this project, the SlurrySucker Mini was employed, emptying the pond of 30 to 40% of the solid material at a rate of 150 m^3 per hour.

"To contain the sewage, we procured specialised geotextile bags measuring 30 m long by 18 m in circumference," he says. "These were laid out on a large area near the dam, which had been allocated for this purpose."

Before the sewage could be pumped into the bags, however, it required the addition of flocculant to facilitate the separation of solids and liquid. This was achieved using an in-line dosing system, feeding the flocculant into the pipeline from a 1 000 ℓ tank. Effective mixing could be achieved while pumping through the 100 m pipeline.

"After two weeks, we had filled three of these large bags with the material from the pond," Venter says. As the water separated from the solid material, it was able to drain through the bags' porous sides and flow back into the pond. The solids could then be left to dry out in the geotextile bags, making it possible to remove them from the site and dispose of safely.

www.pumprental.co.za

Intelligent wash-and-clean solutions from Grundfos

Grundfos iSOLUTIONS can help to ensure reliable, efficient and safe operations, and this is increasingly important as industries need more than just a robust and powerful washing and cleaning solution.

Industries in South Africa today need more than just a robust and powerful washing and cleaning solution; they need one that will support companies' efforts to conserve energy and water while protecting the environment.

This is where Grundfos iSOLUTIONS can help to ensure reliable, efficient and safe operations, according to Grant Cannon, sales engineer in industry water treatment at Grundfos South Africa. The conditions in which washing and cleaning pumps operate are often harsh, and can include humidity and high ambient temperatures. Many facilities also demand a compact physical design so that the pump and motor can be fitted into a cabinet or be mounted onto a cart to be moved around the site to where they are needed.

"This means the pump design must be small enough to fit into a confined space or allow easy mobility," says Cannon. "We achieve this by using an oversized motor, which runs at 6 000 rpm, allowing use of a smaller pump size."

He highlights that if a similar pressure had to be required from a conventional pump, the pump itself would be about 1,2 m in height. In Grundfos's design, the pump height can be reduced to less than 40 cm.

"In addition to delivering high pressure reliably and efficiently, our solutions are also intelligent, so they can easily be integrated into an existing SCADA system," he says. "The system is closely monitored, intelligently adapting to changing production demands and reducing excessive energy use."

This monitoring and optimising of performance saves energy, water and chemicals, while also generating the required operational data for the customers' purposes.

The pump solutions are fully assembled and tested before delivery, so no on-site wiring or programming is required. All that is needed is for the water and electricity supply to be connected, and the system is ready for action.

"The result is a compact and robust system that is customised to the application, saving the customer considerable installation and engineering time," Cannon says.

www.grundfos.com/za

Grundfos iSOLUTIONS enables Grundfos pumps, sensors and monitoring and control products to intelligently communicate with customers through seven different BUS protocols.

A Grundfos Hydro Multi E booster pump set with HMI display.

A Grundfos three pump booster set with a cascade function: when flow varies across the plant the booster set can maintain constant pressure with varying flows depending on wash-and-clean demand.

Smart pneumatics: five ways to improve packaging

Chris Noble, Emerson business development and IIoT consultant for the food and beverage industry, talks about smart pneumatic control and how it can be used to improve the performance and reduce the costs of packaging.

Today's packaging machines are becoming better equipped with sophisticated automation systems that often include some type of pneumatics technology for actuation, filling, positioning, palletising, depalletising, etc. However, the digitalisation and IoT benefits that can be realised from modern pneumatic systems are often overlooked.

The packaging industry has counted on pneumatics as a simple but reliable machine technology to package items ranging from shampoo bottles and cereal boxes to egg cartons and cheese containers. In fact, most products on store shelves have interacted with pneumatics at some point, often in materials handling. Even labelling applications can involve pneumatics.

Pneumatic systems are ideal because they tend to be a very forgiving machine element and a low-cost way to add motion to equipment. Pneumatic components are relatively simple to diagnose and fix — quite different from many other complex components found on a modern packaging line.

Another advantage is that pneumatics can easily adapt to certain changes in the operating environment, such as a slight variation in temperature or humidity or the introduction of a new packaging material. Pneumatic actuators are more tolerant when it comes to grabbing new products or package sizes, even when components and materials aren't perfectly aligned on the machine. Contrast that with a complex servo system that can't adapt as easily, causing issues that trigger downtime and expensive troubleshooting.

Improving machinery with smart pneumatics

Pneumatics has long been considered a steadfast and cost-effective technology, especially when compared to all-electric solutions. Now, however, pneumatic systems are getting a fresh look from the OEM community as technology suppliers such as Emerson add intelligence to what were previously considered 'dumb' devices.

In the past, it didn't make financial sense to monitor data from a low-cost pneumatic actuator; one simply replaced it when it broke and dealt with the downtime. However, in reality, a US$100 actuator could be a pinch point to the entire machine. Today, as sensing technology has advanced, it is now easier to monitor these actuators and get actionable data without prohibitive costs.

The challenge for technology suppliers, OEMs and end-users is to work together to create systems that deliver useful intelligence. For example, agreeing on key performance indicators (KPIs) upfront can help ensure consistent machine performance that aligns with expectations. But end-users might not communicate the critical KPIs they need to manage. One solution is for OEMs to stay involved with the end-user after equipment installation. This creates an opportunity for them to collect valuable feedback that can help overcome customers' pain points.

Pneumatics can now tie in with an overall automation system to provide comprehensive, actionable performance data that can improve overall equipment effectiveness (OEE). Here are five key considerations for adding IoT-enabled pneumatics solutions that can make a difference.

1. Integrate pneumatics into the automation system

The advent of IO-Link, an internationally standardised input/output technology for machine communication at the sensor/actuator, allows for a new level of intelligence in data coming from sensors on the machine. IO-Link is independent of upper-level fieldbus systems and is available for almost all major fieldbus protocols. Machine sensor upgrades can increase functionality while keeping expansion costs to a minimum by using existing PLC controls. As a result, it's becoming easier than ever to integrate smart pneumatics into existing automation platforms without changing the PLC, even with legacy systems.

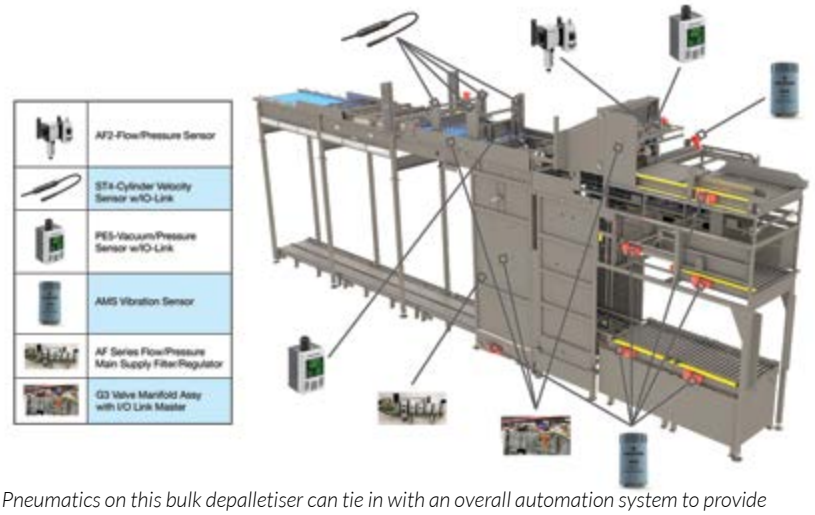
For example, as machines become increasingly high-tech, machine builders and end-users are trying to get more from their investment by running multiple levels of package sizes and weights on the same line. Sensors are now smart enough to adapt and collect different data depending on what's coming down the packaging line. For pneumatics, that can include an automatic valve adjustment for an actuator handling a larger container size. The sensor is able to recognise the change in the packaging on the line and adjust its data collection parameters accordingly.

The Emerson Aventics AF2 airflow sensor can provide real-time insights on air flow, while also capturing pressure and temperature data in the feed line. Image courtesy of Emerson.

The combination of new digital technology and reduced implementation costs is allowing machine makers to leapfrog from basic data collection to advanced information that drives flexibility and freedom to maximise new machine platforms from day one. Taking a holistic view of data collection also allows improvements across the entire pneumatic system, from the compressor room to the operating environment and from the machine to the operator.

2. Compressed air consumption and leak detection

In the past, end-users had no clear or concise insight into analysing air consumption. So, if a compressor reached 80% capacity, for example, many consumer packaged goods (CPG) companies would often purchase another compressor to address the issue, which could



Pneumatics on this bulk depalletiser can tie in with an overall automation system to provide comprehensive, actionable performance data to improve overall equipment effectiveness. Image courtesy of Busse/SJI Corp.

sometimes cost up to $100 000.

Smart pneumatics allow CPGs to evaluate their compressor's ability to drive new and existing equipment. Sensors can collect flow, pressure and temperature data, enabling advanced diagnosis of the operating parameters. For example, the Emerson AVENTICS™ AF2 flow sensor provides real-time insights on flow, while also capturing pressure and temperature data in the feed line. An increase in air temperature, for example, could indicate a compressor problem. Information on the current or cumulative energy consumption can be passed straight to the relevant parent system without requiring the machine control.

With this information, end-users can look at differences and decide what levels are acceptable within a specific range. For a new plant, smart pneumatics present an ideal opportunity to establish a usage baseline and then analyse leaks or other energy inefficiencies over time.

3. Device lifecycle management

Often, companies will add counters in their programmable logic controller (PLC) to count cycles on their actuators. Traditionally, a valve might be rated for half million or a million cycles, and when that point is reached the valve is replaced whether it's faulty or not. But a counter cannot account for the changes, such as constant stopping and starting, that can significantly affect a component's lifecycle. As a result, the component may fail unexpectedly and cause expensive, unplanned downtime.

Pneumatic sensors allow for better real-use data than a calculation based on numbers from a specification sheet. Now users can access data based on actual stroke and movement as well as speed. Sensors measuring speed are a recent innovation that can detect if actuators are pushed outside of a specified percentage range — much like knowing the state of a car's brakes based on gently using the brake pedal or slamming them on.

4. Actuator velocities, mechanical cushioning wear and vibration monitoring

Measuring actuator velocity can also help to ensure better OEE. With smart pneumatics, end-users can now measure the consistency of an actuator's acceleration and deceleration rates. The machine operator can use velocity to see if the action measures the same across time or if there are aberrations that require attention. Likewise, smart pneumatic technology can help monitor internal cushion wear to determine how aggressively the actuator is running into the cushion. Looking into data from these areas can reveal potential problems, such as worn cushions or misaligned pneumatic cylinder rods. The end result is scheduling maintenance accordingly to minimise downtime on the machine and keep OEE levels as high as possible.

For many OEMs, vibration monitoring serves as a starting point for IoT-enabled technology. The next level of smart pneumatics incorporates vibration technology built into the actuators. This technology has been used for some time in other areas, such as racing or robotics, and is being leveraged to identify the characteristics of specific machine components.

5. Operator adaption parameter changes

Many users think increasing the amount of data collected generates new layers of complexity. However, when implemented properly, IoT-enabled components can simplify data into maximums and minimums to help operators adjust machine or sequence performance. For example, if a machine drops beyond 10% of its optimal range, the operator will see more than a basic notification that something is wrong. The alert can also provide the issue's location — such as an indicator showing specifically which door of a car is ajar — saving time when troubleshooting by identifying the specific problem instead of working through a time-consuming checklist.

Smart pneumatics can also make it easier to implement and track parameter changes to ensure consistency across production shifts. For example, a beverage manufacturer running three shifts might regularly run into situations where different operator adjustments are made from shift to shift. Now, at the start of each shift, an operator can easily reset the machine components to automatically align with established settings, saving time during shift changes.

Smart pneumatics technology is being used to help companies with digital transformation. It offers more efficient preventive maintenance as well as energy savings. In addition, smart pneumatics is scalable, whether it's a new machine or legacy equipment that needs a retrofit.

Ultimately, success hinges on partnering with an experienced pneumatics technology provider that can provide smart pneumatic monitoring systems with embedded algorithms for ready-to-leverage data, enabling machine makers and end-users to significantly improve on operational efficiency.

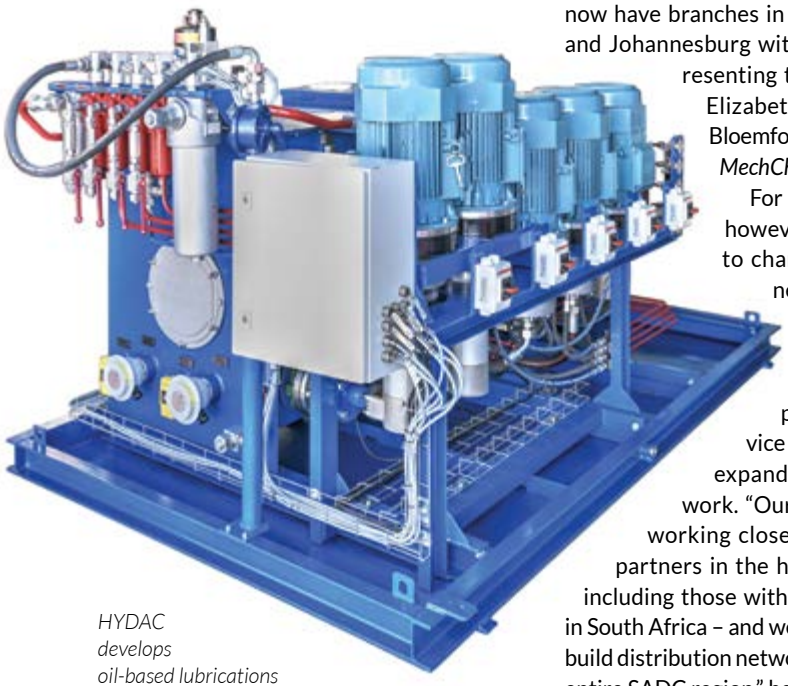
Emerson.com

HYDAC expands its hydraulics footprint in Southern Africa

MechChem Africa talks to HYDAC South Africa's MD, Angus Beveridge (right), and the company's GM, Uven Moodley (left), about their ongoing quest to expand HYDAC's footprint and to be seen as a leading provider of hydraulic services, components and turnkey project solutions in every corner of the Southern African Development Community (SADC).

As part of the HYDAC International Group, HYDAC South Africa is responsible for Kenya and the SADC region, which includes all of the Southern African states up to the DRC and Tanzania as well as the Islands of Madagascar, Mauritius and the Seychelles off the East Coast of Africa. "Our core focus area is in this SADC region, although for certain products such as propulsion systems for barges, we also have select customers in North and East Africa that are supported from our South African offices," begins Beveridge, adding that the Northern and Western regions of Africa are supported directly by HYDAC France, Germany and India.

"We have long been known as specialists in hydraulic accumulators and filters, but we also have a comprehensive range of hydraulic equipment: from pumps, valves, sensors and coolers to everything required to put together engineered hydraulic systems for any application," he says.



HYDAC develops oil-based lubrications systems for ball mills as well as gearboxes. Shown here is a hydraulic power pack for a white metal bearing jacking and lubricating system.

Describing the strategy being put into place to meet the combined goals of expanding its footprint and establishing HYDAC as a 'go to' company for the full range of hydraulic solutions, Beveridge starts with the acquisition of Cape Town-based Basic Hydraulics. "We acquired Basic Hydraulics four years ago to give us a foothold into the marine market. With agencies such as Weka Boxcoolers, Dynaset, TSL Marine & Offshore and Hydro Armor, Basic Hydraulics specialises in the marine market with this array of deck equipment, cooling and propulsion systems.

"Basic Hydraulics operates as an independent company that supports HYDAC to deliver a full and comprehensive hydraulics service, while also creating a local centre of excellence for the marine industry," Beveridge explains.

"HYDAC has recently expanded its presence into more South African cities. We now have branches in Cape Town, Durban and Johannesburg with HYDAC staff representing the company in Port Elizabeth, Richards Bay and Bloemfontein," Beveridge tells *MechChem Africa*.

For SADC-wide services, however, the core focus is to channel HYDAC's business through a distribution network where practical and possible, using partners for local service delivery rather than expanding our branch network. "Our expansion involves working closely with distribution partners in the hydraulics industry – including those with B-BBEE credentials in South Africa – and we are working hard to build distribution networks able to cover the entire SADC region," he notes.

"As a point of principle, though, we strive to support and cooperate with our distributors rather than to compete with them," he assures. In certain cases, where it makes business sense, HYDAC works directly with clients. In South Africa, for example, HYDAC won the contract for the installation of hydraulic piping, power packs and fittings for two large power stations. "The project took several years to complete and we have since done several other plant installations," says Beveridge.

"We directly support these long term clients with service and delivery, which makes us very competitive in the SADC markets," he says, while again emphasising that, going forward, HYDAC South Africa's underpinning strategy is to deliver services through locally based distribution partners.

As well as the hydraulics offering, HYDAC has several completely different solutions for other markets. Uven Moodley explains: "In many parts of Africa such as the DRC, Zambia and Mozambique, humidity is a huge problem, which makes the reliability of diesel-driven equipment fall off significantly. We offer diesel filtration systems that can significantly increase engine life, which, compared to having to routinely replace or rebuild the engines, substantially reduces equipment ownership costs.

"Where humidity causes water ingress, microbial organisms can grow in the diesel, forming diesel pest, which is detrimental to an engine. Our filters remove solid contaminants as well as water through a unique coalescing system, which is unaffected during the life of the filter element. Ensuring that clean diesel is supplied to the engine injectors increases injector and engine life," Moodley says.

"Our range of diesel and process fluid filtration solutions is currently in high demand across Africa," adds Beveridge, "also due to the increasingly stringent fuel quality standards required by modern diesel engines. We can offer diesel filtration solutions throughout the entire diesel supply line. Globally, HYDAC has a strong presence in the diesel filtration market, which is supported with in-house expertise as well as the previous acquisition of US-based Schroeder Industries, and this gives us access to the broadest possible range of

filtration solutions," he tells *MechChem Africa*.

Moodley continues: "We are also strong on oil-based lubrications systems, for lubricating the bearings on the likes of ball mills as well as large electric motors and gearboxes. We have a rental fleet of oil reconditioning units that can clean lubricating oil and remove contaminants, water and varnish, thereby increasing the life expectancy of the fluid and preventing premature failure of components. Customers can use these units on a needs basis, without having to purchase a unit for themselves," he says, adding that interest in this offering has grown significantly, opening up opportunities for HYDAC to showcase its broader hydraulics offering.

Turning attention back to the turnkey hydraulics offering, Beveridge says that business is broadly divided into product sales and project sales, with project sales being responsible for working with the customer engineering teams. "Our project teams work with OEMs, EPCMs or end-user engineering teams to develop hydraulic systems to best meet application specifications for industries such as the marine, mining, power generation, water treatment, cement, steel, fishing, agriculture and the defence industries, along with many more. "System sales is a foundation for our aftersales markets, so we strive to develop high-end, durable systems that we can put into the field to generate a preferred market for our filtration, replacement components and other service related products," Beveridge explains.

HYDAC has several engineers responsible for designing and developing these systems. "And all of our sales people are highly technical, too, because every one of our products needs to solve a customer's problem, so the technical fit must be right, even for a basic hydraulic component. We strongly believe in upskilling our team's product knowledge so we can assist our customers with solutions," he assures.

HYDAC is also "pushing hard" to expand the use of connected components that enable a system's state-of-health to be monitored continuously and remotely. "Preventative maintenance is becoming increasingly important and, for this, sensors need to be installed to monitor system performance and condition; data needs to be collected and stored; and that data then needs to be routinely analysed. We are now including these IOT-type innovations into the hydraulics and lubrication systems we develop," continues Moodley.

"By monitoring fluid cleanliness and pressure spikes, for example, we can identify useful information about remaining life expectancy of a critical component. This enables us to intervene to protect the equipment before it fails," he notes. "We focus on the technologies that enable data to be uploaded to a local server or to the cloud, from where it can be analysed and displayed on a dashboard anywhere in the world. This enables technicians to have a very accurate idea of the repairs or changes necessary to restore a system to health before travelling to a site," Moodley explains.

A view of HYDAC's Johannesburg workshop where engineered systems are assembled and tested before shipping to sites across Southern Africa and the SADC region.

Through Basic Hydraulics, HYDAC has created a local centre of excellence for hydraulic deck equipment, cooling and propulsion systems for the marine industry.

"COVID has put this need into sharp focus. Lead times are now longer and travel more restricted, so information about exactly what is needed and what has to be done on a remote site becomes very important," adds Beveridge.

He says that HYDAC is very strong on modern sensor technology and the bus systems that enable them to communicate with local and cloud based networks. "Systems engineering is one of our particular strengths and we have a lot to offer those needing integrated systems for sophisticated, robust and highly cost-effective applications.

"With a broad range of hydraulic and electronic products and components to choose from, we are well positioned as a provider of turnkey solutions and systems for almost any industrial application. We have the inhouse capacity to deliver on projects from small to very large and we intend to use this capacity to extend our reach in the Southern African region as far and as wide as possible," Beveridge concludes. ❑

HYDAC has a strong presence in the diesel filtration market, which is supported by in-house expertise and advanced fluid conditioning solutions.

Tetra Pak solutions for cheese manufacturers

Leading food processing and packaging solutions company, Tetra Pak, has announced the development of a range of new best practice lines (BPLs) for cheese manufacturers, which include total production and packaging solutions based on expertise and technology for fresh cheese production, Mozzarella, semi-hard cheeses such as Cheddar and compacted hard cheeses such as hard Cheddar and Parmesan.

Tetra Pak has announced the development of 14 new best practice lines (BPLs) for cheese manufacturers, the latest of which, specifically customised for Cottage Cheese, was released last month. The other cheeses that are benefiting from these BPLs include Mozzarella, semi-hard cheese, Cheddar and fresh cheese production. Together, these cheese types make up 79% of all cheese volumes and have a CAGR forecast of 3% for the four-year period from 2021 to 2025. Two of the new lines (Mozzarella and Cheddar) were recently previewed at the 2021 Global CheeseExpo, hosted online on April 6 to 8 by The Center for Dairy Research in Wisconsin, USA, and the Wisconsin Cheese Makers Association.

Leveraging over 50 years of experience in the cheese industry, the biggest dairy food segment in the world with a 42% share and more than 27-billion kg per year, the new Tetra Pak BPLs provide a complete cheese production solution for customers, optimised to fit their needs.

The processing lines utilise proven equipment combined with industry-leading expertise to create a safe and easy route to profitable cheese production with higher yields, while incorporating traditional cheesemaking techniques. The hygienic production process enables a longer product shelf life, as well as consistent and replicable quality. Sustainability is also a factor, with solutions focusing on reducing water, steam and power consumption.

The Tetra Pak high-shear B200-300A and B200-300VA cheese mixer is deal for the cost effective production of a range of products from smooth sauces, mayonnaises and chocolate puddings to thick vegan cheeses.

Fred Griemsmann, Vice President Cheese & Powder Systems at Tetra Pak says, "Cheese is consumed on every continent around the world, and consumer appeal shows no signs of abating. In fact, it's quite the opposite.

We've expanded and deepened our expertise and knowledge over the past decade, consolidated our proficiency and sites in the US, and recently invested €25-million to create a world-class cheese production centre in Poland. With 50 years of expertise, we are the only supplier of complete solutions from milk intake to cheese production and on through to packaging. This provides us with a sophisticated toolkit that enables us to tailor solutions to be completely suited to the customers' needs, and we are so confident in these new best practice line solutions that they come with performance guarantees," Griemsmann assures.

Investing in innovation

The most popular cheese is yellow cheese, accounting for a 34% share of global cheese volumes, and this includes both hard and semi-hard cheese varieties. The Tetra Pak® draining belt portfolio provides continuous production of fused and stirred Cheddar and Pasta Filata cheese types. These enclosed belt systems are designed to automatically drain, acidify and texture, mill, salt and mellow cheese curd, similar to the traditional cheesemaking method. Fines from whey are captured by a fines saver screen integrated into the belt to maximise yield. This design allows for consistent curd production resulting in uniform acidity, moisture, salt concentration and loading rate.

The second most popular cheese category is Mozzarella. With a focus on yield improvement, product quality and reduced environmental impact for the production of Mozzarella, the Tetra Pak® Cooker Stretcher DDA dry cooker uses a patented heated-auger and dimpled, heated-jacket technology to heat the product indirectly, resulting in higher fat retention in the final product. Employing nine independent heating zones with integrated ingredient addition capabilities, it offers producers unprecedented control of the cooking process.

Tetra Pak´s draining and forming systems set the benchmark in the industry. The Tetra Pak Blockformer system, where curd is compacted in a series of vacuum and pressure relief cycles, employs an advanced design enabling it to run Parmesan cheese as well as Cheddar. Meanwhile, Tetra Pak® Casomatic systems efficiently drain and form semi-hard cheese and promote high-quality whey production. These reliable systems maximise yield with a highly controlled process that eliminates weight and moisture variations in the final cheese product. The hygienic design enables long production runs and short cleaning cycles to optimise uptime.

Growing consumer appetite

Tetra Pak conducted consumer research in March 2021, which was based on 4 500 online interviews in nine countries: the USA, Brazil, Germany, Italy, India, China, Russia, South Africa and Turkey, revealed that COVID-19 has shifted consumer behaviours in many ways.

Cheese is no exception, with a third (36%) of consumers saying they have significantly increased their intake of cheese throughout the global pandemic. This is due, in part, to the fact that we are spending more time at home, providing us with increased opportunities to eat cheese, such as when watching TV (36%), with a drink (35%) or as a quick lunch (35%).

People are very attuned to the wellbeing benefits of cheese, acknowledging that it is healthy (56%), nutritious (51%) and high in protein and calcium (42% and 41%, respectively). It is apparent that there is real demand from consumers to know the origins of their food, with an overwhelming majority (77%)

expressing an interest in the process of cheese production, specifically the ingredients and where they are from (72%), where the product is made (52%), the heat treatments used (41%) and sterile production (37%). Over a third also place particular value on environmentally friendly packaging. "Cheese has been an essential part of our diet for centuries and it is set to remain so for many years to come. People are becoming more adventurous in terms of taste and texture, and we have the facility to accommodate this, ensuring that there is no compromise on the overall quality of the end result," he concludes.

www.tetrapak.com

Tetra Pak circular economy journey

Tetra Pak South Africa has welcomed Section 18 Regulations to the National Environmental Management: Waste Act (NEMWA), which came into effect from 05 May 2021. The Extended Producer Responsibility (EPR) aspect of NEMWA will see existing producers being able to register with the Department of Environment, Forestry and Fisheries once the regulations are implemented from November 2021.

Rodney Reynders, Tetra Pak's Cluster Leader for the environment and sustainability for Greater Middle East & Africa, says the new Section 18 regulations are a significant move towards a more collaborative approach between industry and government.

"Government has recognised that EPR is the preferred vehicle to reduce waste generation and increase diversion from landfill. Tetra Pak is fully aligned with this view as we believe EPR is central to South Africa's waste management strategy to minimise growing waste generation volumes. Allied to this is the circular economy, which is an essential part of sustainability today," says Reynders.

Tetra Pak was founded on the idea that a package should save more than it costs, with sustainability always at the core of how the company operates as a business. Reynders says that the company's sustainability strategy is founded on its commitment, both globally and in South Africa, to a low-carbon circular economy.

"We believe that such an economy should consider not just recycling and reuse, but also the climate impact of raw materials and manufacturing, as well as impacts on biodiversity and freshwater availability. EPR is a central component of the overall circular economy strategic approach, which is why we are committed to a circular economy that also has a low carbon focus: one that considers not just recycling and reuse, but also the carbon impact of manufacturing and, particularly, raw materials." In June last year Tetra Pak confirmed its strategic priority in driving sustainability transformation by setting an ambition for net zero emissions across the value chain by 2050.

For several years Tetra Pak South Africa has invested in building recycling capacity for carton packages, supported collection programmes and created awareness that cartons can be recycled. More recently, it now has all the suppliers of liquid paperboard packaging working together under the newly formed PRO Fibre Circle to promote and drive recycling of cartons.

"We are committed to continue to work closely with government as this process unfolds and urge all industry players to start engaging sooner rather than later with producer recovery organisations. The success of this welcomed initiative will be based on numbers – the greater the levels of buy-in, the quicker we will start seeing tangible results and a positive impact on the environment," says Reynders. ❑

Multotec's new UX7 spiral for recovering ultra-fines

As a leading designer and manufacturer of spiral concentrators, Multotec has released its UX7 spiral, which will allow customers to recover more of their valuable ultra-fine material so it does not go to waste. In fact, according to Refentse Molehe, process engineer at Multotec, the UX7 opens the door for customers to cost effectively re-treat their tailings dams.

Multotec has taken another innovative step to help customers recover more of their valuable ultra-fine material so it does not get discarded as waste.

As a leading designer and manufacturer of spiral concentrators, Multotec has released its UX7 spiral which focuses on recovering material in the particle size range of 75 µm and smaller. Refentse Molehe, process engineer at Multotec, says the success of the Multotec UX7 is based on extensive in-house test work, which has led to recovery improvements of around 13%.

"Much of the testing was conducted on chrome, manganese and iron ore, but the UX7 spiral can as easily be applied to copper, platinum and other metals," says Molehe. "This is an exciting development for the sector as we have seen growing interest from our customers in gaining financial value from material that has traditionally ended up in tailings storage facilities."

She notes that efforts to improve the recovery of ultra-fines have used a range of technologies, but spirals have always been regarded as a highly reliable and energy efficient solution. Multotec's continuous improvement of its spiral technology to suit customer needs now opens the door for customers to cost effectively re-treat their tailings dams to recover valuable ultra-fine material.

"In addition to its ability to recover ultra-fines, the Multotec UX7 spiral benefits from the various advantages shared by spiral concentrators," she says. "These include the lower environmental risk and cost due to the absence of chemicals, and the low maintenance of this technology, which has no moving parts."

Multotec's decades of on-the-ground experience in mineral processing – and its depth of expertise in a range of related disciplines – equip the company to provide a customised, full flow sheet solution. Molehe emphasises that each application of the Multotec UX7 spiral will be based on an in-depth understanding of the customer's operating conditions, fine-tuned by extensive testing of material to ensure the optimal result.

"Once we can confirm that the UX7 spiral is the appropriate solution for the customer's operation, we then build in the throughput and capacity requirements and accordingly design the flowsheet to accommodate the specifications to be achieved," she concludes.

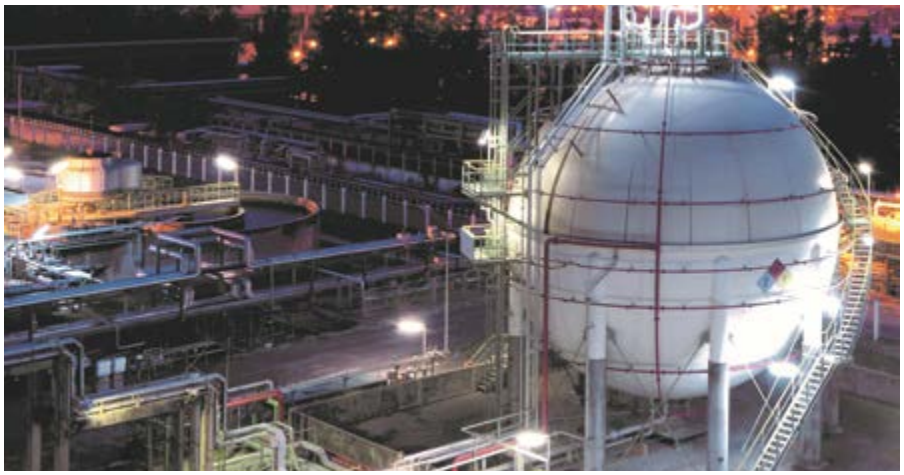
www.multotec.com

Multotec's new UX7 spiral for recovering ultra-fines has been tested on chrome, manganese and iron ore but can also be applied in the recovery of copper, platinum and other metals. Each application of the Multotec UX7 spiral will be based on an in-depth understanding of the customer's operating conditions.

Multotec's versatile spiral test rig in use, upgrading ultra-fine chrome. The full-scale test rig is part of a range of dedicated facilities employed by Multotec's Technology Division to optimise mineral separation and concentration methodologies for customers.

BMG's advanced solutions for the chemical sector

BMG's range of Danfoss electronic, mechanical and intelligent 'mechatronic' devices are designed to optimise automation processes and reduce energy consumption in many sectors, including the chemical industry.



Danfoss VLT® AutomationDrive solutions for the chemical sector ensure energy savings, increased flexibility, high efficiency processes and low maintenance requirements.

With the modular Danfoss VLT® drive system – which encompasses specific power sizes, features, enclosure classes and fieldbus protocols – each plant can determine what parameters are essential to meet specific industry requirements.

"Danfoss VLT® AutomationDrive units effectively reduce operational costs and increase efficiency in any motor driven chemical plant application, ensuring optimum drive solutions in the commissioning of a new plant or the conversion of an existing factory," explains Mick Baugh, Electronics Business Unit Manager, Electromechanical division, BMG. "This versatile system, available in the power range up to 1.4 MW, is built on a modular design concept and is available as a single module, control cabinet or as a complete drive system to meet exact requirements. Typical applications include pumps, condenser fans, compressors, extruders, mixers, dosers and centrifuges.

"With the addition of the newly launched 690 V versions of VLT® AutomationDrive units, we now also offer a wider range of compact drives for the power range 1.1 to 75 kW. The new Danfoss D frame VLT® AutomationDrive units, which are significantly smaller than previous series, feature a 250 kW frequency converter regarded as the smallest in its class and with an impressive IP 54 enclosure rating. These compact units are equipped with integrated DC link chokes and EMC filters to minimise mains interference," says Baugh.

VLT® AutomationDrive frequency converters can be individually configured with specially coated circuit boards for safe use in harsh ambient conditions and with the additional safety functions required in the chemical sector. Safety solutions include the VLT® Safe Option MCB 140/MCB 150 and a VLT® PTC Thermistor Card to monitor Ex d and Ex e motors.

VLT® AutomationDrive FC 302 frequency converters can also be used to control ATEX-certified, frequency converter compatible motors, for safe operation in zones 1 and 2 (gas) as well as zones 21 and 22 (dust). With the Danfoss MCB 112 PTC option, users can now implement the required ATEX-certified temperature monitoring directly in the frequency converter.

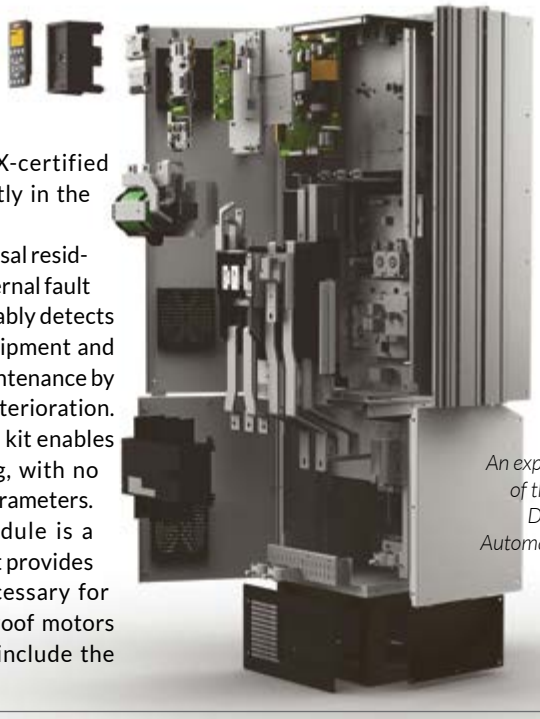
The system also offers universal residual current monitoring. The external fault current monitoring module reliably detects sudden insulation faults in equipment and also enhances preventative maintenance by detecting gradual insulation deterioration. The pre-configured connection kit enables quick and easy commissioning, with no need to configure monitoring parameters.

The Danfoss chemical module is a specially designed package that provides all the protective devices necessary for the operation of EExd flameproof motors used in this sector. Features include the PTC option that ensures a safe shutdown in the event of motor faults, or a forced mains disconnect facility as an alternative. Standard DC link chokes and filters enable the VLT® AutomationDrive FC 302 to be used with long motor cables, allowing the frequency converter to be located outside an explosion hazard area. A relay option, with eight floating contacts and additional analogue outputs, can also be mounted on the side if necessary.

This system offers two options to ensure electromagnetic compatibility; either to suppress interference at the source by minimising or eliminating interference emissions, or to increase the interference immunity of the device or system, to eliminate or reduce susceptibility to interference.

BMG has been appointed as a Danfoss DrivePro® Service Partner. Through this agreement, BMG provides a support service for VLT® and VACON drives that encompasses troubleshooting, maintenance, repairs and replacements. As a Danfoss DrivePro Service Partner, BMG also offers specialised training and technical support to improve productivity, performance and uptime for the entire life cycle of Danfoss drives.

www.bmgworld.net



An exploded view of the Danfoss D frame VLT AutomationDrive.

Depth of engineering capacity underpins mining

Mining industry customers look to Murray & Roberts Cementation for engineering excellence to underpin their safety, productivity and profitability. Hercilus Harmse, engineering services executive at Murray & Roberts Cementation, outlines why.

Engineering remains the backbone of mining, and is a focus that Murray & Roberts Cementation continues to prioritise through its extensive capabilities in engineering services.

"More than ever, our customers are looking to us for engineering excellence that will underpin their safety, productivity and profitability," says Hercilus Harmse, engineering services executive at Murray & Roberts Cementation. "This means retaining a formidable base of local expertise, a well-resourced engineering facility and a range of specialised offerings." Located at the company's 57 hectare Bentley Park premises near Carletonville, south-west of Johannesburg, is some 9 690 m^2 of covered workshop space – constantly busy with a variety of engineering activities. The engineering personnel number almost 70 permanent, qualified technical staff, with more contractors brought in as work requires, says Harmse. The workshops link with the Murray & Roberts Training Academy, situated on the same site, to further develop hands-on artisan and technical skills.

"Key at our Bentley Park facility is our rebuild and refurbishment workshop for trackless mining equipment," he says. "We can completely refurbish equipment such as load haul dumpers, drill rigs and utility vehicles from a range of original equipment manufacturers (OEMs)." This work is conducted on equipment in Murray & Roberts Cementation's own large fleet, as well as on behalf of mining customers. During 2020, over 30 full rebuilds were conducted for customers, complete with on-site commissioning.

"Our long history in the sector gives us a depth of knowledge and systems that comply with the necessary ISO certifications, as well as the stringent specifications of OEMs," he says. "We work closely with OEMs to ensure quality assurance and quality control in line with customers' expectations and codes of practice."

The capability includes a fabrication facility for light, medium and heavy steel structures. The company's fabrication and boilermaking expertise is applied in a number of applications, allowing completely new frames for LHDs and drill rigs to be built from scratch. "The local refurbishment and fabrication capability is part of our wider contribution to the skills base of the South African economy, which we must nurture in pursuit of inclusive economic growth," says Harmse. "Local content is today a more formalised requirement in the Mining Charter, but we have been working this way for many decades."

Murray & Roberts Cementation's specialised rigging team also plays a vital role in heavy rigging and installations, especially with regard to winders and winder ropes. Providing a scarce skill-set to mines in various countries, the team tackles the roping up of new winders, replacements, tensioning, servicing and remedial rope repairs among its other tasks.

"In response to our own needs – as well as those of our mining customers – we are also active in container conversions for specialised purposes," he says. "We convert these 6.0 or 12 m containers into change-houses, laundries, offices, pumping stations or storage facilities, to name just a few uses."

The technical capability at Bentley Park covers the full scope of trades and skills involved in producing these structures – from metal work and racking to electrical wiring and plumbing. "Our in-house capacity and experience in delivering this range of engineering services ensures customers a cost-effective solution and rapid response times, while not compromising on quality," Harmse concludes.

www.cementation.murrob.com

Fitting of an engine frame and components before assembly commences on a 5.5 t load-haul-dumper.

The rebuild of a load-haul-dumper underway at Murray & Roberts Cementation's Bentley Park rebuild workshops.

COVID analyses from sewage treatment plants

Together with its subsidiary Analytik Jena, Endress+Hauser has now developed a verification method that can directly and quickly be used for SARS-CoV-2 analyses in sewage treatment plants.

Endress+Hauser and Analytik Jena have developed a method for the simple detection of viral loads in wastewater. Image courtesy of Analytik Jena.

"People infected with the SARS-CoV-2 excrete virus particles that can still be detected with PCR technology, but which are no longer infectious in the wastewater," says Robert Möller, project manager at Endress+Hauser subsidiary, Analytik Jena. "Systematic sewage water analyses can supply data comparable to indirect mass testing and, as a supplement to national test strategies, this can yield a more precise picture of the actual infection rate," he adds.

Researchers showed that wastewater analysis was a viable option for the detection of SARS-CoV-2 as early as March 2020, when microbiologists in Amersfoort, Netherlands verified the presence of virus particles in sewage water nearly a week after the first case of COVID was officially reported.

"The problem is that the establishment of an early warning system requires sufficient analysis capacity. To date the analyses have been reserved for specialised laboratories, partly because of the complex steps that are involved," says Möller. With this in mind, Endress+Hauser and Analytik Jena have developed a method that makes it easy to determine the viral load in wastewater – directly at the treatment plant and within three hours (180 minutes). The method thus enables wastewater-based epidemiology and real-time monitoring of public safety.

The method is based on real-time polymerase chain reaction (PCR) testing, the proven gold standard for direct and sensitive detection of the SARS-CoV-2 virus. The new method can also be used to detect the novel coronavirus' genetic information contained in ribonucleic acid (RNA) in wastewater.

In 2020, the qTower^3 real-time PCR thermocycler from Analytik Jena supported the first SARS-CoV-2 wastewater screenings in Japan. Several hurdles stood in the way of the path to detection, however. "First of all, we needed a representative wastewater sample," explains Achim Gahr, business development manager for Endress+Hauser Liquid Analysis. "But the sample was in the litre range and had a highly complex composition. For real-time PCR testing, it had to be specially prepared and the volume drastically reduced."

To ensure all of these steps can be carried out effectively at wastewater treatment plants, Endress+Hauser and Analytik Jena have partially automated almost the entire process chain, from sample extraction and enrichment, to nucleic acid extraction and real-time PCR detection. Various instruments from both companies are employed for the method.

The process begins with the CSF48 automatic water sampler from Endress+Hauser, which extracts samples from the water coming into the treatment plant several times a day. Because the incoming volume fluctuates, which influences the concentration level of the residual virus, the test result is based on a mixed 24-hour sample. Thanks to the automation, representative samples are collected over a longer period of time in large amounts and always under the same conditions. The Liquistation CSF48 saves the user time and effort, conforms to worldwide water guidelines and is easy to program, set up and maintain.

The heavily diluted sample is then prepared by extracting and filtering 100 mℓ of water. The residual virus bonds to the filter and is then released again using one mℓ of water. This step increases the concentration of virus fragments in the sample. Homogenisation of the filter membrane is carried out with the SpeedMill PLUS from Analytik Jena, one of the few sample homogenisation instruments on the market able to deliver a reproducible sample when a small footprint is required.

The particle-free sample is then placed in the InnuPure C16 touch from Analytik Jena. It can process up to 16 samples simultaneously and, in combination with the InnuPREP AniPath DNA/RNA kit IPC16, automatically extract the virus' genetic information. The extracted RNA is now isolated within a 100-millilitre sample and can be analysed with real-time PCR technology.

Using an instrument from the qTOWER^3 family of products from Analytik Jena, the RNA sequences are replicated in a thermally controlled process with the help of an enzyme. It becomes apparent that the sample contains the RNA, even during runtime – and the earlier the RNA is detected, the higher the viral load.

Endress+Hauser and Analytik Jena developed this method in partnership with Emschergenossenschaft and Lippeverband (EGLV), Germany's largest wastewater management company and it was tested at one of EGLV's treatment facilities.

"On the basis of this partnership, and because the Group boasts all of the necessary technologies, we were able to get the process up and running quickly," says Gahr. The now-established technology has also highlighted new opportunities that go well beyond the battle against the coronavirus pandemic. "We are now working on processes for acquiring other health-relevant data such as antibiotic-resistant germs, for example," Gahr concludes.

www.endress.com/en

The green economy and Africa

In his role as chairman of the African Hydrogen Partnership, Ian N Fraser refutes ongoing attacks on the green-economy and its viability. Instead, he argues the positive case for adopting green hydrogen as an ideal energy carrier for realising a successful transition to a carbon neutral planet powered from renewable energy sources.

There have been several articles published recently that attack the burgeoning green energy economy. The tone and trajectory of these articles is reminiscent of those published during the 'fight back' by the tobacco industry in the seventies: when the seriously destructive effects of smoking became ever more apparent. Numerous articles were published which claimed that the medically demonstrated adverse effects of smoking were either untrue or exaggerated. It transpired that this was largely promoted and financed by the tobacco lobby.

It is also interesting to note that these anti-green energy missives make little or no attempt to propose an alternative way forward, other than to imply that we should stay with our present destructive habit of burning of fossil fuels. In the case of an article by the founder of the Copenhagen Consensus, Bjorn Lomborg, Africa was included in a list of countries that cannot afford the cost of green energy.

The argument presented tends to be based on two issues. On one hand, a totally spurious claim is made that green energy will be destructively expensive. Even if this were true, which demonstrably, it is not, he seems to be arguing that we should carry on blithely to destruction: because it is too expensive to stop.

It also makes no sense to quote exaggerated numbers and attach these to green energies, without balancing this against the immense economic advantages that green energy will achieve. Using Africa as an example, the continent will benefit greatly from the economic benefits of generating, using and exporting green energy instead of importing fossil fuels at immense cost, both financial and environmental. In fact, Africa has the renewable resources to become a net exporter of energy.

In a recent article the benefits of green energy are brushed aside, using the argument that while energy from the sun and wind may come out of the sky, the machinery to turn them into energy does not; and that the required machinery requires mining, manufacture and transport. Well yes. And the same is true of present energy sources and industries. The cost of the geological research, plus the tapping, processing and refining of fossil fuels is enormous and will become more so as resources dwindle.

However, once the hydrogen economy is ubiquitous, the energy to mine materials and to manufacture, provide and transport the support equipment will all also come from renewables, via the green hydrogen economy. It should be noted that virtually none of these materials will be consumed and almost all will be recyclable.

Nel Hydrogen Electrolysers delivers containerised Proton PEM® electrolysers to produce green hydrogen at refuelling stations sites for heavy-duty hydrogen trucks. Source: Nel Hydrogen Electrolyser.

Another objection is raised based on the totally incorrect assumption that the green economy will depend on energy storage in chemical batteries. There seems to be an impression that the green economy will be based on battery storage of energy to provide power when the sun is not shining or the wind not blowing. This is certainly not the case. Yes, there is a rather inexplicable obsession with battery powered vehicles. This will be largely self-limiting for several reasons, not the least being the fact that batteries deteriorate fairly quickly over their life span, eventually requiring expensive replacement – a fact that is either denied or brushed aside by the battery lobby. In addition, apart from being useful for smaller local city run-around vehicles, batteries will never be able to provide viable power for heavy transport vehicles such as heavy goods vehicles, aeroplanes and ships. Worst of all, once batteries reach the end of their useful life, we end up with masses of toxic un-recyclable chemicals.

The future is green hydrogen. This energy carrier can be generated anywhere, including in Europe. And when the sun or wind energy is not available, it can be augmented by green hydrogen that is generated in, and exported from, areas such as Africa, which has vast open spaces and abundant free energy in the form of sunlight and wind. The benefit to places such as Europe is that a fair amount of the energy required can indeed be generated

locally by wind and sun, and the gaps in these energy resources can be filled by hydrogen delivered by tanker or pipeline from Africa.

Is this a problem? Well, at present virtually all energy in the form of fossil fuel is imported from the Middle East or elsewhere. So the hydrogen economy represents a net gain for Europe, as it will only be importing a portion of its energy requirements. There is, in fact, already a pipeline project under way to deliver hydrogen from Morocco to Europe.

And at what cost? It is reliably projected that within the next few years, as the economies of scale become apparent, the cost of green hydrogen for motor vehicle fuel, delivered at the dispenser, will be lower per energy unit than petrol or diesel.

The repeated claims that the green economy will be massively expensive are simply wrong. The technologies required to capture wind and sunlight, to generate hydrogen and then convert it into energy are all readily available and entirely re-cyclable. If we just consider the green economy in Africa, the continent will rapidly become one hundred percent independent of imported fossil fuels, saving the African economies billions in foreign exchange. As a further bonus, Africa will be able to export to Europe and other countries the large volumes of excess hydrogen generated, earning valuable foreign exchange revenues in the process.

Far from being destructively expensive, we cannot afford not to convert to the green hydrogen economy.

The technologies required to capture wind and sunlight for generating hydrogen and then convert it into energy are all readily available and entirely re-cyclable.

There are also issues raised around habitat loss from solar and wind installations. Yes, some areas will be covered by solar panels, with very little effect on habitat, either flora or fauna. Wind generators are not the prettiest objects on the landscape but neither are the oil wells, refineries and such associated with fossil fuel. And, with the reduction in noxious and greenhouse gases in the atmosphere, there will still be a clear net gain for our planet.

Hydrogen is the future. This is recognised by the fact that virtually every motor manufacturer is already producing or developing hydrogen powered vehicles that have the performance and range equivalent to petrol or diesel vehicles. And a hydrogen powered vehicle can be refuelled in a couple of minutes; unlike the couple of hours required by a battery vehicle after a trip of only a few hundred km.

www.afr-h2-p.com/

African Hydrogen Partnership: AHP

African Hydrogen Partnership (AHP) is a non-profit Africa wide trade association registered in Mauritius. Dedicated to promoting green hydrogen and fuel cell technology in Africa, the AHP strives to create new investment opportunities and jobs in Africa by supporting the development of hydrogen and green economies, improving energy security and air quality, and reducing carbon dioxide emissions and global warming.

The guiding principles of the AHP Charter suggest that member companies:

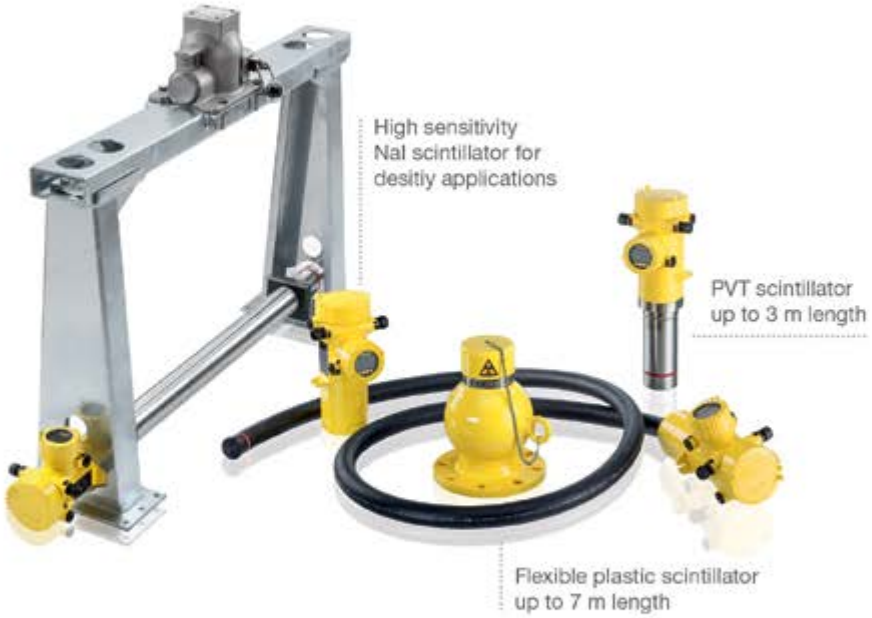
- Support and strive to achieve the climate targets of the Paris Agreement as well as the UN Sustainability Goals.
- Promote green hydrogen as a clean, renewable and sustainable energy carrier and feedstock to achieve the transition to net zero emission societies.
- Recognise that hydrogen can be produced in many ways and that there are different carbon free/neutral hydrogen production pathways in order to enable a zero-emission society.
- Cooperate in the transition of energy generation, transportation, consumption and sector coupling to hydrogen, fuel cell and related technologies as well as the promotion of a strong African hydrogen industry incorporating these systems and technologies.
- Promote fair business practice and provide the necessary support to facilitate the establishment of African hydrogen value chains.

The AHP strives to accelerate the deployment of green hydrogen by aligning general industry, the renewable industry and the financial community and to communicate and share their views with the public, governments and administrative bodies. ❑

Reliable measuring results for extreme process conditions

Whether level, limit level, density, interface or mass flow: Radiation-based process instrumentation delivers precise measuring results in industrial production and handling processes, and that even under the most difficult operating conditions. The non-contact measurement is not affected by the media and provides highest safety and reliability.

Flexibility through detector variety: You can choose between different types of detectors. Detector can thus be optimized for widely different applications becoming the specialist for your particular measuring task.



Advantages

- Simple mounting and operation
- Integrated safety features
- Self-monitoring and diagnosis
- Developed acc. to IEC 61508
- Qualified up to SIL2, SIL3 in multi-channel use

Electronics

- 4 ... 20 mA/HART
- Profibus PA
- Foundation Fieldbus

Display and adjustment module

- PLICSCOM
- VEGACONNECT and DTM
- VEGA Tools app

Housings

- Aluminium double chamber
- Stainless steel double chamber

Trafo distributes world-leading temperature control

Trafo Power Solutions – a leading local supplier of dry-type transformers – has been appointed by Italy-based temperature control relay specialist TECSYSTEM to distribute its products in sub-Saharan Africa.

Italy-based temperature control relay specialist TECSYSTEM has appointed Trafo Power Solutions – a leading local supplier of dry-type transformers – as its distributor in sub-Saharan Africa.

TECSYSTEM has, for over 40 years, been developing and manufacturing electronic and electromechanical devices for controlling temperature on equipment such as transformers, motors, generators and variable speed drives. "We have been using temperature control relays from TECSYSTEM on our dry-type transformers for many years," said David Claassen, managing director of Trafo Power Solutions. "The quality of this product makes the company one of the global leaders in this specialised field."

Andrea Lorusso, sales area manager at TECSYSTEM, says the company is pleased to have the expertise and network of Trafo Power Solutions to give the South African market easier access to its products. "Trafo Power Solutions understands its operating environment well, and also appreciates the value that our technologies can add to the market," says Fabrizio Giavenni, sales and marketing manager. "As we continuously develop our product range, customers in South Africa can look forward to more exciting innovations."

The synergy between the two companies is based on the fact that Trafo Power Solutions equips all of its cast-resin transformers with heat sensors that link to a temperature control system. Wherever there is an unusual temperature rise in a transformer, it is vital that the equipment can automatically generate an alert so the problem can be investigated and solved, emphasises Claassen.

"Customers purchasing dry-type transformers are often supplied with a temperature control relay as a separate item – almost as an optional extra," he says. "This is not our approach. Rather, we consider the control and protection requirements as an integral part of the overall scope of designing a transformer."

Trafo Power Solutions designs a dedicated control and protection panel, which includes a TECSYSTEM relay to suit the customer's specific transformer. It is then a simple matter of cabling up the main supply, without having to deal with the complexity of linking up the control unit.

"This is part of our philosophy of providing a full solution to the customer, not just products," he says. "We are assisted in this by TECSYSTEM's wide variety of highly reliable control relays, which ranges from hard-wired configurations to protocols such as SCADA and ethernet."

The company will also be supplying TECSYSTEM's air-forced (AF) fan cooling systems for cast resin transformers, says Claassen, with control systems designed and installed by Trafo Power Solutions. These fans are installed on the transformer feet, in a set of three fans on each side of the transformer, directly under the windings.

"They are typically used for additional protection rather than continuous operation," he notes. "The fans provide efficient and prompt cooling if and when the transformer temperature exceeds a pre-determined value."

A TECSYSTEM NT935 temperature control relay with communication protocols.

The company's regular use of TECSYSTEM products puts Trafo Power Solutions in an ideal position to assist the market in making effective use of these technologies. There are also adequate stocks held in South Africa to allow for easy availability and quick access to the required products. "Our facilities are equipped with the required equipment to test products before shipment to customers, as well as to pre-programme the units according to the planned application," says Claassen.

The programming is done on a dedicated simulation desk which is able to replicate the conditions in which the relay is required to operate. This simplifies the job for the customer, who then has only to follow a wiring diagram when installing the relay. "We can also play a valuable remote troubleshooting role for customers throughout Africa who need to update parameters in a relay, for instance," he says. "With our equipment and expertise, we can 'mimic' the unit on our side and then assist them over the phone."

According to Giavenni, the first micro-processor unit was developed in 1984 specifically to protect the cast resin transformers from temperature overloads. Continuous research and development by TECSYSTEM has seen ongoing product improvements ensuring reliability.

"Quality is an important cornerstone of our production and all our products comply with the latest technical specifications and ratings. Our R&D department conducts both preliminary and routine testing from the initial engineering phase right through to production," he concludes.

www.trafo.co.za

A TECSYSTEM air-forced (AF) fan cooling system for cast resin transformers.

Digitising agriculture with SICK's 3D environment monitoring sensors

SICK Automation is leading the 'Farming 4.0' agricultural digitisation era with its visual perception solutions for mobile agricultural machines and harvesting robots. Called Visionary Snapshot Cameras, the range is tailored to allow mobile equipment to navigate more easily and safely, while enhancing production.

SICK's Visionary-B, Visionary-T and Visionary-S offer a complete portfolio of 3D snapshot sensors for 3D environmental monitoring on mobile agricultural machines.

Vision technology from SICK inherent in its cameras make them the ideal solution for a vast range of agricultural applications: decreasing downtime with their collision avoidance capability; enabling autonomous agricultural machines to navigate across fields; providing gripping reliability for harvesting robots, level monitoring on transfer vehicles and the accurate measurement of harvest volumes in storage facilities; and increasing the accuracy of targeted pesticide applications by differentiating between crops and weeds

Sensors in agricultural machines are quickly being adopted in combine harvesters, for example. Some large agricultural machines are being fitted with up to 90 sensors and often have more electronic encoders than modern motor vehicles. In the agricultural environment, collision avoidance, navigation, detection and monitoring applications create demanding requirements on sensors. This is why SICK created the Visionary range – it serves all of these applications from one portfolio.

The Visionary range

The 3D Visionary-B driver assistance system is designed for use in extremely harsh outdoor conditions. The camera offers a wide field vision of up to 7.8 m for detection applications and up to 15 m for measuring applications with 3D raw data output.

Most importantly, Visionary-B displays detected objects on the monitor in the driver's cabin and sounds an alarm signal according the degree of relevance for collisions in a specific work environment. If Visionary-B is integrated directly into a complex sensor and visualisation system on a vehicle, or if reliable raw data is required, obstacles and warnings can also be processed and displayed on a central vehicle terminal.

The Visionary-S offers high precision at close ranges with simultaneous colour detection in any light situation. This 3D environmental monitoring sensor also uses stereo vision, supported by active, structured illumination. With its sub-millimetre resolution, it delivers up to 30 colour images per second. The Visionary-S can output distance information captured at depth values of up to 40 klx of illuminance, as reliably in complete darkness as in brightly lit environments.

The 3D camera's high recording speed guarantees high efficiency, even during time-critical applications. Applications such as those using harvesting robots, orchard and vineyard tractors, plant sprayers or mobile sorting systems can be programmed into the device, enabling programs to be executed independently of the vehicle control system.

The 3D Visionary-T environment sensor uses time-of-flight measurements to provide high-precision distance and size information in long-range applications of up to 60 m.

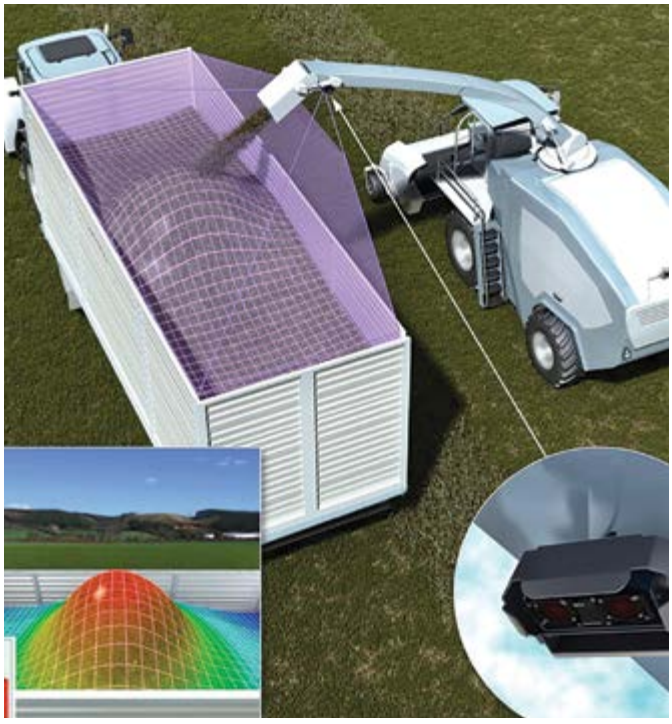
The integrated active lighting system illuminates the surroundings and enables the camera to be used in dark environments. This sensor is suitable as a data supplier for navigation applications in autonomous agricultural and harvesting machines as well as in robot-assisted processing and the storage of agricultural products.

A technology-neutral consulting process and SICK's focus on technical and economic application optimisation ensure that the most suitable product from the Visionary range is used for each customer's unique application.

Additionally, SICK offers 'plug and play' solutions for original equipment or for retrofitted mobile machines. There are also product variants for integrators and software specialists looking to integrate the raw data from the Visionary products into their own software solutions.

SICK's range of Visionary product families for the agricultural industry, means it has the solutions for monitoring, collision avoidance, detection and navigation application requirements.

www.sickautomation.co.za



Reliable level monitoring from SICK's Visionary snapshot cameras for 3D environmental monitoring enables farmers to better manage produce loading on transfer vehicles.

EM safety light curtain boosts productivity

An ElectroMechanica (EM) safety light curtain installation for a hydraulic press at Cape Town-based IWT Abrasives has resulted in operator efficiency improvement of almost 20%, enhanced safety and significantly better press productivity.

ElectroMechanica proposed the installation of ReeR light curtains, to improve safety and enhance productivity on IWT Abrasives' hydraulic presses.

IWT specialises in the weaving and impregnation of glass-fibre rovings used in the reinforcement of cutting and grinding wheels. Its hydraulic press shapes flexible material into the form of grinding disks. To operate the press, the operator used to use two hand lever valves. This mechanism ensured operator safety, but it slowed throughput. A further concern for IWT was the high energy consumption of the hydraulic press due to its constantly operating hydraulic pump, which also heated the oil, reducing its lifespan.

"IWT wanted a solution that would address these concerns, while also improving productivity," explains William Cameron, EM Product Manager. "We proposed our ReeR light curtains to replace the two hand lever safety mechanisms, which automatically and swiftly halt any press movement if the light beam is interrupted."

IWT had previously installed similar light curtains from EM on its Chiesa cutting machines. After doing some research on the ReeR brand, IWT agreed that positive market feedback, affordability and recognised quality made this the ideal solution for its requirements.

EM supplied all the required products for the scope of work, which was undertaken by IWT engineers. The project consisted of removing the existing hand-operated hydraulic valves, simplifying the hydraulic circuit to a single solenoid-controlled valve, and installing sensors to measure stroke movement and the force applied by the press.

A control cabinet to house the new PLC-based control system was supplied, as was a Human Machine Interface (HMI) to enable operator feedback.

The combination of sensor feedback and light curtain protection enabled the press to perform autonomously and to automatically reset. This allows operators to prepare the next product for pressing safely and efficiently, contributing to increased production. "The extra time gained has added a lot of value for IWT," says Cameron.

The addition of a PLC into the solution created smarter press control, resulting in the aforementioned improvement in operator efficiency and reduced waste, as well as energy savings. In terms of production, the biggest improvement over the past two years has been quality, consistency and subsequent waste reduction, since the PLC limits the force and movement of the press. In addition, improved control enables the hydraulic pump to be switched off automatically when the press has been idle for a specified period, increasing system longevity.

"Safety in manufacturing enterprises is often overlooked due to the expected loss in productivity and complexity of adoption. However, safety solutions can be implemented in a phased approach, with minimal disruption, and this can lead to significant productivity returns," concludes Cameron.

www.em.co.za

Following successful installation of ReeR light curtains from ElectroMechanica's portfolio, IWT Abrasives has realised an improvement in operator efficiency of almost 20%.

Machine learning for predictive control in minerals processing

Hosted by Juliano de Goes Arantes, Pavilion Account Executive, Rockwell Automation recently hosted a webinar to help attendees understand how better to meet process objectives.

De Goes Arantes said that more than 75% of mineral processing plants are still using basic control strategies. An audience poll showed similar results in Africa, with 56% saying they use basic control, followed by 28% who use manual control. "While basic control provides adequate control in terms of plant safety, it rarely achieves optimal control of quality, nor does it operate most economically," says De Goes Arantes.

The webinar focused on Pavilion8 Model Predictive Control (MPC) from Rockwell Automation, a tool that reduces process variability and enhances stability over and above what is currently possible with more traditional control schemes. Making use of MPC, processing plants can leverage their control systems to optimise their operations.

De Goes Arantes explained: "MPC uses a model of the minerals processing operation to predict how the process output variables will respond to changes in the process input variables and disturbances. MPC algorithms make use of machine learning, where the engine learns and updates the mathematical model using data, while the MPC then uses this learning to improve control." It is a simple and powerful technology which integrates into the current control system to optimise mineral processes while addressing the objectives and complexities of the plant.

"At its core, MPC uses supervised machine learning technology to assess current and predicted operational data. It compares the data to desired results, and then computes and updates the process online setpoint targets," explains De Goes Arantes.

MPC reduces variability, helps achieve plant stability, manages the process without constraints, and operates closer to specifications and performance limits while maintaining safety margins, ultimately delivering increased throughput, lower reagents consumption, better recovery, optimum water and energy usage, and improved process stability.

www.rockwellautomation.com

Unique recycling project gains national traction

The successful PETCO Separation at Source programme to improve municipal waste management and boost the green economy has begun to be rolled out nationwide.

A UNIQUE programme aimed at upping collection and recycling rates, boosting green economy jobs and diverting waste from landfills has started to roll out across South Africa.

Following a successful pilot rollout in Thohoyandou and Sibasa in Limpopo in March last year, the Separation at Source programme has celebrated its launch in a second province – KwaZulu-Natal.

The May 13 launch in Umlazi saw PETCO – the national industry organisation that supports polyethylene terephthalate (PET) plastic bottle recycling and collections – hand over 120 recycling bins, sponsored by SA's leading polymer producer Safripol, to environmental group Isphepho Enviro Ambassadors. The donation, worth over R230 000, also included 50 bulk bags, a 12 m storage container, a platform scale, signage and a trailer with a 6.0 m^3 volume.

The colour-coded bins – green (glass), yellow (plastics), blue (paper) and red (cans) – will appear at schools, communities and businesses in and around Umlazi and will allow residents and businesses to separate their household waste for the first time. This means – at least for those who partake in the project – that only waste that cannot be recycled will end up in the municipality's landfills.

Isphepho (isiZulu meaning 'tornado') collects recyclables from the community and also facilitates clean-ups in Durban. So far, 20 schools in Umlazi have joined the Separation at Source programme, with Isphepho collecting a minimum of 10 t of PET plastic a month. Isphepho aims to increase the number of schools registered to more than 50 over the next year. The 35-strong ambassador group comprises mostly unemployed graduates from disciplines including IT, public administration, speech and drama, conservation and agriculture. Londi Mbuyisa, who established Isphepho in 2018, says she was inspired to do so after founding another community engagement project in 2016. The organisation is self-funded by Mbuyisa, a senior lecturer in the Department of Nature Conservation at Mangosuthu University of Technology. Not one of the team earns a salary.

As part of PETCO's KwaZulu-Natal Separation at Source programme launch, members of the environmental group, Isphepho Enviro Ambassadors, received a donation of R230 000 in recycling equipment from Safripol.

Youth partake in the launch of the KwaZulu-Natal PETCO Separation at Source recycling programme in Umlazi on May 13.

"The awareness and participation in recycling among Umlazi residents is very limited," said Mbuyisa, whose vision is to create a focus within communities on the value of the circular economy. Mbuyisa also plans to add value to the waste collected by using it for manufacturing construction materials such as bricks "to make affordable housing a reality for the community".

"PETCO coming on board brings Isphepho one step closer to the realisation of our dreams," she says.

Safripol sustainability manager, Avashnee Chetty, said the company was committed to supporting waste collection projects such as this as they are an important enabler to the circular economy. "Separation at source initiatives ensure that valuable recyclables stay out of the environment and are recovered for use in the recycling industry. These projects also have the potential to contribute towards improving the lives and livelihoods of the most marginalised communities," said Chetty.

Belinda Booker, PETCO collections and training project manager, said there was "a huge need to support collection and recycling activities, especially in rural areas and townships where waste management is not well serviced or a priority".

"PET plastic bottles are not trash. They are resources that can be recycled and brought back into the value chain, with local beneficiation," Booker said. Partnerships at all levels of government, industry and civil society were the key to encouraging waste reduction and increasing collection and recycling, she added.

PET recycling in South Africa has consistently created more than 60 000 income opportunities annually since 2018. ❑

Used oil generators urged to recycle responsibly

With June marking National Environment Month, protecting our ecosystems falls firmly in the spotlight. Of particular importance, is ensuring that hazardous waste does not pollute the natural environment.

Used lubricating oil is a hazardous waste that, if irresponsibly dumped, can severely contaminate our water resources. One litre of used oil can contaminate a million litres of water. Used oil contains harmful compounds such as iron, tin, copper, zinc as well as many other hazardous organic molecules.

In light of this, the ROSE Foundation (Recycling Oil Saves the Environment) – an industry body that has been championing the responsible collection and recycling of used oil for 27 years – is calling on South African businesses that generate used motor lubricant oil to become agents of change and ensure they do their part to protect the environment by responsibly collecting, storing and recycling the used oil they generate.

Bubele Nyiba, CEO of the ROSE Foundation, explains that some South African businesses that generate used motor oil dispose of it improperly and illegally. "Often oil ends up in landfills or down drains. Some use oil generators sell their oil to unlicensed processors or end users. It is often used as burner fuel for furnaces, painted onto vineyards and fence poles as a wood preservative, or sprayed onto dirt roads as a dust suppressant."

Because of this, the storage, disposal and recycling of used oil is strictly governed by environmental laws under the National Environmental Management: Waste Act No. 59 of 2008.

"More than ever, we are calling on larger businesses that generate large volumes of used lubricating oil, as well as informal 'backyard' mechanics and DIY repair enthusiasts to be vigilant about what they do with their used oil and to track where it ultimately ends up," says Nyiba.

In terms of the Act, the ROSE Foundation advises that used oil must be properly stored until it can removed for recycling or taken to a drop-off point. This includes draining the oil into a clean container with a tight-fitting lid, such as a reusable combination drain pan/storage container or drum. Empty oil containers and drums make effective storage vessels for used oil; however, do not use a container that previously held chemicals, such as cleaners, solvents, fuels, paint or bleach. Always clearly label the container 'Used-Lube Oil'.

Used oil containers must be kept in a place that can easily be accessed by a ROSE registered used oil collector and the surrounding area must be kept clear and clean. "Ideally, store your containers under cover and away from heat or sources of ignition. And if you generate large quantities of used oil, build a bund wall around your bulk used oil storage tanks so that in the event of a spill or leak, the used oil will be contained," says Nyiba.

The ROSE Foundation (Recycling Oil Saves the Environment) is calling on South African businesses to become agents of change and to protect the environment by responsibly collecting, storing and recycling the used oil they generate.

Used oil generators must ensure that the oil is collected by a ROSE registered oil collector who will come and remove the oil and take it to be recycled in an environmentally compliant and safe manner. "Your collector must always issue the generator with a safe disposal certificate as required by the Waste Act. The safe disposal certificate also acts as a Hazardous Waste Manifest, thereby fulfilling the requirements of reporting by law," says Nyiba.

"The responsibility lies with the generator to ensure that the person who collects their used oil complies with legal requirements for transportation of used oil and can provide the required Safe Disposal Certificate and Hazardous Waste Manifest. Failure to do so can result in fines and prosecution."

For those who generate smaller volumes of used oil, there is the option of dropping the oil off at selected AUTOZONE stores and various motor service centres countrywide. A list of the drop off points can be found on the ROSE Foundation website.

"The safe disposal of hazardous waste has become a critical issue in South Africa to protect our environment, and the legislation in place means that responsible waste management is no longer a nice, but a necessary, thing to do," says Nyiba.

"As the organisation that has championed the responsible recycling of over 1.5-billion litres of used oil, the ROSE Foundation is committed to being a captain of change and ensuring we stimulate awareness and behavioural transformation within the used oil industry. ROSE has been actively recruiting used-oil collectors to join the organisation so we can assist them, and their customers, with waste legislation compliance. Despite the COVID-19 pandemic, in 2020 we recorded the second highest collected used oil volumes since ROSE Foundation's formation in 1994."

For more information and to find out about an accredited collector or drop-off point, contact the ROSE Foundation on (021) 448 7492.

www.rosefoundation.org.za

Bulk bag unloader with dual flexible screw conveyors

Flexicon's new bulk bag unloader with dual flexible screw conveyors is able to feed two downstream processes, dust-free.

The Bulk-Out® BFF series discharger features top-mounted receiving cups and a removable bag-lifting frame for forklift loading of bulk bags. Z-CLIP™ strap holders allow rapid, secure insertion and removal of bag straps from the lifting frame at floor level.

The bulk bag/hopper interface is comprised of a manual Spout-Lock™ clamp ring for high-integrity bag spout connections, and a pneumatically-actuated Tele-Tube™ telescoping tube that exerts continuous downward tension on the clamp ring and bag spout as the bag empties and elongates, promoting flow and evacuation.

Additional flow is afforded by Flow-Flexer™ bag activators that raise and lower opposite, bottom sides of the bag at timed intervals into a steep V shape, and top-mounted Pop-Top™ extension devices that elongate the entire bag, promoting total discharge with no manual intervention.

The hopper is equipped with dual flexible screw conveyors that transfer free- and non-free-flowing bulk materials to downstream processes separately or simultaneously. The flexible screws are the only moving parts contacting material, and are driven beyond the point at which material is discharged, preventing material contact with seals.

The system is available in carbon steel with a durable industrial coating, or stainless steel finished to industrial, food, dairy or pharmaceutical standards.

Flexicon also manufactures other configurations of bulk bag dischargers and flexible screw conveyors, as well as tubular cable conveyors, pneumatic conveying systems, bulk bag conditioners, bulk bag fillers, bag dump stations, drum/box/container tippers, drum fillers, weigh batching and blending systems, and engineered plant-wide bulk handling systems with automated controls.

www.flexicon.co.za

Flexicon's new bulk bag unloader with dual flexible screw conveyors.

BricsCAD: an affordable, modern and widely compatible CAD solution

The latest release of BricsCAD® V21 by Bricsys dramatically boosts CAD software performance while delivering extensive in-product collaboration capabilities. BricsCAD product are offered in four potential options to suit different user needs and budgets.

BricsCAD® Lite is the choice for 2D drafting work, offering all the functionality of AutoCAD® LT, and more. The overall user experience is amazingly familiar. BricsCAD LITE offers the power of AI via machine learning workflows that let designers get more work done, faster and with more accuracy. Migration is also easy; menus and other customisations can be moved directly from other packages into BricsCAD.

With the full power of LISP built in, BricsCAD Lite enables drafting workflows to be customised. Most existing LISP routines will load and run, five to 100 times faster, thanks to the modern memory management of Bricsys' Open LISP implementation.

BricsCAD Pro is the right choice for users who want more power and more innovation on their desktops or laptops, and for those who need access to the hundreds of 3rd party application programs built on the BRX API.

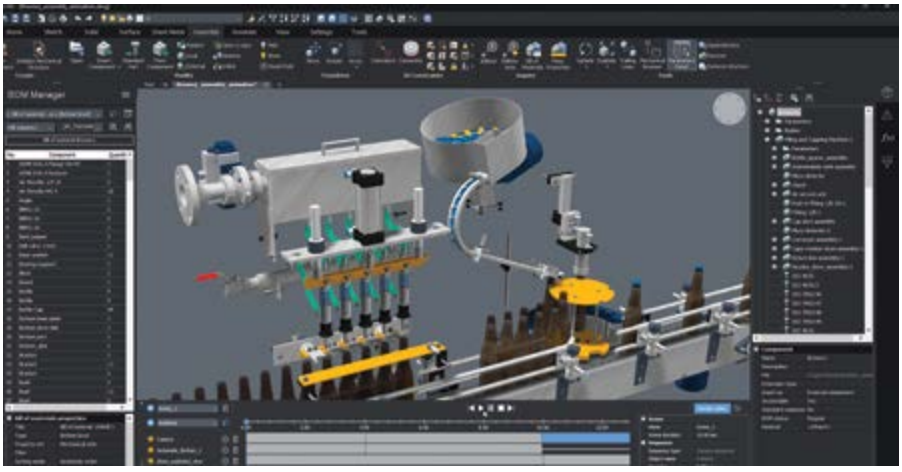
BricsCAD Pro integrates all the advanced parametric solid modelling features previously found in BricsCAD Platinum, and more. It contains a powerful 3D constraint engine and automatic parameterisation. Parametric components and arrays, coupled with the system's 3D direct modelling engine, give ultimate design freedom. The Pro edition also contains civil modelling workflow, with automatic TIN surface generation, gradings, corridors and alignments.

BricsCAD Mechanical offers comprehensive mechanical design and documentation tools that work in BricsCAD's familiar user environment – and it is all in DWG format.

The optional Communicator for the BricsCAD module can import files from, and export them to, industry-standard Mechanical CAD formats, including associated Product Manufacturing Information (PMI). And BricsCAD's powerful Direct Modeler, based on ACIS, treats native and imported geometry the same way, resulting in seamless editing of parts, assemblies and sheet metal components.For architects and structural engineers, BricsCAD BIM is an alternative Building Information Modelling workflow that starts in 3D and stays in 3D. It offers a design-to-documentation Building Information Modelling workflow that focuses on design first. BricsCAD BIM leverages a familiar workflow, using DWGs and XREFs, to bring Building Information Modelling to everyone. Users can begin to capture designs in CAD-accurate solids, without the limitations of family-based systems. Then, leveraging the power of AI and machine learning, BIM's elements can be classified automatically. This same AI power enables the level of development of the BIM to be built in a continuous, consistent fashion. Associative construction documentation can also automatically be created at any point in the BricsCAD BIM workflow.

Chempute Software was founded in 1986 by Dave Wickham, who recently retired. The company is now managed by Andrew Taylor. In 2017, Chempute became a representative of Bricsys, the global provider of the BricsCAD brand of engineering design software at compelling prices with industry-leading product support.

www.dwgcad.co.za



BricsCAD® Pro is the best choice for 3D work and 3rd party apps.

BLT World launches new recycling trommels in Africa

BLT WORLD has launched its MDS M518R recycling trommel into Africa. "The MDS M518R trommel – which has been developed by MDS International to meet exact customer requirements – is especially useful for recycling and light-duty applications. Typical functions are in processing general waste, compost, soil, woodchip, rubber and plastics," explains Ken Mouritzen, managing director, BLT WORLD, the exclusive distributors for MDS in Africa and the Indian Ocean Islands.

"We believe this robust and versatile trommel will optimise productivity in the recycling industry by increasing output. Quick drum changes minimise downtime and there are significant cost savings by using one trommel for many applications. Accessibility of this machine to various recycling centres is also enhanced by easy haulage from site to site."

The M518R trommel has a brush cleaner attached to the unit and is especially useful for recycling and light-duty screening applications.

The M518R, which weighs less than 20 t and has an overall reduced height at 3.14 m, can easily be transported on regular low body trailers. Other notable features include a low centre of gravity and the ability to achieve high stockpile heights. The trommel has been designed for easy changes to the configuration of its drums, giving users the flexibility to produce different grades of materials using the same unit. The machine is equipped with an hydraulic drum removal system that enables quick drum changing using a standard forklift.

BLT WORLD offers three different styles of MDS drums – fully-welded, mesh and punch plate – all designed for high output in different applications. These drums, with openings from 1.0 mm to 150 mm, are made as frames onto which different sized meshes can be fixed. For user convenience, the MDS design team has standardised dimensions of the M518R, to ensure compatibility with other OEM drums.

The full range of MDS trommel screens and apron feeders is supported by BLT WORLD's technical advisory, supply and repair service throughout Africa.

www.bltworld.com

CSIR to establish SA's first supercritical CO_2-based encapsulation facility

The CSIR team of researchers responsible for developing a novel supercritical CO_2-based encapsulation technology. ***From left:*** *Lonji Kalombo, Andri Swanepoel and Dr Philip Labuschagne.*

The Council for Scientific and Industrial Research (CSIR) has been awarded R25.9-million by the Department of Science and Innovation (DSI) to establish South Africa's first pilot-scale Supercritical CO_2 Encapsulation Facility (SCEF), which is set to be operational in 2022.

The facility will address the innovation chasm that exists in the industrialisation of supercritical CO_2-based encapsulation technologies, while enabling local small, medium and micro enterprises (SMMEs) and firms to conduct field trials and assist in investigating the market uptake of their technologies. The unique advantage of the technology is that it encapsulates sensitive actives used in animal and human health such as probiotics, proteins and vitamins in an inert environment without exposure to moisture, oxygen and solvents, while operating at low temperatures and thereby preserving the activity of the materials. This is key to providing a balanced nutrition for human health, livestock, improved feed digestibility, and reduced overall feed requirements, all of which lead to production cost savings.

"Currently, the encapsulation methods that are being used commercially are spray drying or extrusion. However, these processes expose sensitive actives to high temperatures, shear, organic solvents, moisture and oxygen. All these can compromise their stability. Therefore, as an alternative, our team has developed novel encapsulation technologies using the supercritical CO_2 process. This is a more efficient process to encapsulate sensitive actives, says principal researcher at the Centre for Nanostructures and Advanced Materials of the CSIR, Philip Labuschagne.

The CSIR recently developed and licenced this technology to a local SMME for commercialisation of a range of probiotic-containing health supplements. However, a major barrier for full-scale commercialisation is that there are no pilot-scale supercritical CO_2 encapsulation facilities in South Africa to produce products at scale.

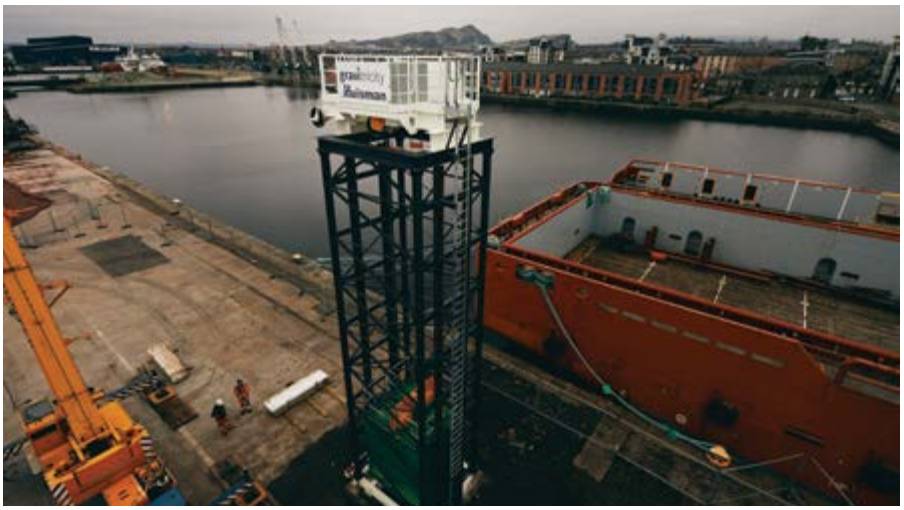
In response, the CSIR will now establish a pilot-scale SCEF facility with a production capacity of up to 100 kg/product/hour for a wide range of applications from personal care products to nutraceuticals. In addition, as the end-products will be for use for nutraceuticals for human and animal use and personal care products, the Hazard Analysis Critical Control Point (HACCP) safety system will be implemented across the facility.

The establishment of this pilot facility at the CSIR will allow industry access to CSIR scientists for new product development, as well as technology transfer.

www.csir.co.za

Gravity plus hydrogen energy storage in underground shafts

Energy storage specialist Gravitricity has submitted a global patent to turn underground shafts into pressurised energy stores capable of safely accumulating significant quantities of hydrogen gas. The solution would be coupled to its short duration quick response gravity-based energy storage system, with a green fuel-gas solution for longer feed-in durations or to refuel heavy goods vehicles, ships or trains.



Gravitricity has built a proof of concept model on a 15 m tower that uses a 50 t weight to store and release 250 kW of power.

Describing Gravitricity's core technology, MD Charlie Blair says that, in principle, it is similar to pumped-storage technology, but with very different mechanical characteristics. "Instead of pumping water up into a high level dam so that it can be run back down into the pump-turbines below, a heavy weight in a mine shaft is connected to a winch and generator system. The weight is raised by the motor using green, surplus or inexpensive power. When additional power is needed to balance the grid, the weight is dropped back down into the shaft, causing the motor to operate as an electricity generator.

"We lower a weight to discharge stored energy and we raise the weight again to recharge the energy store. It is just like a giant rechargeable battery that stores and then releases electrical energy, using gravitational potential energy for storage instead of chemical energy," he explains, adding that Gravitricity has built a concept model on a 15 m tower that uses a 50 t weight to store and release 250 kW.

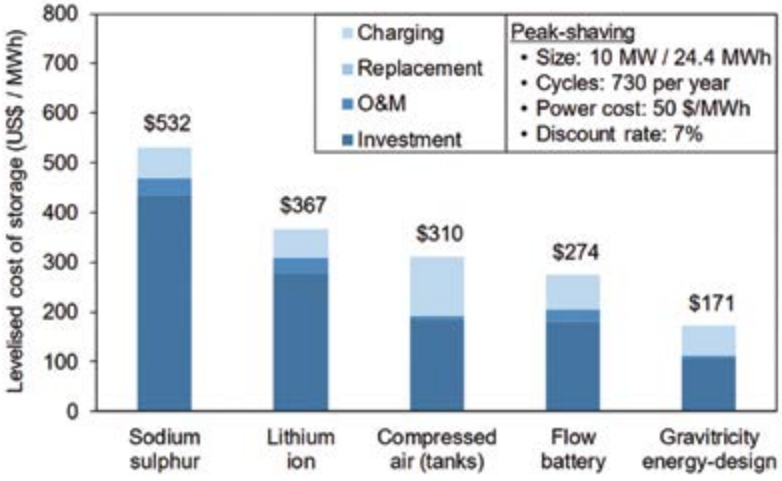
The mine shaft infrastructure of depleted underground mines is ideal for rolling out commercial installations of this technology, giving these sites a renewed purpose. "The investment returns are easily justified, because every aspect of the technology has a very long life: we can easily guarantee 25 plus years of energy storage from a Gravitricity system," says Blair.

Energy storage saves at the very highest costs of generation systems, because it enables a local energy grid to be sized and operated based on average rather than peak demand. "Wind and solar are difficult to dispatch, but we know that PV-battery storage and other solutions make the transition to renewables possible. The question is how do we do it as cheaply and effectively as possible.

"We believe that long-life energy storage is key to the effectiveness of the transition, so our technology is very different to battery storage technology because it has a cycle life of up to 100 times longer," notes Blair.

Initially, to reduce costs and risks, the use of redundant mine infrastructure is clearly sensible. "There is a pull from the end-of life mine operators who want to be seen to be doing responsible things with their ageing infrastructure. For coal mines in Czechia and Poland for example, the European Commission (EC) is supporting the deployment of Gravitricity solutions, because their mines are closing due to EC legislation. In South Africa, the mine operators are faced with land reclamation and remediation costs. At the same time, there is pressure to support the ailing grid, so adding a real long-term solution such as Gravitricity is a good-fit solution," suggests Blair.

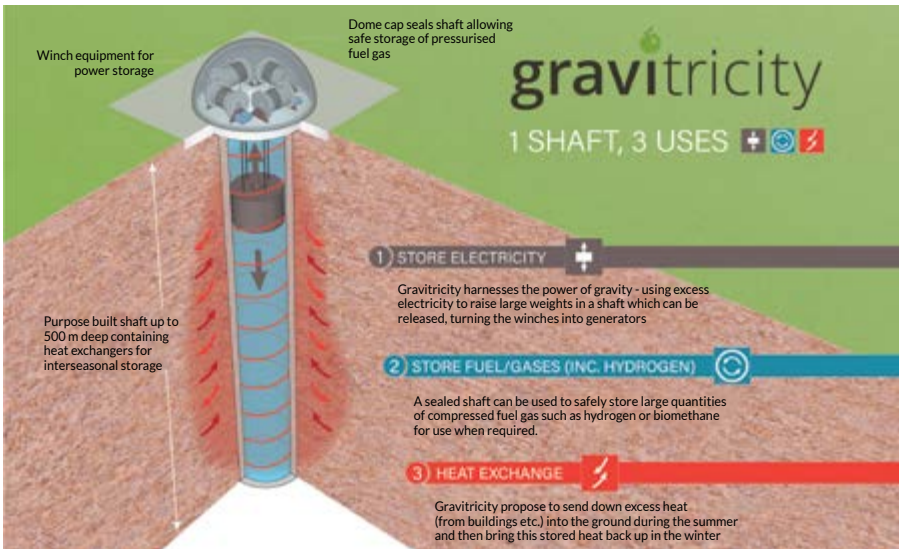
He says that Gravitricity currently has a pipeline of some 50 shafts around the world that are interested in the technology, several of which are in South Africa. "These are €10-million projects so it takes time to reach financial closure, but we do have interested mine operators from South Africa and across Africa. Some are interested in using the stored power for themselves, while others



A levelised cost of storage comparison between a 10 MW peak shaving Gravitricity system and four comparative energy storage technologies – based on a 25-year project duration.

are simply looking to find new uses for their infrastructure, in which case a build-own-operate model may emerge with development partners taking on the investment based on PPA type contracts.

He goes on to say that one of Gravitricy's partners, RESA, is currently building many hundreds of MW of solar power across southern Africa and, for these, tens of MW of storage is needed. "They are not fussy about where the storage is located, either, as long as it is connected to the same grid," says Blair.



The addition of hydrogen storage

Gravitricity's founder, Martin Wright says the future hydrogen economy will need to find economic and safe ways to store hydrogen where it's needed. "At present our domestic gas network in the UK has vast amounts of storage built in, under the North Sea. The gas grid of the future will be powered by intermittent renewables and that means we need to find ways to store green hydrogen when energy is plentiful, close to where it's required.

"Our idea is to make each Gravitricity shaft serve as a very large, sealed pressure vessel and to use the shaft itself to hold significant quantities of gas. We believe this will be far more economic and safer than above-ground storage pressure vessels, and it will massively increase the storage capacity of the system.

Wright envisages building single or multiple shafts which, when co-located with a green hydrogen electrolysis plant, would have a very clear dual function: to store excess electricity for use by the electrolysers when needed, and to store the plant's output as a buffer into the gas grid. This will not only smooth the input and output of the green hydrogen plant, but it will improve the economics, bringing down the cost of green hydrogen.

"The hydrogen store could also be used as a fuelling point, providing low (or zero) carbon hydrogen fuel for heavy goods vehicles, ships or trains: or it could be used to generate significant additional quantities of electricity if required," Wright says.

Further explaining how the two technologies complement each other, Blair says that gravity-based energy storage is very good for second by second, minute by minute or hour by hour energy management: it can rapidly respond to generation shortfalls and feed power into a grid to balance demand for shorter durations. "Any shortfall within the same day can be accommodated," he says.

To fill in for longer periods, a fuel gas solution is generally required. "That's where we see hydrogen coming in. We could of course also store bio-gas or even natural gas, but the basic idea is to use the structure and geology of the same shaft being used to lower and raise the weight to store pressurised hydrogen," he says.

"Renewable energy generation is already creating periods of surpluses of energy, which is causing wind farms, for example, to be underutilised. The readily dispatchable generators on a grid, such as coal-fired and nuclear power generation, cannot be easily ramped up or down to follow demand, so grid connected wind turbines are routinely being turned off to keep the grid balanced.

"Instead of turning these turbines off, we believe surplus electricity could be redirected into hydrogen electrolysers to make 'free' hydrogen fuel instead of wasting the generation capacity. It may never make sense to put all of that hydrogen back into electricity, but hydrogen is also an ideal green fuel," he explains.

Initially, he suggests, Gravitricity's hydrogen storage technology is likely to be implemented in new-shaft projects in Europe, where high pressure sealing can be incorporated during the initial construction. "It is obviously harder to create a pressure seal in an existing mine because there are side shafts from the mine workings, for example, but it's definitely possible and still not as cost intensive as sinking a new shaft from scratch," he adds.

In Africa, own power use is also more common, Blair suggests. "Solar power plants operated on an islanded off-grid basis are of particular interest to us and we have a short-list of facilities we are investigating with respect to operating gravity- and hydrogen-based storage plants using onsite solar panels," he says.

"Between Martin Wright, myself and our other business partner, Peter Fraenkel, we have well over 50 years of experience in clean energy, storage and transition. This is our passion, to balance the power grid to make clean and renewable energy generation more dispatchable and, in so doing, to create an affordable and stable energy transition," Blair concludes.

gravitricity.com



Gravitricity's Charlie Blair and his two business partners, Martin Wright and Peter Fraenkel.

Circular economy products developed from industrial wastewater – making use of nutrient discharge

VTT project manager, Hanna Kyllönen, talks about the €1.03-million TYPKI project, which is striving to realise the significant potential for raw materials lurking in wastewater. By developing feasible solutions for the treatment and recovery of nutrients from industrial wastewaters, the TYPKI project consortium is responding to the challenge of zero liquid discharge (ZLD).

Industrial wastewater is facing tougher regulation, and tighter limits on nutrient discharge are being imposed to secure the quality of waterways. This increases the need for more thorough purification technologies. Meanwhile, there is a significant potential for raw materials in wastewater. The TYPKI project coordinated by VTT promotes the recovery and refinement of nutrients into industrial chemicals, construction materials, and fertiliser additives.

The treatment of industrial wastewater creates effluents that contain substances such as nitrogen, phosphorus, potassium and sulphur. It is harmful to discharge large amounts of nutrients into the environment, but when these nutrients are recovered they serve as valuable constituents for new circular economy products. At the same time, the use of virgin raw materials can be reduced, while boosting self-sufficiency, such as in nitrogen- and phosphorus-based industrial chemical and fertiliser products in Europe.

Technically and economically feasible solutions for treatment of wastewater and recovery of nutrients are being developed in the TYPKI project. Purification and separation technology covers different types of methods from pre-processing to membrane filtration or evaporation. When the methods are combined intelligently, valuable nutrients can be separated from the wastewater for further refinement.

New circular economy products from nutrients – focus on industrial chemicals

Legislation that steers circular economy products is changing, making it easier to productise wastewater and effluents. Constituents that can be separated from waste flows have been treated as waste-based substances, but now they are seen as valuable raw materials. This is important if circular economy products are to compete against products produced from virgin raw materials.

In the TYPKI project, new nutrient innovations and circular economy products are being developed from industrial effluents. The effluents to be used are coming from the mining sector, followed by other fields of industry such as the chemical and forest industries.

"In new circular economy products, we are focusing especially on additives in chemicals that are used in the construction industry. We are seeking a better composition and clean product flows from which harmful substances and excess water, for example, have been removed. The goal is to develop competitive products with features that correspond to the customer's needs," says Project Manager Hanna Kyllönen at VTT.

"At Tapojärvi, the circular economy of metals has been at the core of our activities for about 20 years. The TYPKI project is an important continuity for this pioneering work. Now we are latching on to the possibility of recovering nitrogen used in the mining industry, for example", notes Jaana Koivumaa, project director for Tapojärvi's subsidiary Hannukainen Mining.

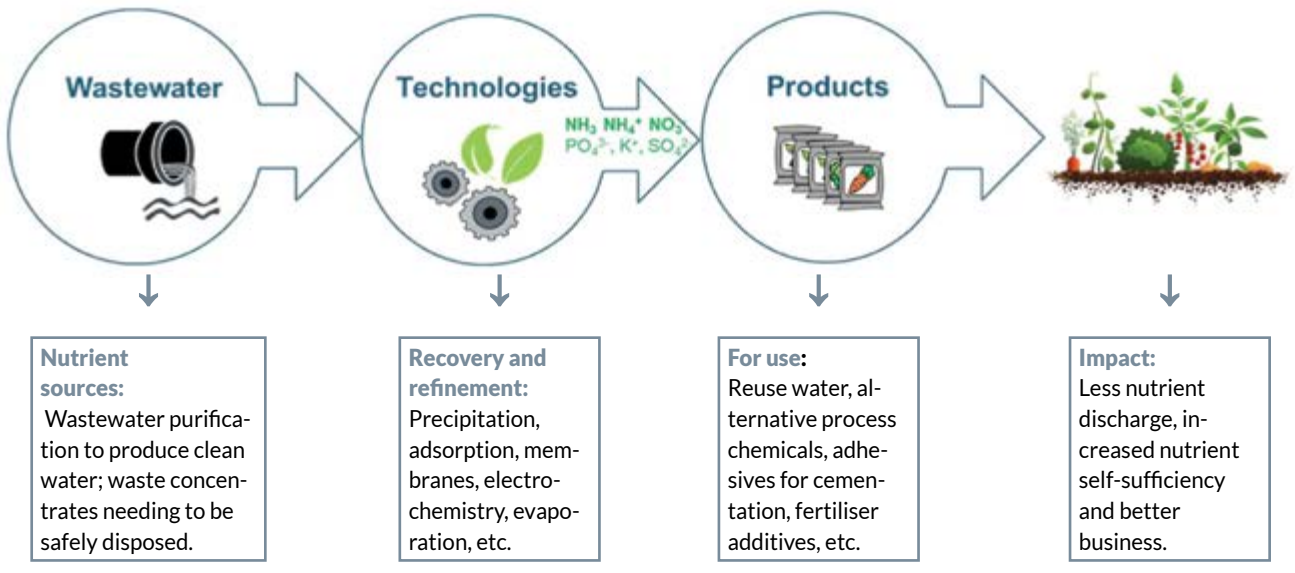
Comprehensive solutions for the entire nutrient value chain

The TYPKI project consortium includes research institutes and companies, from producers of wastewater to experts in purification and separation technologies, to manufacturers and users of recycled products. This forms a strong ecosystem around recycled nutrients and international cooperation enhances skills and knowledge.

"Our goal is to build the best possible consortium to develop new circular economy concepts and to promote Finland's innovations and offerings in these themes. By joining forces we can compete on the international circular economy market. There are undoubtedly other ongoing activities linked with recycled nutrients, and I hope that those who are interested in this area will contact us," Kyllönen says.

The two-year TYPKI project (Resource-wise nutrient recovery from industrial wastewaters), which is partly funded by Business Finland, has a total budget of EUR 1.03 million. The project is coordinated by VTT and the consortium includes the University of Oulu, Tapojärvi, Aquaminerals, BioSO4, Brightplus, Industrial Water Ltd, Agnico Eagle, Gasum, Hannukainen Mining, Valmet, and Yara.

www.vttresearch.com



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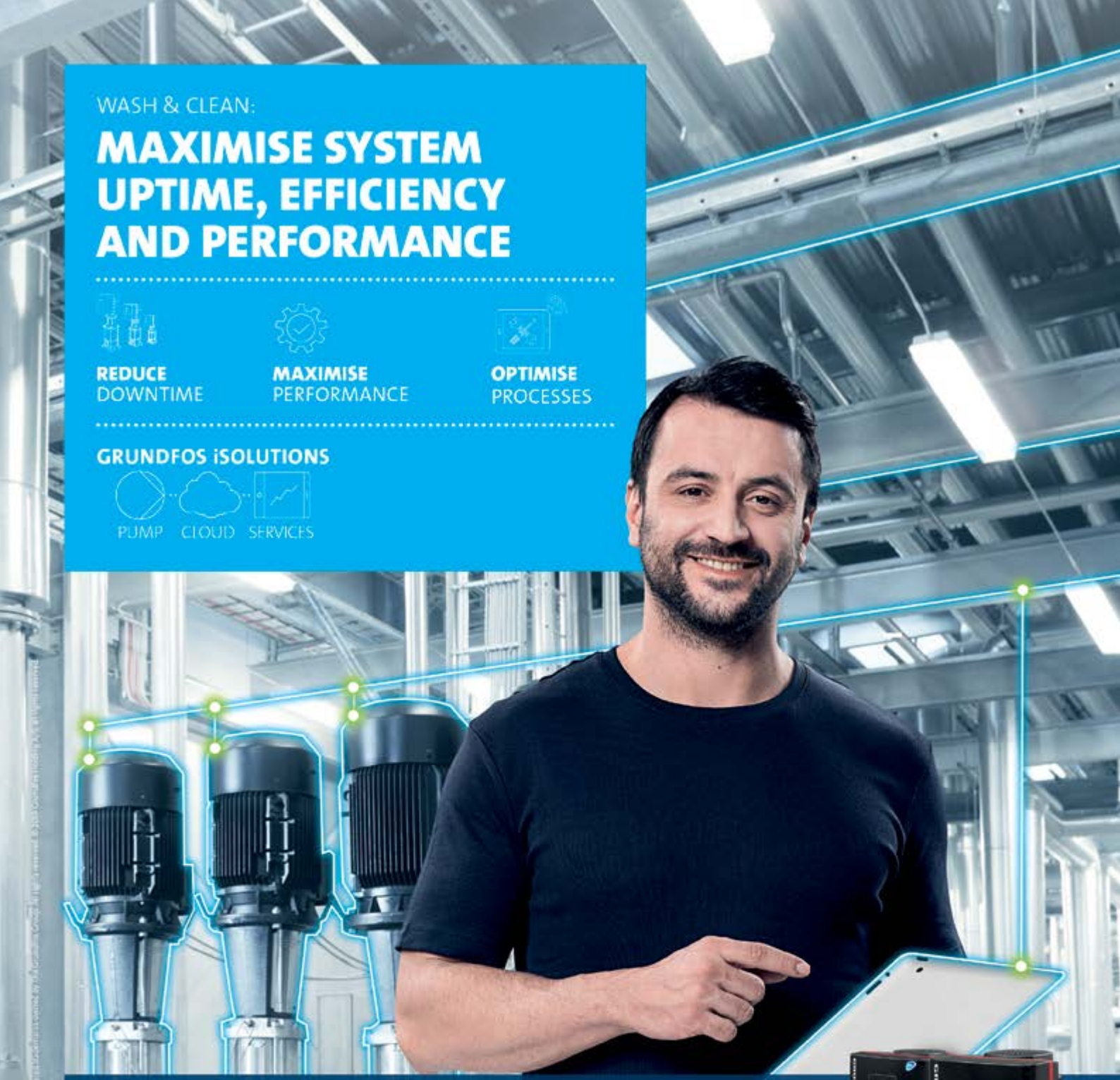

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