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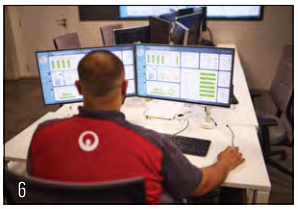

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COP26 and concrete action

Peter Middleton

COMMENT

The United Nations' 26th Climate Summit, COP26, is currently underway in Glasgow. It is horrifying to think that 26 years have passed since the issue of global warming due to greenhouse gas emissions was first identified as a serious global crisis. Ironic even, that the word Summit, which suggest the idea of a culmination or a climax, has been used for so long to address the same issue.

It does feel a little different this year, though. There seems to be less scepticism, more urgency and even some optimism.

On the Friday before the conference opened, Pope John Francis broadcast a message pleading with world leaders to offer "concrete hope to future generations". He said that global crises in health, the environment, food and the economy were profoundly interconnected and "forecast a perfect storm that could rupture the bonds holding our society together".

"We can confront these crises by retreating into isolationism, protectionism and exploitation. Or we can see in them a real chance for change, a genuine moment of conversion, and not simply in a spiritual sense," said Pope Francis.

A spiritual leader pleading for concrete action from everyone!

On Day 1 of COP26, world leaders called for greater ambition on mitigation, adaptation and finance, urging negotiators to work together to accelerate climate action in this 'crucial decade'. At the heart of their aims is to 'conclude the Rulebook' to support delivery of the Paris Agreement goals to limit global warming to below 2.0 °C and, if at all possible, to 1.5 °C. This asks every nation to develop and commit to a climate action plan called an NDC (Nationally Determined Contribution) that sets out target greenhouse gas-emission limits to match those calculated as necessary by climate scientists. This will only be possible if climate finance is scaled up, including urgently delivering on the US$100-billion per year goal set in Paris.

To support South Africa's decarbonisation efforts, A Just Energy Transition Partnership was announced as a precedent for how collaboration between an emerging economy and international partners might work. The Transition Partnership between South Africa, France, Germany, UK, US and the EU will initially mobilise $8.5-billion for the first phase of financing. The initiative is expected to prevent up to 1 to 1.5 Gt of emissions over the next 20 years, support South Africa's move away from coal and accelerate its transition to a low-emission, climate-resilient economy.

Also now being discussed is adapting to the impacts of climate change as a matter of survival. There is an acknowledgement that climate change is already happening, as is evident by the increasing impacts of storms, floods, droughts, fires and a recent locust plague 'of biblical proportions' in East Africa.

Africa is a most vulnerable continent because of its over-dependence on the local agricultural ecosystem and low levels of adaptive capacity and technologies, and COP26 is highlighting the need for a step-change in finance for adaptation, at least a doubling of current funding.

It had become increasingly clear that the 'radical' side of the change required to attenuate global warming has to come from citizens and private companies. The cover story in this issue of *MechChem Africa* comes from the National Cleaner Production Centre of South Africa (NCPC-SA), which, since its establishment in 2010, has helped industrial companies to save 6.5 TWh of energy by implementing energy-efficiency and resource-optimisation initiatives.

In that time, a new employment sector has been created consisting of 6 000 NCPC-SA-trained professionals in Energy Management Systems and Energy Systems Optimisation. These experts are now available to South African industry with help to better manage the energy use of boilers, pumps, motors, compressors and fans.

New NCPC-SA courses continue to be introduced, including a Bio Systems course, which, according to Tanya Van Zyl, "is of particular importance to us at the NCPC, because it allows us to promote the generation of renewable, sustainable energy in the form of biogas from biological waste, which embraces all the principles of the modern circular economy".

This is concrete action. It is beneficial to the economy, it creates jobs and it is much better for the environment. It makes a zero-carbon future seem achievable and 100% compatible with a happy and healthy lifestyle.

Aside from the global big picture of emitting much less CO_2, methane and other harmful gases from our fossil-burning power stations, every person of every nation needs to use less, buy less, waste a lot less and be more mindful of the nurture our planet requires. We don't have to see this climate-friendly future as austere and impoverished, however. As the Pope suggests, this 'genuine moment of conversion' may lead to a lifestyle filled with far less that is superfluous and far more that is valuable. ❑

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New NCPC-SA training initiatives extend IEE project success

MechChem Africa talks to Tanya van Zyl of the National Cleaner Production Centre of South Africa (NCPC-SA) about the success of the training courses developed and delivered as part of the IEE Project in partnership with the United Nations Industrial Development Organization (UNIDO), and about some of the exciting new courses that have been added to extend this success.

Since 2010, the NCPC-SA has trained over 6 000 professionals in Energy Management Systems and Energy Systems Optimisation in a number of energy systems, including steam, pumps, motors, compressed air and fans: all linked to the principle of energy management and efficiency optimisation.

Describing the core objective of the NCPC training initiatives, Tanya van Zyl says the NCPC-SA offers training at introductory, end user and expert levels and these courses are designed to provide comprehensive learning pathways for professionals wishing to develop expertise in creating more energy efficient and cleaner production plants in South Africa and across the world. "Our resource-efficient and cleaner production (RECP) training is based on the UNIDO/UNEP toolkit and equips trainees with the skills required to conduct assessments and identify and implement improvements. This typically involves the analysis of raw materials, water, waste, energy consumption, along with the identification and implementation of improvements.

"Our energy management training programmes are all based on the SANS/ISO 50001 standard and have created a new profession for individuals to develop and implement energy management systems for industry. Our systems optimisation programmes then focus on the specific technologies where energy efficiency interventions can reduce consumption and carbon emissions while also saving companies substantial amounts money," she tells *MechChem Africa*.

"We have recently added a few new specialisations for energy professional to our mix, most notably, Power Quality Management; Biogas Project Development; and Large Scale Cooling and Refrigeration System Optimisation," says Van Zyl.

Power Quality Management

In introducing the new power quality field, Van Zyl says that this area has become extremely important due to the addition of so many more renewable energy plants to the energy mix. "As companies and professionals begin to convert their electricity use to renewable options, they often forget that the quality of power from multiple sources may not be consistent, which, at worst, can damage equipment and, more commonly, will compromise energy efficiency and system performance," she says.

Renewable solar and wind power plants, for example, tend to rely on high switching frequency inverters to create grid compatible ac power. This can inject harmonics onto the power grid, creating power quality problems at the point of use. "Most power quality problems can be attributed to faulty connections and/or wiring, though, while frequency disturbances, electromagnetic interference, transients, harmonics and low equipment power factors also need to be properly managed," she tells *MechChem Africa*.

The Power Quality End User course covers the fundamental principles of power quality to introduce those involved in electrical systems to power quality; regional regulatory practices; the rights of users and the obligations of utilities; and the legal perspectives that protect users of electrical energy. "We also have an expert course in Power Quality that covers the application of power quality principles, which is aimed at delegates with electrical, mechanical or electro-mechanical backgrounds with field experience or relevant qualifications," Van Zyl notes.

As with all NCPC-SA expert courses, after the classroom-based theoretical training , the following 9-12 months requires each delegate to perform power quality assessments at his or her workplace and write and present an assessment report for the site. Progress is monitored on a monthly basis via online webinars, during which delegates report progress while being mentored by a facilitator.

The qualification is awarded following a short final written exam, with the candidate's plant report being assessed for evidence of proficiency.

Biogas Systems Optimisation courses

"Biogas is of particular importance to us at the NCPC, because it allows us to promote the generation of renewable, sustainable

The third new set of offerings consist of the CRSO End User and Expert courses, which are aimed at individuals involved with large industrial chiller and refrigeration systems.

energy in the form of biogas from biological waste, which embraces all the principles of the modern circular economy," continues Van Zyl.

South Africa's biogas origins can be traced back to a British pilot called John Fry who started a pig farm in South Africa after the second World War. Fry developed an anaerobic methane digester to help him to get rid of the 26 barrow-loads of pig manure he was having to dispose of every day. He was very successful. He generated methane biogas and used it to as fuel for a converted diesel power plant that directly powered the pumps on the farm and a generator.

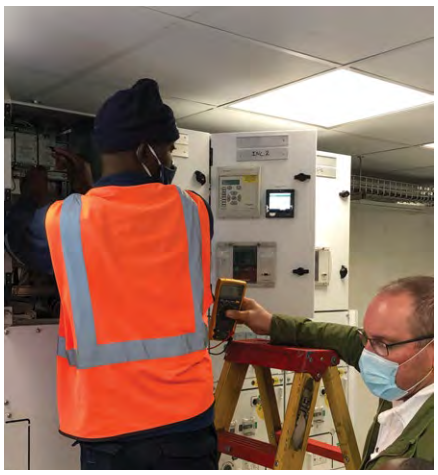
"As coal gets more difficult and expensive to mine, along with the pressure to reduce greenhouse gases, we have to look to other sources of energy," says Van Zyl, adding that in South Africa today, biogas has the potential to displace 2 500 MW of grid electricity, equivalent to the size of Eskom's Arnot coal-fired power station in Mpumalanga

She says that the country's agriculture sector generates some 40-million tonnes of biomass and organic waste every year, making circular biogas business opportunities far too big to ignore. In addition, according to the Southern African Biogas Industry Association (SABIA), this industry has the potential to create 30 000 jobs, reduce national greenhouse emissions by 2.0% and attract R50-billion in new investment.

There are currently two Biogas courses on offer from the NCPS-SA, the end-user course and an expert course. The two-day Biogas End User course is aimed at developers of small-scale biogas projects such as farmers that focus on animal husbandry or intensive horticulture; commercial and public businesses; eco-industrial parks and many more. Topics covered include the biochemistry and raw materials in biological waste; potential uses of biogas; the circular economy; project development; health, safety and environmental aspects; and how to operate a biogas plant. Successful completion of the Biogas End User course is an entry requirement for the Expert Course.

"The Biogas Expert Course is for professionals wishing to enter the field and, like most of our expert courses, takes place over a period of 9 to 12 months with four-days of classroom teaching at the start, followed by two days of practical, on-site training and demonstration. We then send candidates out for six months to develop practical projects, with regular support and contact from mentors," notes Van Zyl.

"The last module of the NCPC's biogas course is what we call 'the shark tank.' This is an opportunity for trainees to develop and pitch investment proposals for real-world biogas projects to investors. We invite financial institutions to analyse the risks and critique these business proposals and we also see this as an opportunity for the financial community to get acquainted with the opportunities that a South African biogas industry could offer," he explains.



Left: The NCPC-SA's Biogas Systems Optimisation courses promote the generation of biogas from biological waste, which embraces all the principles of the modern circular economy. Right: The new power quality field has become extremely important due to the addition of renewable energy plants to the energy mix.

CRSO: Cooling and Industrial Refrigeration System Optimisation

The third exciting new set of offerings consists of the CRSO End User and Expert courses, which are aimed at individuals involved with large industrial chiller and refrigeration systems. These individuals may be from industrial plants, they may be energy efficiency experts or even service providers or equipment vendors.

Many industries typically need these large chilling and refrigeration systems: food processing plants, breweries, vegetable farms and meat processing and packaging plants in the food and beverage industries, for example. The automotive industries and large commercial buildings such as shopping malls also use these systems, as do our underground mines.

Using the 'Systems Approach' candidates are trained to evaluate cooling and refrigeration (CR) systems; to model their performance using fundamental laws of physics, thermodynamics and heat transfer; and they are equipped to use best practice software tools such as Chiller and Refrigeration Scoping Tool (CRST), Chilled Water System Analysis Tool (CWSAT), CoolPac and 3EPlus, as well to develop load profiles and energy baselines for CR systems.

"The CWSAT software was originally developed by the University of Massachusetts Amherst and funded through the USDoE. The NCPC-SA was able to have the software updated and a metric version now being available with all the temperature data of major cities in Africa," Van Zyl reveals.

The course provides information on measurements required to manage CR systems, how to measure COP and to estimate the magnitude of specific losses in a CR system. The identification and prioritisation of opportunities in single unit and multi-unit systems, distribution systems (and their insulation) and end-use are all covered.

The use of different fluids such as refrigerants, water, oil and their inter-relationship and impact on the CR system is discussed together with the impacts of the Montreal and Kyoto Protocols, the Kigali amendment and other in-country regulations.

"Lastly the energy costs associated with the CR system are calculated and the primary economic impact of potential opportunities evaluated," Van Zyl adds.

The first CRSO Expert course will be delivered in November 2021 by the international expert Riyaz Papar and, like the others, starts-off with a four-day theoretical in-plant training session, followed by candidates performing assessments at their own plants and being mentored through online webinars with the facilitator.

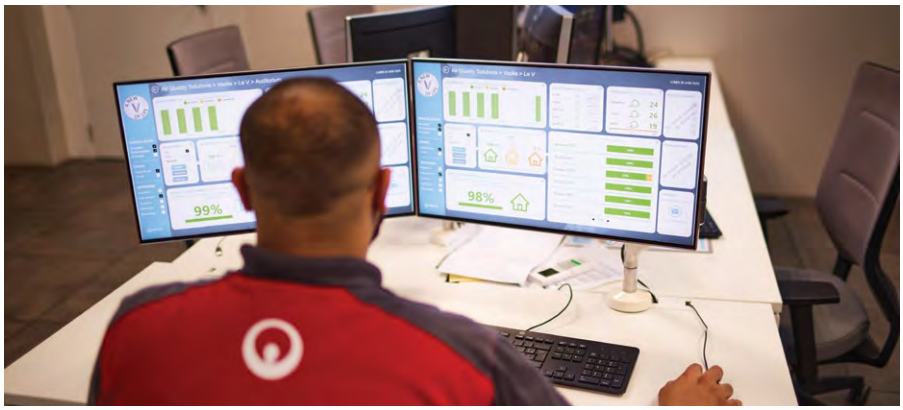
The process of applying for CPD accreditations for these new courses has begun and, because the NCPC-SA is ever proactive, plans are already in place for the development of further courses such as Hydrogen Technology, Industrial Water Efficiency, Solar Thermal Systems and Life Cycle Management.

Following the award winning success of the NCPC's Industrial Energy Efficiency Project, which helped industrial companies save 6.5 TWh of energy, the NCPS-SA continues to meet the demand for new professionals specialised in modern energy-efficient systems and resource optimisation. "These people are sure to be needed as South Africa and the world accelerate the transition to cleaner, carbon neutral and environmentally friendlier industrial practices," Van Zyl concludes.

www.csir.co.za/national-cleaner-production-centre-south-africa

Hubgrade: sustainable management of our natural resources

Veolia Environmental Services is introducing its Hubgrade digital platform, which combines human expertise and digital technology for operational and environmental efficiency. Hubgrade acts as both a facilitator and a tool for forecasting and decision making support as part of Veolia's continuous quality improvement process. Chris Braybrooke, the company's general manager for Marketing in South Africa, explains.



With the addition of Hubgrade, Veolia clients are able to concentrate on their core business and rely on Veolia's team of globally experienced professionals to operate and maintain their plants.

Our new Hubgrade platform is able to monitor the biology taking place in the digesters of municipal wastewater, optimising these processes so that water of discharge quality can be consistently produced. It can also monitor non-revenue water, leakages and track the quality of any water stream, be it for human consumption or industrial process use, begins Chris Braybrooke of Veolia Services Southern Africa.

For industrial process water, Hubgrade can alert plant managers to serious issues such as compliance and license to operate. In the mining sector, for example, spillages can cause the suspension of operations, significant losses of revenue as well as reputational loss, he says.

In the food and beverage industry, where waste streams are beneficiated for biogas generation as a source of fuel for heating or electricity production, the Hubgrade platform assists in optimising processes to deliver savings for clients, he continues. The platform also makes it possible for multi-site benchmarking in real-time, such as treatment plants required to deliver similar levels of water quality for potable use, discharge into rivers or for industrial processes, for example.

The platform is built around five key client requirements across market sectors: compliance; uptime; efficiency; sustainability and convenience:

- From a compliance perspective, traceability of the water quality at all times is a key principle. Service and maintenance history is also critical, along with alarm management and early warning systems, which are incorporated to help ensure quality compliance. Ultimately, this minimises risks and maintains a facility's license to operate, with the added assurance of remote and continuous monitoring.
- Uptime is about maintaining continuous production, which requires high plant equipment availability. Membrane monitoring, for example, is critical for a desalination plant. The idea is for the Hubgrade platform to proactively/predictively identify maintenance issues well before problems arise so that maintenance personnel can react quickly to targeted alarms sent via SMS or email. Remote troubleshooting and advice by our in-house Veolia teams are also offered to enable technicians to arrive on-site well prepared.
- Efficiency advantages come from the ability to continuously optimise plant parameter settings based on monitored key performance indicators (KPIs). It is also possible to benchmark operational efficiency across plants, so as to increase robustness and productivity. Other efficiency benefits arise from being able to safely delay Capex expenditure; savings on inspection and walkaround time for operators; multiple site management; automated reporting; easy access to support; and many more.
- Sustainability management comes from being able to quickly access data about water, energy and chemical consumption and to use this data to minimise waste and optimise production efficiencies. The platform enables Veolia specialists to extract reports on these issue, track long-term progress, perform benchmarking and identify lessons learned.
- Multiple convenience advantages also accrue: From a technical perspective, equipment parts lists, O&M validation documents, operation performance reports and commercial orders, for example, can all be centrally stored and accesses from anywhere. Order handling and service budgeting becomes transparent and globally visible across multiple sites. For maintenance personnel, Veolia's Hubgrade is also being uses as a repository for self-training videos on installation and maintenance procedures.

Necessities highlighted by COVID

All water and wastewater sectors are required to be fully operational at all times, with properly functioning maintenance services, whether this entails industry-specific employees being onsite or specialist contractors such as Veolia on standby. During the COVID-19 pandemic, certain risks became apparent: the non-availability of plant operators due to illness; or the lack of maintenance and support staff due to hard lockdowns being enforced. Such personnel shortages can quickly result in plant safety issues, the need to shut down or even plant failure.

A digital platform such as Hubgrade can mitigate many of these risks. Embedded predictive maintenance features such as targeted alerts along with logs of previous maintenance can help staff to make informed decisions on minimum needs. On the operational side, alarms can be divided into critical and non-critical ones to enable managers to take action quickly, appropriately and remotely.

Hubgrade can also help to deliver the specifically required technical support from

in-house specialists who might be incapacitated due to a pandemic. Communication with the clients and decisions affecting plant operations can be made remotely and as quickly as they can under normal conditions.

COVID has also led to the need for much more multitasking to cover for incapacitated staff. The skills and experience levels of plant operators and maintenance personnel, although extremely high, cannot cover the entire plant. Digital and remote assistance tools, however, such as those embedded in Hubgrade, can fill the gap, mitigating most of the risks.

Our Hubgrade platform consists of different service modules designed to suit different requirements. These range from basic data collection to a 24-hour support service from Veolia engineers. These options are embraced using the modules:

- CONNECT: which creates a continuous link between Veolia and clients, providing quick access to information and expertise.
- SUPPORT: which offers customised service support and advise to meet each customer's operational and strategic needs.
- IMPROVE: which strives to continuously improve the operational and environmental performance of a client's equipment and infrastructure.

For the success of any Hubgrade implementation, therefore, it imperative that clients discuss their exact requirements pertaining to the monitoring and operation of their plants so we can deploy the correct package for the application, says Braybrooke.

Customised profile based training

Once installed, any new plant fitted with Hubgrade and operational outputs, the platform is set up with the required elements as specified by the client. Different training is then given to personnel who have access to the platform, depending on the profile of the person in the organisation.

Braybrooke explains: Sometimes business managers want to see only performance data and critical alarms, whilst operational managers need to see reports on all aspects of a system's performance. So we tailor-make the training depending on what the profiles of the people are and their requirements for feedback from the platform. In total, eleven training courses are stored on the Hubgrade platform.

Overcoming SA's infrastructure challenges

South Africa's municipal waste and potable water production plants are mostly run down and dilapidated. Upgrades to such facilities are urgently required, as are capacity expansions. In addition, industrial water plants are all dependent on proper maintenance and upgrades as technology advances. Our older plants require retrofitment of equipment or new facilities need to be designed and constructed. Technology has improved, though, and most new Veolia plants have a footprint up to 75% smaller than older conventional plants. This includes membrane technology plants such as ultrafiltration for wastewater plants – our ACTIFLO clarification technologies can operate at rise rates of 100m/h compared to conventional plants that operate at only 3.0 m/h.

For industrial process water, Hubgrade can alert plant managers to serious issues such as compliance and license to operate.

The industrial wastewater treatment plant at ArcelorMittal in South Africa.

The Veolia Group has built up best practice data over a period of more than 160 years. It is fair to say, we have a wealth of experience in terms of operating and maintaining any type of water treatment plant. This empowers us to partner with a client in both the municipal and industrial sectors to ensure plant availability and performance excellence.

By using the best-practice methodologies of operation and optimising plant production, we remove the headache associated with budgeting, plant breakdowns and compliance failures for clients.

With the addition of Hubgrade, Veolia clients are able to concentrate on their core business and rely on Veolia's team of globally experienced professionals to operate and maintain their plants, ensuring that all of the performance KPIs, quality outcomes and compliance needs are continuously being met, notes Braybrooke.

For Veolia, although we have access to more than 350 different technologies, we are strongly committed to sustainable environmental practices and concrete action to assist our clients and shareholders to achieve their sustainable development commitments.

When designing a plant, sustainability must be the first consideration: process optimisation, energy reduction, waste valorisation, lowering the cost of production and affordability. The resulting plant will then be able to meet all of our physical, financial and environmental needs, long into the future.

We at Veolia know that digital is key. That's why it is essential to capitalise on Hubgrade, which offers unique solutions across all our business segments, ensuring improved visibility of operations and offering opportunities to improve the performance from this single digital platform, Braybrook concludes.

www.veolia.co.za

Quality, custom rubber hoses from Alrode facility

Weir Minerals Africa is a leading South African producer of high-quality rubber hoses that designs and builds mining hoses for customers, from 50 to 1 000 mm nominal bore and up to 10 m in length with up to 1 100 mm bends. A decade of investment and experience ensures high levels of manufacturing consistency in its custom-engineered products.

Yatheen Budhu, Weir Minerals product manager for rubber products, hose and spools.

As a leading South African producer of high-quality rubber hoses, Weir Minerals Africa designs and builds mining hoses for customers from 50 to 1 000 mm nominal bore, up to 10 m in length and with bends up to 1 100 mm.

"Our state-of-the-art manufacturing facility in Alrode, Gauteng, comprises advanced semi-automated processes to produce hard wall hoses, soft wall hoses and bends," says Yatheen Budhu, product manager for rubber products, hoses and spools at Weir Minerals Africa. "With a decade of investment in semi-automated building equipment and training, we can ensure high levels of safety, manufacturing consistency and quality in our custom-engineered products.

"The safety of our people is our number one priority, and the investment included system improvements in the hose building process to protect our employees from harm at all times," he says.

These hoses are designed to the specifications of customers around the world, using an option of Linatex®, Linard®, Linagard® and Linacure® abrasion-resistant internal wear liners. The hard wall mining hose is built for suction and discharge applications, with a heavy spring steel wire helix to cater for high dynamic loads. For discharge applications with no vacuum or suction that could collapse the hose, the soft wall mining hose is usually used as it allows for ease of movement and flexibility.

"Among the innovations we have introduced is a wear-indicator system, for critical applications where unexpected hose failure carries an unacceptable level of risk," says Budhu. "The wear-indicator system gives operators early warning of wear on the liner and allows proactive replacement to be planned and conducted." Weir Minerals Africa's world class local manufacturing capability gives a number of benefits to mining companies, he

The Weir Minerals state-of-the-art automated hose manufacturing facility in Alrode.

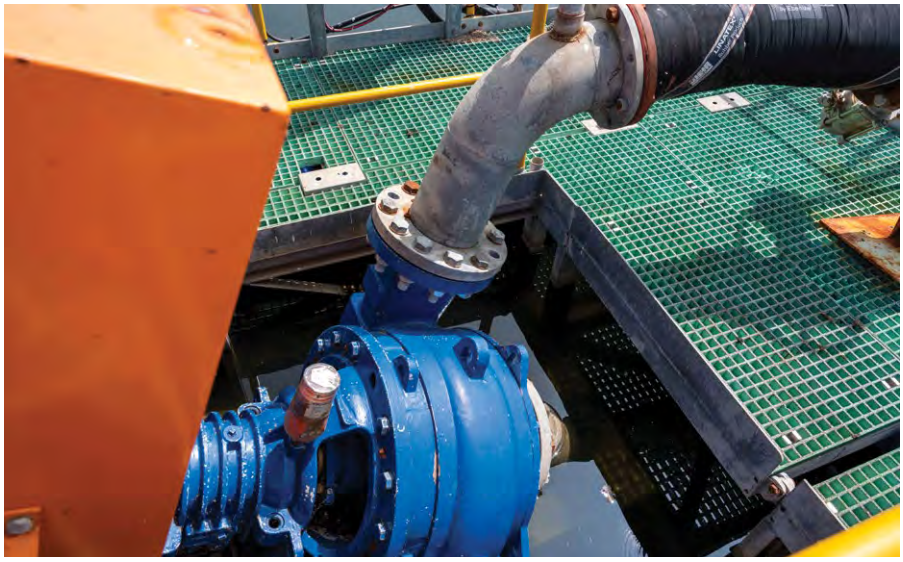
says. These include quicker lead times and a valuable contribution to Mining Charter compliance.

"Having our manufacturing facilities relatively close to our customers also facilitates our engineered-to-order approach," he says. "We spend time with customers whenever possible – through our comprehensive branch network – to understand their conditions and requirements."

For mines across the commodity spectrum, Weir Minerals' rubber hoses deliver long wear life in applications from the demanding conditions in mineral sands dredging operations to use for tailings, cyclone feed or thickener underflow.

"Our hoses must deal not only with abrasive materials, but also unexpected foreign objects in slurry, some of which may be sharp," he says. "Nonetheless, as an example, we have seen our hoses in mineral sands applications last up to seven years – considerably longer than most customers are used to."

Weir Minerals also manufactures related equipment such as flexible distance pieces to customer specifications instead of using normal bellows, notes Budhu. With its Linatex® wear liner, these items last considerably longer. In addition, they can be used to connect pipework that is not well aligned.



A Warman DWU dirty water pump with Linatex hose used for pumping process water.

Weir Minerals Africa has an extensive footprint across the continent to deliver efficient technical support for its range of rubber lined hoses. This technical experience, coupled with the premium quality liners and the consistency achieved through using the semi-automated manufacturing process gives customers the assurance of a well-engineered product for the application.

www.minerals.weir

Weir Minerals' Mill Circuit University

By giving its personnel the 'big picture' of minerals processing, the Weir Minerals Mill Circuit University ensures that customers benefit from a broader, solution-focused approach.

"Offering sustainable solutions to the minerals processing sector – rather than just products – needs insight and understanding of the operational context," says Teddy Malunga, Principal Process Engineer at Weir Minerals Africa. "The Mill Circuit University gives our customer-facing staff knowledge of the full circuit, as well as where our various products make their specific contributions."

This has become a vital aspect of the modern mining industry, as customers look increasingly for technology partners who can offer and support integrated solutions, says Malunga. He highlights that Weir Minerals Africa's comprehensive offering covers processing stages from crushing, grinding, classification, separation and rubber lining to slurry transportation, mine dewatering systems and tailings management.

"The Mill Circuit University ensures that we all grasp the full range of minerals processing fundamentals in addition to our particular product specialisations," he says. "This allows us to understand the client's processes better, and collaborate more easily across our own process, CIP, engineering, supply chain and projects departments."

Holding five-day courses three times a year, the Weir Minerals Mill Circuit University in the Africa and Middle East region enrols about 25 candidates per course. They learn from both internal and external presenters, and are familiarised with plant processes and Weir Minerals products.

Weir Minerals' Mill Circuit University gives customer-facing staff full knowledge of the products in a mill circuit.

The involvement of the University of Pretoria in the minerals processing component of the course adds a special value, including the award of continuous professional development (CPD) points. Course attendees also benefit from a visit to the university's Department of Material Science and Metallurgical Engineering, which provides more practical insights.

"We also see the value in sharing a range of 'soft skills' in our courses," he says. "This includes communication skills, neuro-linguistic programming and relationship building."

An important aspect of the course is to empower Weir Minerals Africa personnel to understand the needs of customers more clearly and focus on their key performance indicators (KPI) such as plant availability, throughput and recoveries. These factors are then included in the process of identifying the appropriate products and designing solutions that meet the sustainability needs of its clients.

www.minerals.weir

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VEOLIA

To process dam operators: desilt as soon as possible

Integrated Pump Rental has issued a dire warning to operators of water storage and process dams to make sure that their process dams are desilted as soon as possible so that they are ready to accept additional rainwater. Managing director, Lee Vine, explains.

As the rainy season approaches, Integrated Pump Rental has issued a warning to operators of water storage and process dams to desilt these as soon as possible. Progressive build-up of silt over time would have caused many of these facilities to reach close to critical volume and excessive rainwater could have major implications.

Lee Vine says that the progressive build-up of silt over time would have caused many of these facilities to reach close to critical volume and excessive rainwater could have major implications. "While it is critical to ensure that water storage dams, settlement ponds and similar reservoirs are kept at their required storage volumes at all times, it is just as important to regularly clean and desilt these to avoid any environmental occurrences should these facilities become overfull due to heavy rainfall," Vine explains.

He says that increased demand has already been seen for the company's innovative and effective SlurrySucker desilting solution with many operators becoming more proactive than in previous years. This applies across a range of industry sectors where water is stored either for recycling or as part of the process, such as in settlement ponds.

He is quick, however, to point out that while desilting or cleaning of settlement ponds may seem like a simple task, it is not always as straightforward as it would initially appear. Cleaning these facilities can become an onerous task, as it involves the pumping of high solids materials from the facility being desilted and should an incorrect system or equipment that is not fit for the task be specified this can cause issues including environmental harm.

"Historically, many operations have used manual excavation methods for desilting and cleaning, but our established track record with proven references has proved that this is not only inefficient, but it often fails to remove the required volume of sediment," he says.

There are several ways to accomplish effective desilting, but it has to be done effectively and cost efficiently, and this is where Integrated Pump Rental's skilled and experience team come into play. The best option, according to Vine, is a site visit to assess the application requirements and conditions.

"In some instances, it is possible to pump the high solids material to another nearby dam or reservoir. However, this is sometimes not possible and in this type of scenario we implement an alternate solution such as capturing and storing the content in specialised geotextile bags while the water is separated from the solid material," he explains.

Once the actual condition of the dam or pond has been assessed, the decision can be made as how to proceed. The SlurrySucker itself needs sufficient volume of water on which it can be floated, and should there be areas where this is not possible, then a hydro-mining solution is applied to these drier areas.

The SlurrySucker is equipped with a high performance pump capable of moving high solids volumes so it can dredge quickly and cost effectively over the full area. Where necessary, monitoring guns are used to blast the drier slurry towards the discharge point.

In addition, specialised pumps with chopper blades can also be deployed in instances where required. An example would be where dislodged reeds or other plant materials are present in the dam.

Locally engineered and manufactured by Integrated Pump Rental, the SlurrySucker is designed to deal with a range of high solids material including coal slurry, general silt and sand.

In conclusion, Vine says that opting for the SlurrySucker option is also far safer as the barge itself can be operated remotely from a defined distance away from the dam or pond edge. This is much safer than having equipment and personnel on the dam.

www.pumprental.co.za

Left: The SlurrySucker, which is equipped with a high performance slurry pump, is an innovative, safe and effective desilting solution. Right: The SlurrySucker can be equipped with specialised pumps with chopper blades for areas where plant material is present.

Rexnord: for fitting convenience and superior performance

Following the release of SN 500-compatible Rexnord RN series bearings into South Africa by Bearings International (BI) *MechChem Africa* talks to Lingesh Naidoo about the Rexnord brand and its niche advantages.

The new Rexnord RN series of metric bearings from BI is ideal for arduous, demanding applications.

The current Rexnord product manager for Bearings International, Lingesh Naidoo, began his career some 28 years ago in the Technical Department at Bearings International.

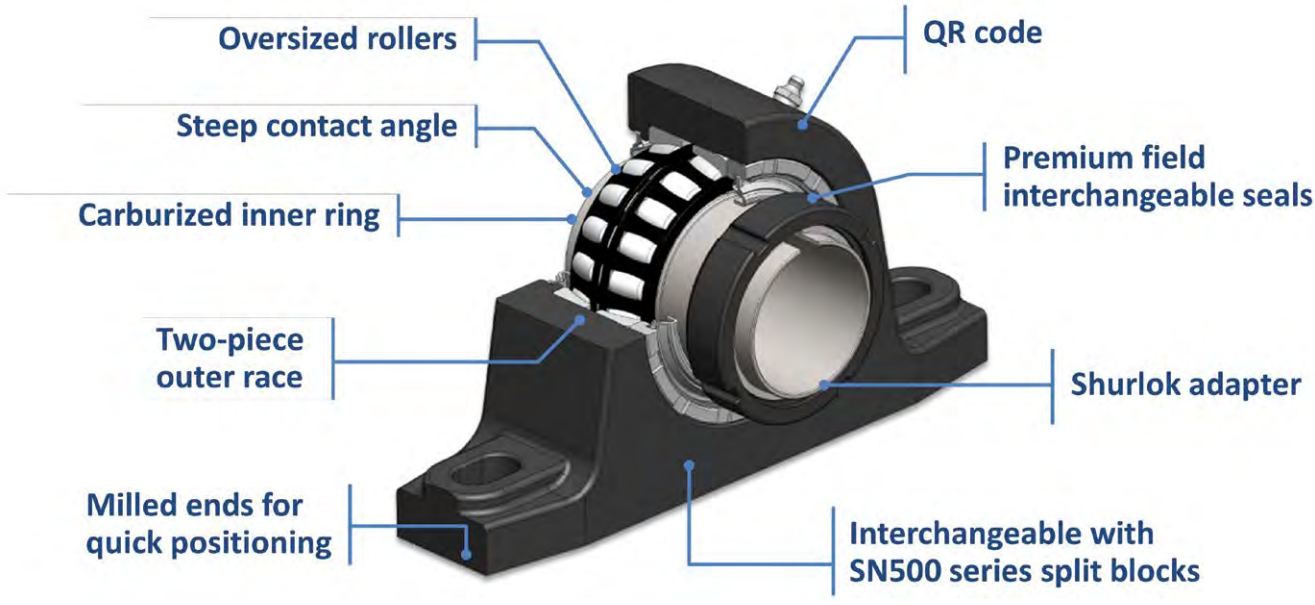
In 1998, BI acquired LBA Transmissions, which at the time was the authorised agent for the Rexnord/LinkBelt bearing range, and Lingesh Naidoo was tasked with the move of the engineering workshop from LBA to BI's premises. "BI sent me on a 30-month course in Mechanical Engineering through Johannesburg University, which I completed in 2005," says Naidoo. "I then moved to a sales and technical management role for a sister company, Arrow Bearings, and from there I spent some time as the INA/FAG specialist for the Eastern Region, before taking over as manager of BI's Witbank branch," he tells *MechChem Africa*.

"But the Rexnord bearing product range has always been my favourite, so when the Rexnord Product Manager post at BI's Parkhaven headquarters became available in April of 2019, I could not miss the opportunity to take on the product again," he continues.

Outlining the Rexnord product offering from BI, Naidoo says that the company has long been a specialist in flat top chains, more specifically, TableTop and MatTop Chain and associated conveyor products, which are still currently available from BI sister company, Brutech. Other Rexnord products supported by BI in South Africa include REX Omega, Viva and Rapflex Couplings, with the new REX CentaFlex Couplings being added soon. "Most notably, though, we carry the full range of Rexnord bearing products: ball bearing units specialised for the food and beverage industries; cylindrical roller bearings for industrial gearboxes; and the unitised bearing ranges, which include the new Rexnord RN series of spherical roller bearings and plummer blocks," he notes.

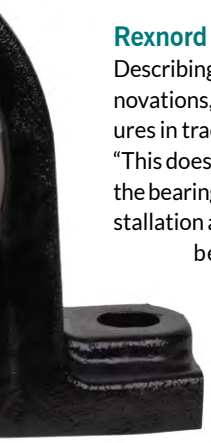
"Through various shaft locking innovations, Rexnord bearings are renowned for easy on, easy off mounting and dismounting. Also, though, the bearings are purpose-designed to deliver superior performance under extreme operating conditions," Naidoo continues. "The Rexnord brand has proven itself in several industries where opposition or standard plummer block bearings just cannot handle the harsh environments such as in smelters, aggregates, crushers and conveyors applications in all industries, to name a few."

Citing a success in ash conditioners for crushing partly burned coal, he notes that the crushers operate in a sump, where random and sometimes frequent flooding is likely to occur. "When these sumps flood, the bearings become submerged by about 1.5 m of a highly



A summary of some of the unique advantages offered by the new Rexnord RN bearing range.

abrasive mixture of water, ash, coal and other contaminants. We have introduced Rexnord solid-housed plummer blocks with Rexnord's unique sealing arrangement into this application and, in terms of operating hours, these have outperformed the bearings we replaced by about 80%," he says.



Rexnord fitting advantages

Describing the advantages of shaft locking innovations, he says that a leading cause of failures in traditional bearings is contamination. "This does not only occur during operation of the bearing and seal failure, but also during installation and initial grease fill. With Rexnord bearings, which are completely sealed, pre-greased, shaft ready, easy to fit solid units, there is no chance of contamination occurring during installation," Naidoo explains.

"Fitting a traditional bearing really needs to be done by a specialist with a technical background. The bearing has to be carefully and accurately tightened to achieve the correct internal clearances required. This is an art, which depends on the fitter's skill and, on an off-day, is easy to get wrong. Rexnord's unitised bearings come shaft ready with various locking mechanisms: grub screws and spring locking mechanisms, for example, that make fitting easy and risk free. They take away all of the guesswork involved.

Sleeve mount versions are also available, and do not require the use of a feeler gauge. The bearings are simply slid onto the shaft and the Lock Nut is rotated by a specified amount to get the correct tightness. "So a pre-sealed and shaft ready bearing unit simply needs to be slid onto the shaft and locked on using either a few grub screws or a Lock Nut. This makes adjusting or refitting the bearing just as easy," Naidoo explains.

Rexnord has carried this idea through to higher load self-aligning and axial (thrust) bearing designs. On traditional tapered sleeve adapters for roller bearings, for example, the bearing clearance is achieved by pushing the bearing up the sleeve when tightening the locknut, which tightens the adapter sleeve onto the shaft while expanding the inner ring of the bearing.

But when the locknut is loosened, nothing happens because the nut is not connected to the sleeve, so it cannot 'break' the mating tapered surfaces between the bearing and sleeve. This often results in having to cut the bearing off with a torch or cut-off wheel, which is time consuming and can create equipment damage.

When tightening the nut, the RN Series Shurlok does the opposite of a traditional tapered adapter and pushes the sleeve into the bore of the bearing, rather than pushing the bearing onto the sleeve. The sleeve and locknut are connected, so when loosening the locknut, the sleeve is drawn out of the inner ring, breaking the taper. Also, the Shurlok design rotates the inner ring of the bearing in one direction and the locknut and sleeve in the other direction, which further helps to break the taper.

Naidoo cites two more prominent fitting features: field interchangeability of the seal and field internal clearance adjustment. "Seals can be changed in the field: from a labyrinth seal for higher speed application to a Buna heavy duty spring loaded seal for extreme applications, for example. These bearing seals can be replaced during maintenance shutdown intervals," he says, adding, "in rare cases and if necessary, when abnormally high temperatures are being seen, for example, the internal clearance of Rexnord bearings can also be adjusted in the field by end-users."

Rexnord capacity advantages

"The most obvious technical superiority Rexnord has over opposition bearings is the ability to over-size the rolling elements due to the unique two-piece outer ring design. This unique-to-Rexnord feature of spherical roller bearings allows for an industry-leading steeper contact angle of up to 28° compared to one piece standard outer rings, where 17° is the norm," Naidoo explains. This allows for much larger axial load carrying capacity compared to other spherical roller bearing brands. In addition, Rexnord RN bearings, for example, allow for an industry leading misalignment capability of 4°, that is, 2° either side of the centreline.

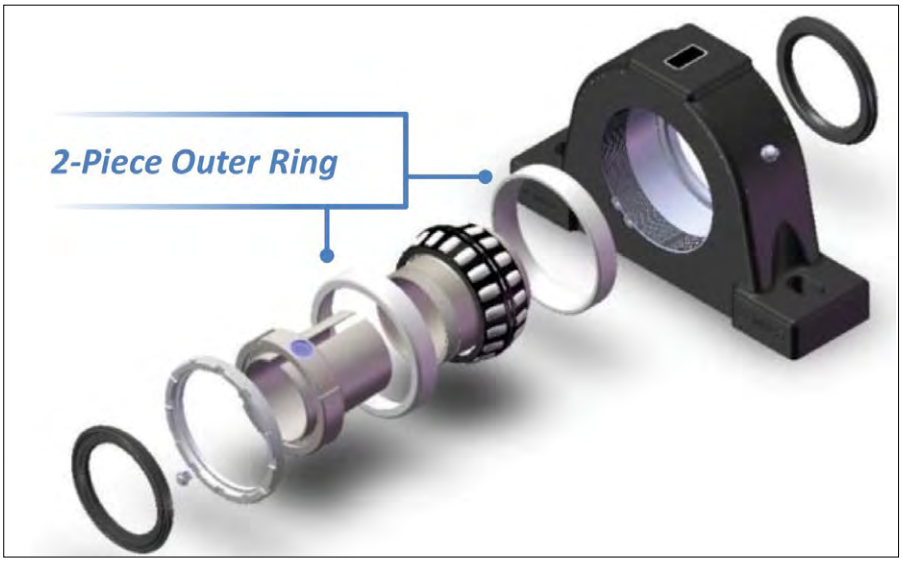
Because the Rexnord Spherical Roller bearing's outer dimensions and width are not restricted by a one-piece, one-size outer ring Rexnord has more flexibility with respect to the size of rolling elements and therefore, the load carrying capacity of the bearing.

On the new 50 mm Rexnord RN series bearing, the two-piece outer ring has enabled Rexnord to introduce rolling elements that have a 19% greater surface contact area than standard (22210) spherical roller bearings. This translates into a higher dynamic radial and axial load carrying capacity, which is further improved by including a case-carburised inner ring to cater for higher impact loading.

Talking directly about the new Rexnord RN series spherical roller bearings, he says that after 80 years of experience in the development of bearing technology based on US sizes and standards, the RN series is based on ISO SN 500, which is fully metric. "In South Africa, we have had to manufacture metric-sized housings to accommodate the US Rexnord bearing inserts. The new Rexnord RN series is fully metric and comes with standard SN 500 plummer block dimensions, so they are 100% compatible with OEM equipment built outside the US," he tells *MechChem Africa.*

Available for shaft sizes from 35 mm to 125 mm, this widens availability of the Rexnord premium bearing solution, while enabling BI to shorten lead times and improve stockholding.

"Rexnord bearings provide superior convenience, performance and value because of their better design features, which include a greater contact angle, more robust shoulders, more contact surface, field interchangeable seals and clearances and many other advanced features that distinguish them from other roller bearing products. And, with the introduction of the new Rexnord RN series plummer blocks, these advantages are all now available in a standard SN 500 series unitised package," he concludes. ❑



The unique two-piece outer ring design of the Rexnord RN spherical roller bearings allows for an industry-leading contact angle of up to 28°.

Sealed chains for the harshest environments

BMG's extensive range of Tsubaki high performance chains comprises engineering class SJ3 sealed joint chains, with improved sealing technology designed to improve the reliability of mechanical components exposed to harsh environments.

"An important feature of the Tsubaki SJ3 series, is that extended bushing barrier seals prevent abrasive materials from entering and attacking chain joints, thus reducing wear and extending the service life of chains," explains Gavin Kirsten, Tsubaki product manager at BMG. "Tsubaki's patented SJ3 labyrinth structure keeps each pin and bushing assembly free and clear of contaminants. This multi-seal combination inhibits fine particulates from entering critical bearing areas.

"The Tsubaki SJ3 design comprises three distinct seals. Although independent of one another, the seals complement each other to provide secure bushing and pin protection. The first seal is an industry standard extended bushing, that limits the clearance between the ends of the bushings and the mating sidebars. This provides a highly effective first layer of protection.

"The second seal is a polymer face seal placed around the extended bushings. These are available in various performance materials and can withstand temperatures up to 204 °C. The final seal is a patented labyrinth seal that inhibits any remaining fine particles from entering the critical bearing area. The labyrinth is formed by a stainless steel ring attached to the pin, which rotates freely in a finely crafted groove in the bushing."

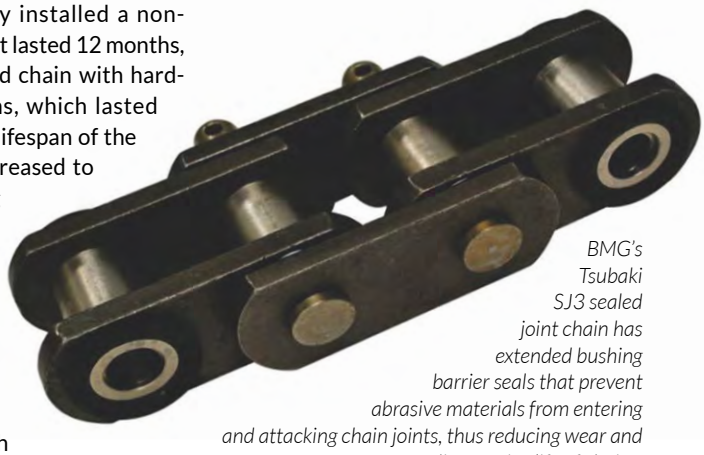
BMG's durable Tsubaki SJ3 series, has been designed for dependable operation in harsh environments, including mining, cement, paper, sugar, grain and asphalt applications.

Successful installations of Tsubaki's SJ3 technology include a synthetic gypsum feeder breaker, where the user was struggling to get more than four months of use from an OEM-installed chain. Since the installation of SJ3 chain with stainless steel pins, service life of chain has extended to more than 36 months.

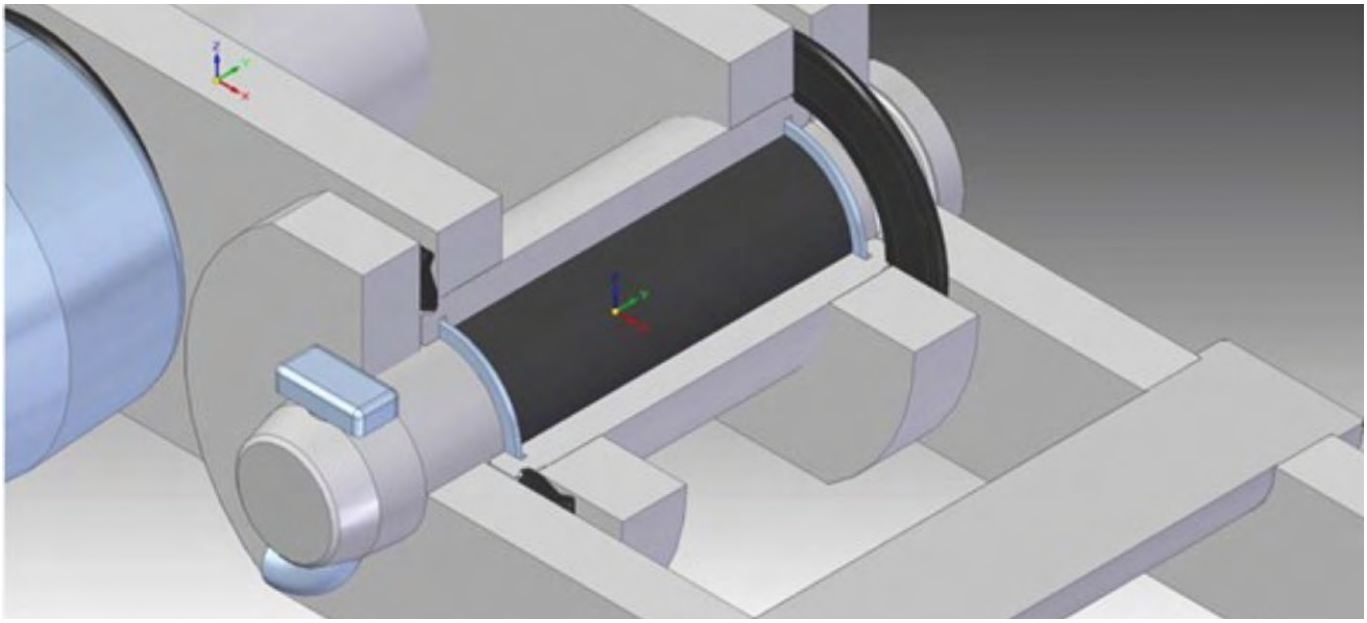
Another customer using a carbon coke bucket elevator initially installed a non-sealed elevator chain that lasted 12 months, followed by a non-sealed chain with hardened stainless steel pins, which lasted double that period. The lifespan of the chain on this system increased to 56 months after installing a Tsubaki SJ3 chain. Also, the chain of a potash feeder, with packed joints that kinked and eventually failed, was replaced with a Tsubaki SJ3 chain with stainless steel pins, which trebled component life for the feeder, and in a fly ash bucket elevator, standard elevator chain lasted approximately 12 months, while the service life of the chain increased to more than 36 months after the installation of Tsubaki SJ3 chain.

BMG's total plant management solutions encompass a technical advisory service on correct chain selection – a critical factor in any power transmission system. The complete range of Tsubaki power transmission components is available from BMG's national branch network, which offers a 24-hour back-up service.

www.bmgworld.net



BMG's Tsubaki SJ3 sealed joint chain has extended bushing barrier seals that prevent abrasive materials from entering and attacking chain joints, thus reducing wear and extending service life of chains.



Tsubaki SJ3 chain is protected by three distinct seals: Industry standard extended bushing; a polymer face seal placed around the extended bushings; and a patented labyrinth seal.

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Optimising mill circuits for best efficiency impact

Decades of product evolution have given FLSmidth a range of solutions – including its LoadIQ smart sensor technology – to supply and optimise all the technology in grinding circuits.

According to Terence Osborn, director for the regional product line and key account manager at FLSmidth, grinding typically accounts for about a 30% of the operational cost of a concentrator plant. Energy, liners and grinding media are among the many elements that make up this substantial cost. In addition, the milling circuit as a whole consumes about 50% of the concentrator plant's power demand.

"Any improvements, however small, that a mine can make in the efficiency of milling and grinding can therefore have significant financial benefit," says Osborn. "This is why FLSmidth has compiled an enviable portfolio of technical hardware and software serving the comminution space."

Left: Heavy duty FLSmidth MillMAX slurry pump purpose-designed for abrasive mill discharge pumping applications with grinding circuits. Right: A Field SmartCyclone user interface unit, which allows for operator intervention when poor cyclone performance is detected, allowing for optimised cyclone classification in a milling circuit.

This full suite of equipment allows FLSmidth to design the most efficient grinding circuits. In addition to semi-autogenous and autogenous grinding mills, the company's offering includes a wide range of slurry pumps and cyclones. For optimal performance, its SmartCyclone™ technologies automate the monitoring and control of cyclones, providing real-time data on key indicators such as spigot wear and roping. He highlights that integrating the performance of all aspects of the circuit is vital to the company's value-add proposition.

An important recent step in this process was the acquisition of technology company KnowledgeScape, which places FLSmidth in a leading position to offer a plant-wide digital optimisation solution. This capability enables customers to reduce operational costs and environmental impact across the entire minerals processing flowsheet. "Among the new solutions acquired is LoadIQ, for monitoring and optimising the performance of semi-autogenous (SAG) mills," he says. "The SAG mill is a key element of many milling circuits

An FLSmidth wireless LoadIQ system installed on a mill shell, from which it gathers mechanical and operational data for enhanced decision making on the mill performance.

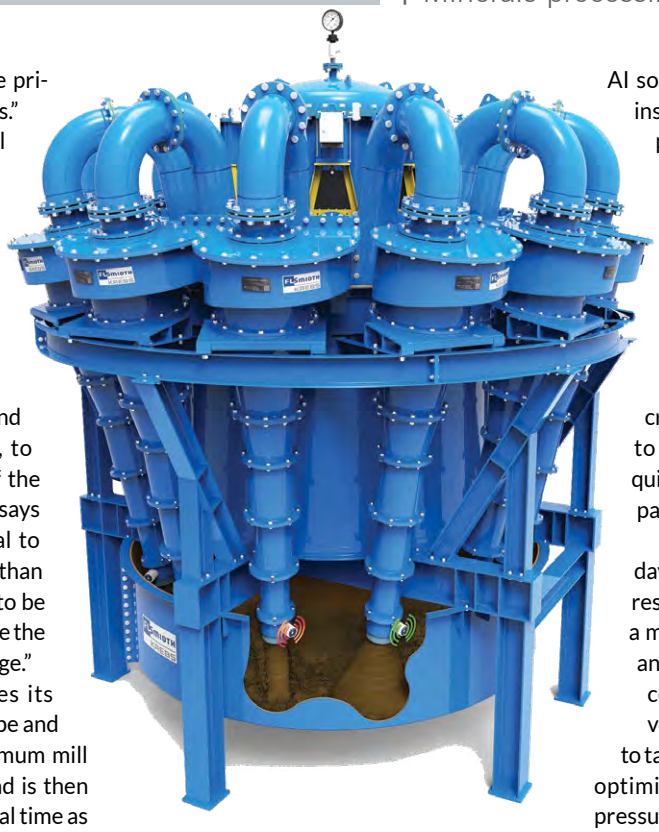
today, usually located between the primary crushing and ball milling phases."

LoadIQ utilises FLSmidth's mill scanner smart sensor technology to accurately measure volumetric filling and ore trajectory in real-time, according to Lineshan Naidoo, FLSmidth's regional product line manager for digitalisation for sub-Saharan Africa, Middle East and South Africa.

"The unit measures vibration and impact among other parameters, to ensure the optimal 'cataracting' of the media and particles inside the mill," says Naidoo. "It is vital for the material to cataract onto the charge toe rather than onto the liners. This allows energy to be optimised to promote breakage while the liners remain protected by the charge."

The technology then combines its readings with data about the ore type and liner profile to determine the optimum mill load and mill speed. The target load is then set automatically and adjusted in real time as grinding conditions change.

He highlights that LoadIQ has seen global success with about 60 units installed to date, mainly in the Americas. Customers using this solution have typically experienced mill throughput increases of 3% to 6%, with some customers benefiting from over 10% increases in tonnage. These values vary based on a number of parameters such as ore characteristics and grinding circuit configuration.

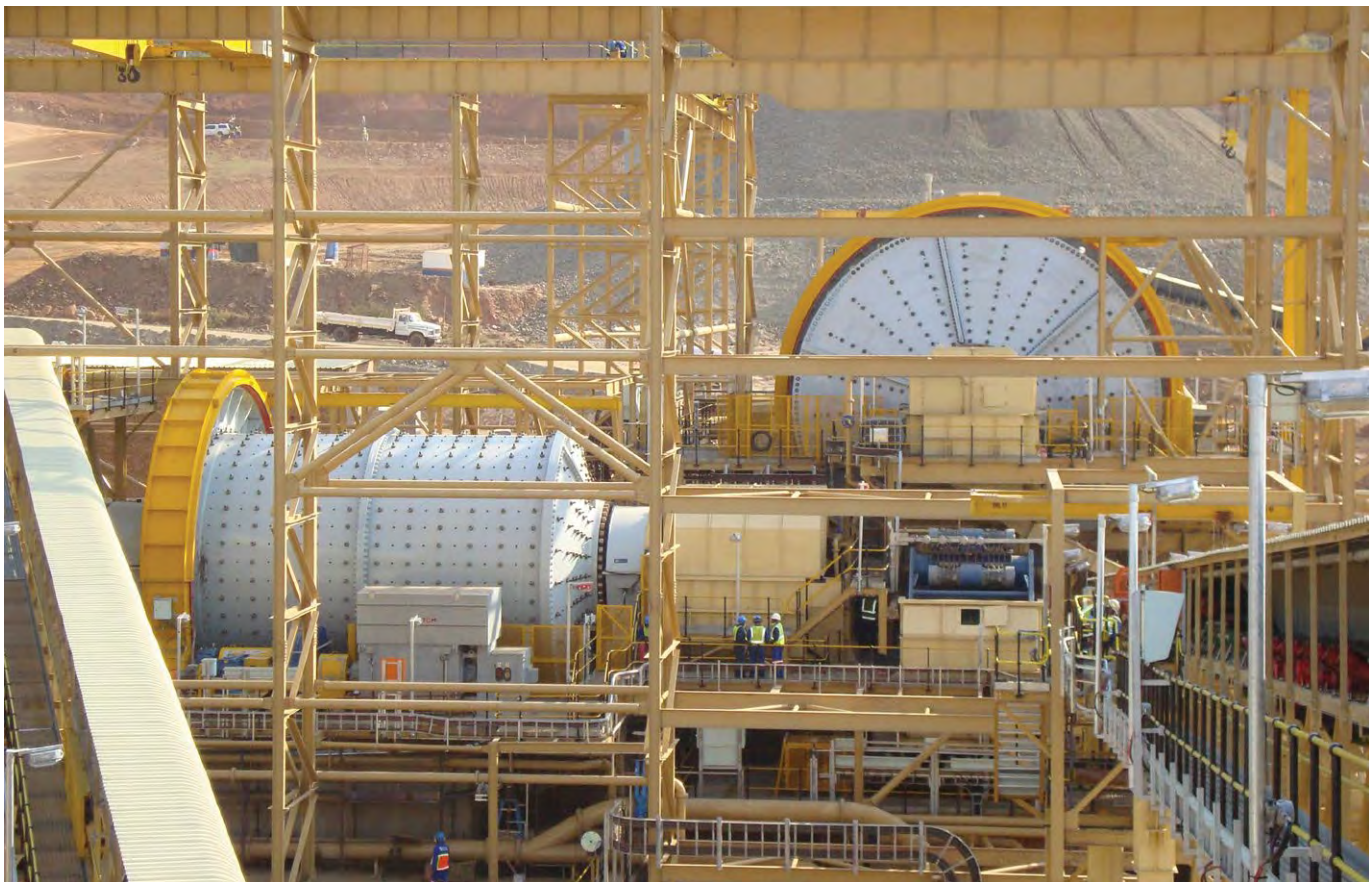


A FLSmidth classification cyclone cluster used in grinding mill circuits showing the implementation of the SmartCyclone system to detect cyclone roping and wear online.

Mines can also optimise mill load using a system of smart sensor technology and AI software. In South Africa, FLSmidth is installing LoadIQ in a leading platinum producer's plant, where the strategic focus is on generating and analysing data for better decision making and prompt action. Osborn notes that the delay between data generation and the required decisions remains a real challenge in most process plants and technologies such as the LoadIQ are targeted at making more critical decision-making data available to the plant operation team enabling quicker adaption to changing operational parameters in as agile a way as possible.

"Process samples can take up to days to be analysed, while the material's residence time in the plant may only be a matter of hours," he says. "By the time any adjustment can be made to the process based on the data, considerable volumes of value mineral has been lost to tailings." FLSmidth's solutions therefore optimise key parameters such as bearing pressure, material density and power consumption in a continuous manner. He says the ECS/ProcessExpert software is able to make plant adjustment decisions consistently and accurately, and without fatigue. A South African nickel mine has been among the customers gaining high levels of success with this solution.

www.flsmidth.com



FLSmidth designed and supplied the AG/SAG and ball mill operating in a nickel and PGM comminution circuit.

New presses for Multotec Rubber

Responding to the rising demand, Multotec has added two new rubber vulcanisation presses at its extensive local manufacturing facility in Spartan, Gauteng, raising quality levels while reducing lead times for customers.

The new addition of two modern rubber vulcanisation presses at Multotec's Spartan manufacturing facility have improved the production capacity of the facility as well as the dimensional capability in the production of lifter bars, shell plates, head plates and grate plates for mill linings.

According to Thando Makhoba, managing director of Multotec Rubber, the new hydraulic presses have larger daylight openings to accommodate higher throughput and larger sized products.

One of the new presses, the largest yet installed by Multotec, is among the largest in South Africa's wear lining industry. With a 2.7 m long platen size, it is 1.9 m wide, boasts a 1.1 m daylight opening and a press with a 3 600 t load capacity. "This enables us to produce lifter bars up to 400 mm wide, with advanced human-machine interface (HMI) software and a locally developed PLC control system," says Makhoba. "It also means we can improve our production rates, so that we reduce the lead time on these items for customers."

He highlights the safety benefits of the new units, with the HMI hardware and software allowing operators to have less physical engagement with the machines during production. Adding to efficiency on one of the presses are two stripping tables: one directly in front of the press to pull the mould out of the daylight opening; and a side stripping table to pull out the first mould to make space for the second. This allows semi-automated loading and unloading, further accelerating the process.

Technical manager at Multotec Rubber, Waldo Verster, says the new presses allow Multotec to press more units per cycle, with one press capable of pressing between seven and 14 lifter bars at a time. "These presses also improve our ability to service the demand for integrated liners, allowing us to integrate up to two lifter bars and two shell plates – or two lifter bars and two head plates – into a single liner," says Verster.

"For the customer, these integrated liners are quicker to install, so they reduce mill relining time. And they are also safer, as they can be installed by a mill liner handler operated from outside the mill."

A further opportunity for the new equipment is the market demand for larger lifter bars, as few companies can produce lifter bars measuring 400 mm wide and 350 mm high. Makhoba notes that the installations demonstrate Multotec's commitment to taking a technological lead in its sector, to optimise the operations of its customers.

"This also allows us to deliver high local content in our products, in line with the aims of the Mining Charter," he says. "To the best of our knowledge, we are the only mill lining supplier in the country with a local content certification from the South African Bureau of Standards."

Top: Thando Makhoba, Managing Director at Multotec Rubber. Bottom: Waldo Verster, Technical Manager at Multotec Rubber.

www.multotec.com

With a 2.7 m long platen size, the largest of the two presses is 1.9 m wide, boasts a 1.1 m daylight opening and a load capacity of 3 600 t.

Afrisam upgrades crushing technology with Metso C120

AfriSam will be installing a Metso C120 jaw crusher supplied by South African distributor Pilot Crushtec with the investment indicating the company's confidence in the future, and its commitment to quality production standards.

A rendered CAD model of a complete Metso C120 primary jaw module complete with grizzly feeder, skid structure and take-out conveyor.

Leveraging new-generation crushing technology to optimise uptime at its Pietermaritzburg quarry, AfriSam will be installing a Metso C120 jaw crusher supplied by South African distributor Pilot Crushtec.

According to Glenn Johnson, general manager for construction materials' operations at AfriSam, the investment indicates the company's confidence in the future, and its commitment to quality production standards.

"Staying abreast of available technology is important in advancing our efforts to enhance our supply security and product quality, while targeting certain aggregate products demanded by the market," says Johnson. "The C120 crusher is part of a broader technical investment at our Pietermaritzburg plant aimed at underpinning reliability of supply for customers."

AfriSam's facility in Pietermaritzburg provides a diverse portfolio of aggregate products that are suitable for readymix, asphalt, the civils and road building sector as well as for concrete product manufacturers in the construction sector. Its output is currently vital to key infrastructural improvements in the area, such as the upgrades to the N3 highway south to Durban and north towards Johannesburg.

He highlights that the high vibration impact of primary jaw crushers disseminated onto the associated designed fabricated sub-structures or concrete foundations have long been a significant structural integrity challenge for many aggregate quarries, and he expects the new C120 crusher's design and dampening technology to help AfriSam mitigate this risk.

"A key consideration in choosing the Metso C120 was its proven self-dampening concept," he says. "This will help us move away from the risks and challenges related to costly civil engineering works that were previously required to create a fixed base for the crusher."

Theolan Govender, AfriSam's national engineering manager, says the advantage of the Metso C120 is that the current design of the crusher incorporates a retro-fitted self-dampening system that drastically reduces the associated effects of dynamic and static loading onto these structures and associated foundations. This reduces the effects and consequences of under-structure or foundation failures.

"It further reduces the need for complex

A new Metso C120 primary jaw crushing module installed with a retaining wall.

under-structures professionally designed by consultants and the ill-effects of triggering professional indemnity on failures. Pilot Crushtec includes an additional five year/10 000 hour warranty on the sale of this product, which is an added benefit when compared to its competitors," says Govender.

According to Sampie Kruth, AfriSam engineering manager for KwaZulu-Natal, the plant needed a proven solution to ensure that the crusher's dynamic forces would not damage the sub-structure.

"Many equipment suppliers in this field are developing their concepts in this direction; however, Metso is one of the few companies that already has tried-and-tested models available in the market" says Kruth.

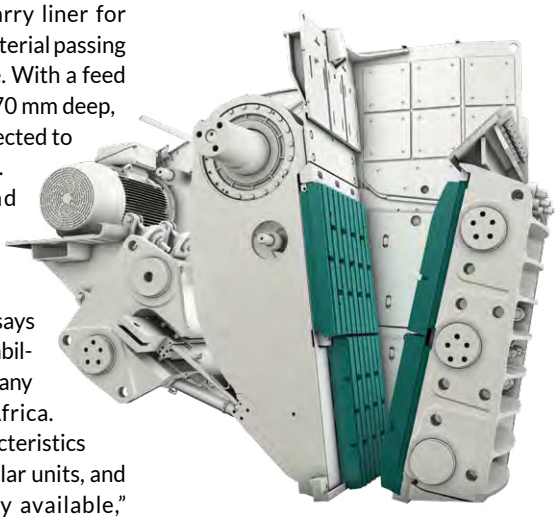
AfriSam regards health and safety as a key priority and in line with its protocols relating to equipment safety, the Metso C120 has an hydraulically adjusted gap setting, allowing for safe and easy adjustment. Further, the jaw liners also have their own hooking points to facilitate liner changes, reducing the practice of adding welding lugs for removal.

Working closely with Pilot Crushtec on the specifications, AfriSam will also be applying a specific designed quarry liner for better continuous grading of material passing through the first crushing stage. With a feed size opening of 1.2 m wide by 870 mm deep, the crusher's throughput is expected to range between 200 and 300 t/h.

Pilot Crushtec Sales and Marketing Director Francois Marais notes that the Metso C120 is one of the most widely sold jaw crushers globally, and says that, being well known for its reliability and performance, there are many units operating in southern Africa. "Their robust and rugged characteristics make this one of our most popular units, and replacement parts are readily available," says Marais.

The order also marks another step in the company's partnership with AfriSam, with Pilot Crushtec playing an important role in providing OEM-quality support and maintenance.

www.pilotcrushtec.com



The C120 crusher height gives the steepest possible cavity cross-section, and the nip angle high up in the cavity, together with an aggressive well-aligned stroke at the bottom, ensuring high throughput capacity.

Sasol and UCT collaborate to produce green jet fuel

Sasol and UCT researchers are collaborating on the use of commercial iron catalysts to convert hydrogen and CO_2 into green jet fuel and chemicals.

A team of researchers from Sasol and the Catalysis Institute at the University of Cape Town (UCT) has made advancements in the use of commercial iron catalyst, produced cheaply and at large scale at Sasol's Secunda plant, which enable conversion of unavoidable or biogenically-derived carbon dioxide (CO_2) and green hydrogen directly to a variety of green chemicals and jet fuel. This development is a significant step towards the implementation of CO_2 hydrogenation technology in South Africa. For decades, Sasol has been using its Fischer Tropsch (FT) technology to convert low-grade coal and gas into synthetic fuels and chemicals. The largest scale example of the commercial application of this technology is its Secunda plant in Mpumalanga, which converts synthesis gas – a mixture of carbon monoxide (CO) and hydrogen (H_2) – derived from coal gasification and supplemented by reformed natural gas into 160 000 bbl of products per day.

Sasol Research & Technology in collaboration with the University of Cape Town (UCT) is using commercial iron catalyst for the conversion of CO_2 and green hydrogen into green chemicals and jet fuel.

With its announced intention to leverage its existing FT technology and skillset to lead the development of South Africa's hydrogen economy, Sasol and UCT have been working on finding innovative ways to use this chemistry to convert CO_2 and hydrogen into a range of useful and green products. Now they have.

"Conversion of green hydrogen together with CO_2, a process called CO_2 hydrogenation, is gaining significant interest worldwide and is a promising way to produce sustainable aviation fuels and chemicals that have a significantly lower carbon footprint," says Cathy Dwyer, vice president for Science Research at Sasol Research & Technology.

The collaboration with UCT has revealed that Sasol's iron catalyst can achieve CO_2 conversions greater than 40%, producing ethylene and light olefins that can be used as chemical feedstocks, with significant quantities of kerosene-range hydrocarbons (jet fuel).

There are two ways to convert CO_2 into a useful range of products using FT chemistry. In the indirect pathway, CO_2 and green hydrogen are first converted to synthesis gas, either by co-electrolysis or over a catalyst. The synthesis gas is then reacted over a suitable FT catalyst to produce hydrocarbons and water. Sasol's suite of cobalt catalysts is highly efficient for the latter process. Alternatively, hydrogen and CO_2 can be converted directly over a single catalyst to a useful range of products, using a 'tandem' catalysis, and this is where the iron catalysts have been found to be advantageous.

UCT's Professor Michael Claeys said Sasol and UCT have a longstanding collaboration on the fundamental aspects of FT technology, on both commercial cobalt and iron catalysts, which provide workable solutions for operating plants. The partnership brings together Sasol's established expertise around FT catalysis and synthesis gas conversion and UCT's modelling and in-situ characterisation capabilities.

In recent years, the university has also been working on CO_2 conversion technology and has built up extensive experience in CO_2 hydrogenation.

www.sasol.com

Cleaner coal viable due to fine-coal beneficiation

Gravitas Minerals director, Tebogo Kale, talks about the shift to mechanised coal-mining, how it has caused more fines to be produced than traditional thickeners can cope with, and how the Optima Classifier™ can be used in conjunction with traditional spirals in fine-coal processing circuits to recover these fines for more efficient and cleaner recovery.

In October, Gravitas presented a detailed overview of its latest advances in fine-coal beneficiation at the Southern African Coal Processing Society (SACPS) Biennial Conference at the Graceland Casino and Country Club in Secunda via a presentation entitled 'Coal Processing and our Role in the Drive for Cleaner Coal'.

The shift to mechanised mining in the coal industry has had the side-effect of an excessive quantity of fines being produced, which often means that the thickeners deployed in minerals-processing circuits are undersized and cannot cope. "Eight out of ten coal mines encounter this problem in their operations, mainly due to the fact that the thickeners are not designed to handle such a large quantity of fines," says Gravitas Minerals director, Tebogo Kale.

"The transition to renewables as a significant component of South Africa's energy mix is not going to happen overnight, which means that any advances in clean coal are critical to boost environmental awareness in the coal value chain and the impact on the triple bottom line of 'people, planet and profit'," he notes.

"The key questions we need to ask is how do we make the most out of coal fines and what are the alternatives?" Apart from thickener issues due to an overproduction of fines, these fines invariably end up in slurry ponds, tailings dams and silt traps, incurring significant handling, construction and disposal costs when it comes to remediation.

Whereas traditionally only 10% to 15% of fines went to the thickener, this figure is now 20%. "The technology we can bring to the table not only mitigates this problem, but results in a commercially viable and sustainable end product," stresses Kale. "Not only can this high-quality product be exported, it also means that less fines end up in slimes dams, which further mitigates against the environmental impact of coal."

While Kale's presentation focused on the business case for the technology developed by Gravitas Minerals, Franco van de Venter, who oversees the company's technological development facility in Benoni, presented a paper with Multotec Process Equipment about how the Optima Classifier™ can be used in conjunction with traditional spirals in fine-coal processing circuits.

The Optima Classifier™ can be used in conjunction with traditional spirals in fine coal processing to significantly increase fines recovery rates.

Two approaches were evaluated, one where run-of-mine fine coal was fed to the Optima Classifier™ and one where the Optima discard was fed to a low-cut spiral. In addition, the Optima can also be added to an existing fine coal circuit or mineral preparation plant as a separate module to boost overall recovery and quality.

Kale says that the presentations by Gravitas Minerals and Multotec generated a lot of interest at the SACPS Biennial Conference 2021. "We clearly outlined the problems associated with clean coal and the impact from an environmental point of view, as well as outlining a potential solution that can be implemented efficiently and cost-effectively. It is important for the coal industry to advance the cause of clean coal in response to growing environmental concerns about greenhouse gas emissions and climate change."

A water-only density separator, the Optima Classifier™ is an engineered system that consists of feed preparation, beneficiation/separation and dewatering modules to ensure a high-quality product with the correct moisture content. Typical end products have an ash content of below 16% and a calorific value of at least 27 Mj/kg. Moisture plays a major role in the fine coal market and the water recovered from the product is immediately reused for processing.

Grain sizes of up to 5.0 mm can be processed, while Optima Classifier unit sizes of up to 150 t/h can be built. The discharge devices are electrically controlled, which presents a further opportunity for a greener solution.

The fact that the solution does not draw much power, with the Optima Classifier™ using the same 220 V rating as a typical household appliance, means that renewable energy can easily and effectively be added as the main power source for sustainability.

www.gravitasminerals.com

The Gravitas Minerals team at the 2021 Southern African Coal Processing Society (SACPS) Biennial Conference in October.

Kwatani develops specialised spiral elevator in-house

Gideon de Villiers, senior mechanical engineer at Kwatani.

Kwatani's depth of local engineering expertise and technical capability was leveraged to design and fabricate a specialised spiral elevator for a mobile containerised sorting plant for a diamond mine in Australia. Although not the first spiral elevator to be produced by the company, this particular one was a first-of-a-kind design and was engineered from scratch and manufactured by Kwatani in South Africa.

Demonstrating its depth of local engineering expertise and technical capability, local vibrating screen specialist Kwatani has designed and fabricated a specialised spiral elevator for a mobile containerised sorting plant for a diamond mine in Australia.

Although not the first spiral elevator produced by the company, this particular one was the first-of-a-kind design and engineered from scratch and manufactured by Kwatani.

Better known for its large, robust vibrating screens and feeders, the Kwatani 450 kg custom spiral elevator was an interesting contrast for the engineering team, who again produced results that reflect the company's usual standards of excellence. Within a timeline of just 10 weeks, the project combined first principles of physics with Kwatani's decades of experience in custom design and manufacture. "The client had specific functional and dimensional requirements for this design, with the available space for installation being very constrained," says Kwatani senior mechanical engineer, Gideon de Villiers, who led the team in developing the two metre high spiral elevator. "We were also pleased to be able to meet the client's throughput needs first time around with this specific design and build."

The unit will convey up to 3.5 t/h of diamondiferous ore between sorters in a mobile containerised sorting plant, which is destined for a diamond mine in Australia. The material to be moved up the spiral elevator ranges in size from 5.0 mm to 30 mm.

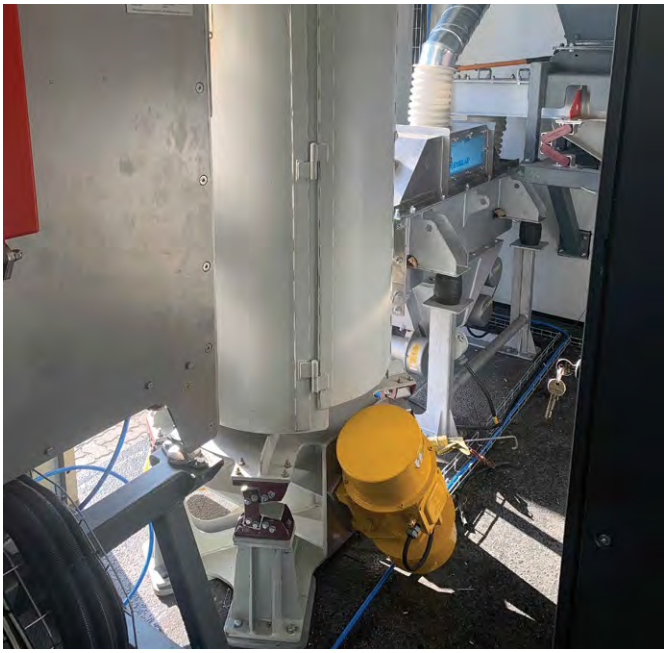
De Villiers highlights that Kwatani already has an established reputation with the sorter OEM, creating the necessary trust in Kwatani's custom-engineering capability. "Our extensive knowledge of feeders and vibration dynamics placed us well to successfully tackle this innovation," he says. "We started with the basic engineering calculations to clarify what dynamic movement we required, working through factors such as planned tonnages, isolation of dynamic forces, friction value of ore, and motor orientation and direction."

Designs were simulated using specialised software before Kwatani's skilled team of artisan welders tackled the task of construction and platework. This included finite element analysis to identify areas of potential 'hot spot' stresses.

Working with relatively light plates of 3.0 mm to 4.5 mm thickness, the elevator comprises S355 structural steel to cater for dynamic vibrations. The footprint was kept to around 700 mm, with two unbalanced motors at the base. "Due to the high value of the diamonds in the material, the structure also had to include static covers welded to the body, as well as maintenance doors with anti-tamper seals," De Villiers says.

Once fabrication was completed, the team embarked on a thorough testing programme lasting two weeks, conducted in Kwatani's dedicated test laboratory. This allowed for the adjustment of various parameters, with close collaboration between the design and fabrication teams.

www.kwatani.co.za



Left: Kwatani designed and fabricated a specialised spiral elevator for a mobile diamond sorting plant. Right: The Kwatani spiral elevator feeder in operation on site at a diamond mine.

Festo Didactic: unleashing full learning potential

In this article, Festo introduces a social media campaign called Didactive Unpacked to help customers to 'unbox' its online training courses and webinars. Hannes Otto, Automation Skills Consultant, gives an overview of Festo's modular training courses and how they have been designed to create successful pneumatics, hydraulics and automation professionals.

Technological changes are continually transforming tasks in today's companies. Investment in technologies and machines alone is not enough to ensure success. Festo recognises that skilled employees are the key factor in productivity. It is pivotal for professionals to be able to contend with continuous technological changes, which require unprecedented levels of adaptability.

As a global provider of technical education, Festo Didactic has developed an extensive range of CPD accredited face-to-face training. Festo has been expanding this training offering to include online training courses and webinars, which enable customers to access training from anywhere in the world without geographical barriers. This means that customers can attend practical training courses in the safety and comfort of their homes or workplaces. Using the right software and methods, the company's trained experts convey the latest industrial learning content. Furthermore, online courses prepare customers and form a foundation for hands-on, face-to-face courses.

Didactic Unpacked

In its latest unique campaign: Didactic Unpacked, Festo is giving its customers the opportunity to unbox these training courses, through fun and interactive games.

Each week, Festo releases a game on its Facebook and LinkedIn pages. To participate, interested individuals simply need to watch the associated Festo Didactic Unpacked video and unlock the different informative games. Prizes are up for grabs at each game level and, furthermore, participants that play all three levels will be entered into a lucky draw worth R10 000!

As with all Festo face-to-face courses and webinars, the Festo Didactic Unpacked videos that participants unbox have been designed to train industry professionals to perform in highly dynamic and complex environments. The campaign games are available until the 31st January 2022 and anyone can start to participate and stand a chance to win by visiting Festo's South African website: www.festo.co.za.

Face-to-face courses with state-of-the-art equipment

Although the world is advancing to online learning, Festo still understands the importance of online and face-to-face blended learning. Their hands-on, face-to-face practical training allows direct interaction and ensures that every participant receives personal attention. Participants also have the opportunity to apply their newfound skills using industrial equipment during the practical sessions.

Festo makes every effort to commit time and resources to educate and empower industry professionals in Africa for productivity and employability. Festo Didactic therefore offers training courses in key areas of everyday industrial life. Hannes Otto, Automation Skills Consultant, gives an overview of the company's modular training courses:

- Pneumatics training courses: "In recognition of the demand for advanced skills levels within the pneumatics industry, Festo Didactic helps customers understand and operate complex pneumatic machines," says Hannes Otto. The range of pneumatic courses covers modern industrial pneumatic concepts and applications necessary to understand, install and maintain pneumatic automation systems and machines.
- Hydraulics courses for seamless flow: "Our hydraulic courses provide insight into hydraulic hardware technology and its functions," he continues. From its Hydraulics course, attendees get to learn how to design circuits, read circuit diagrams and to control the speed, pressure and position of cylinders and actuators using hydraulic drives. More advanced topics are covered in follow-up hydraulic courses.
- Electrics/electronics courses: The increasing use of electrical drives in the industry has led to a skills gap that can have a negative impact on productivity. "With the skills and knowledge that is gained on their electric courses, customers can make informed decisions on the best technology option for their applications," adds Otto.
- Digitalisation/Industry 4.0: To establish Industry 4.0 in a company, the training and qualifications of its skilled workers must be adapted to meet the new requirements of this interdisciplinary approach. "Festo Didactic prepares industry professionals for these rapid changes through an intuitive training curriculum and hands-on exposure to I4.0 applications and equipment," Otto explains.
- Customised training courses: Festo also focuses on customer needs and requirements. "Our experienced trainers pride themselves on developing and presenting customised training that is designed to address specific customer needs and to improve skill sets ranging from basic through to advanced levels," he adds.

Festo Learning Experience (LX)

Festo believes that every person is unique, therefore learning should be adapted to the individual needs of the learner. That's why the company has developed Festo LX: the Festo Learning Experience. The digital learning portal for technical education and training picks up current and future learning trends at an early stage and offers comprehensive learning content for many areas of technical education and training. Festo LX combines industry expertise with didactic know-how.

Skills shortages can slow down the entire operating cycle, negatively impacting productivity and competitiveness. Ongoing industry training from Festo Didactic can help individuals, employees, and managers meet the changing requirements that today's automation environment demands from them. Years of experience have familiarised Festo trainers with the industrial work environment and its challenges – making Festo the ideal training partner.

www.festo-didactic.com/za-en

Atlas Copco celebrates 75 years

In September 2021, Atlas Copco celebrated its 75th anniversary of innovation leadership in South Africa. This piece outlines past successes and future intentions.

An Atlas Copco Innovation: A GA11VSD+FF air compressor and NGP8+ nitrogen generator installed in a temperature-controlled container to mitigate impact of polar conditions on machines.

In modern business environments it is fundamental for organisations to be extremely agile in their responses to market change. Companies must remain flexible in terms of their responses to increased competition, new customer demand and many other market forces. Swedish multinational Atlas Copco has demonstrated that ability and agility since being founded in 1873 in Stockholm. In South Africa this year, the company is celebrating an incredible 75 years of impact where it has had local presence since 1946.

Internationally, Atlas Copco was founded to provide Swedish Rail with all of its equipment needs for the country's new railway system. A redirection occurred in the mid-1880s to produce more advanced offerings such as steam engines and boilers to cater to the needs of the first industrial era.

Locally, that spirit of innovation and agility in its business processes also took hold as the company started manufacturing equipment such as components for service rifles and aircraft engine parts during 1947, before broadening into a wider range of industrial equipment.

A constantly growing operating footprint

Atlas Copco has grown the local business and entered many new sectors through regional expansion and acquisitions, consequently expanding its product and service offering to clients. The organisation's impressive history of innovation not only resulted in productivity, environmental, cost and operational efficiency benefits, but has also translated into numerous awards for the company.

These include receiving an outstanding award for its Leadership Role in the Green Building Economy during 2017. In addition, Atlas Copco won a slew of prestigious Red Dot Design Awards for products such as the 8 Series range of portable compressors and the HiLight H5+ LED light tower in 2017. Atlas Copco Industrial Technique also came up tops in the Good Practice Awards competition, which focused on the safe handling of hazardous substances, with the award recognising the company's focus on improving air quality in laboratories.

In 1999, Rand Air became part of the Atlas Copco Group, offering customers rental services of compressors. Founded in 1973, Rand-Air has built an excellent reputation as an industry leader when it comes to the rental provision of portable air and power. The Rand-Air range varies from oil-free compressors, industrial air compressors, diesel compressors, electric air compressors to diesel generators and lighting towers.

Beyond innovation and agility, corporate social responsibility has also been ingrained in the Atlas Copco way of doing business. Atlas Copco is involved in various projects including sponsoring the world's largest full-service mountain bike stage race, KAP sani2c. This event provides much-needed employment for the local community through enterprise development, with the latest edition of it resulting in 150 community members being employed. In South Africa the company also has a strong focus on helping to provide water to communities with poor access to water and sanitation.

This story of innovation and growth is set to continue, under the novel Atlas Copco motto: 'The Home of Industrial Ideas'. The organisation has also set ambitious sustainability goals that include an audacious commitment to have 30% female representation across the business, including every managerial level, by 2030, a goal that builds on the business' out-of-the-box thinking and problem-solving capabilities to ensure that it continues to drive innovation for the next 75 years and beyond.

www.atlascopco.com/en-za

Bosch Rexroth SA's renewable energy investment

Bosch Rexroth South Africa has recently partnered with solar energy company Green Wave for a large solar panel project designed to assist with reduction in power consumption at the company's 16 000 m^2 facility in Kempton Park, Johannesburg. The solar panels were installed to reduce municipal energy usage and lower the company's carbon footprint.

The solar yield for this installation is predicted to reach 5 743 MWh within 10 years. This reduces CO_2 emissions by 5 169 t, the amount that would be absorbed by almost 26 000 trees in 10 years. The installation will also reduce power consumption and costs at the six companies based within the facility Bosch Rexroth SA: Hytec SA, Tectra Automation, Hytec Services Africa, Hägglunds and HYSA, the Group's specialist logistical arm.

Using a flush mount design, the panels are attached to the roof. The layout allows for easy panel maintenance and an aesthetically pleasing, neat appearance. The solution was based on actual usage data, taking weekend and weekday usage into consideration when calculating paybacks and estimate yields. By using historic usage data, Green Wave provided a yield estimate that allows for an actual vs estimate comparison.

"We look forward to a solar-powered future for Bosch Rexroth South Africa. Innovation in this area will continue to drive new applications of solar energy technologies to improve our daily lives and help power a cleaner world," says Deon Victor, facilities manager for Bosch Rexroth South Africa.

www.boschrexroth.africa

Re-using depleted mines for energy storage

thyssenkrupp Uhde South Africa has signed a pre-feasibility study with Pumped Hydro Storage Sweden for a project that involves storing renewable energy at low cost with high efficiency using depleted underground mining infrastructure.

thyssenkrupp Uhde South Africa and its international partners are now collaborating to facilitate underground mine repurposing.

Last year thyssenkrupp Uhde signed a cooperation agreement with mining rehabilitation specialist Wismut GmbH in Germany. This international cooperation agreement has now been expanded by an agreement with Pumped Hydro Storage Sweden to execute a pre-feasibility study for the Renewable Underground Pumped Hydroelectric Energy Storage project (RUPHES) on a specific site belonging to a South African mining company.

With fast increasing renewable energy generation, there is a greater need for energy storage. Renewable Underground Pumped Hydroelectric Energy Storage (RUPHES) in repurposed mines – coupled with solar and wind power – can reliably provide green energy when it is needed. Repurposing of depleted gold mines for RUPHES enables short construction schedules and significantly reduced costs because gold mines already have the underground water storage reservoirs that are commonly the mostly costly components of pumped hydro plants. They just have to be adapted to their new energy storage purpose.

This is exactly what Pumped Hydro Storage Sweden does. It is part of the company Sustainable Energy Solutions and is currently developing a 2.0 MW/8.0 MWh underground pumped energy storage project in an abandoned iron mine in Aland, Finland. The project has the support of both the European Commission and the Swedish Energy Agency, and they are looking to commission the project in December 2023. This project demonstrates the reduced construction schedules and costs associated with utilising mining infrastructure for pumped energy storage, as did a similar project at the Kidston gold mine in Australia.

Well-proven, cost-competitive solution serving a major trend in Africa

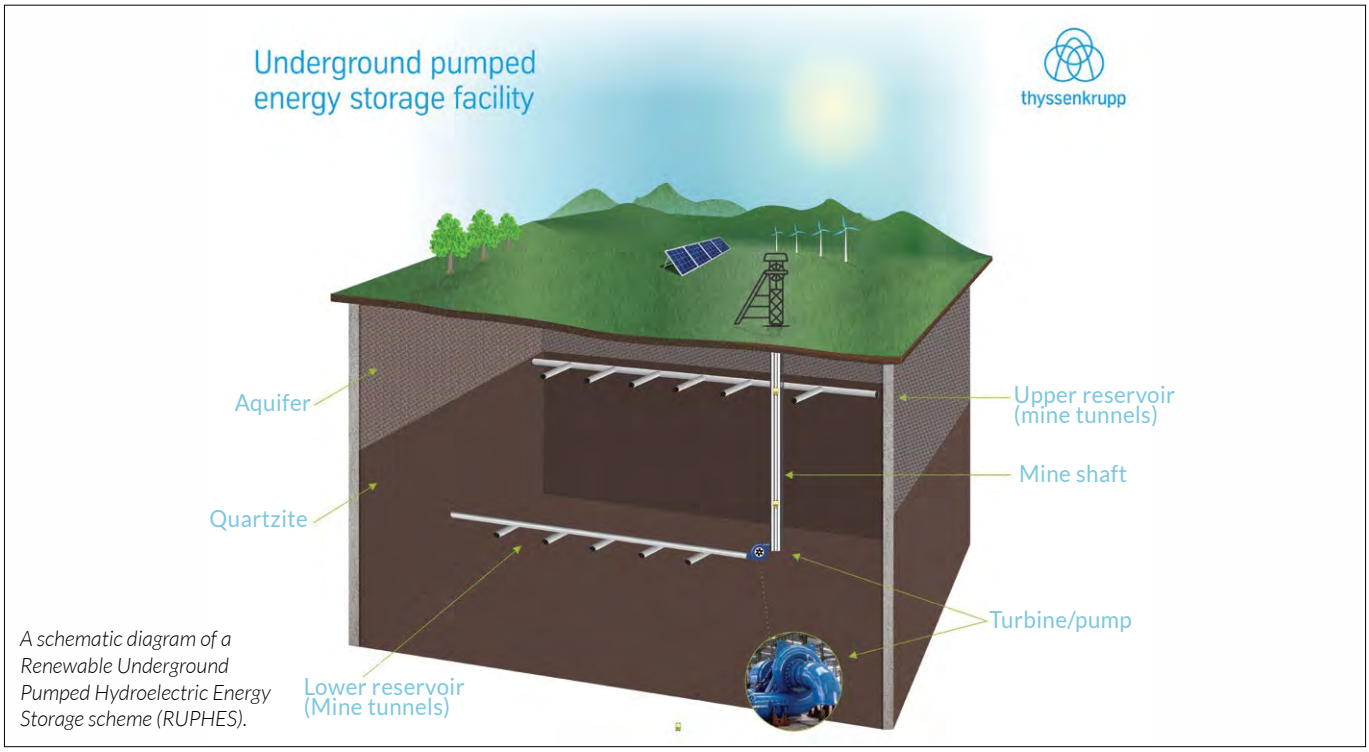
As probably the most mature energy storage technology currently available, pumped hydro accounts for 97% of the global storage capacity. Exceptionally high hydraulic heads and stable hard rock geology render ultra-deep gold mines ideal for implementing the concept, and for producing internationally cost-competitive, reliable green electricity as well as green hydrogen and green ammonia.

Just for comparison, in June 2021, a South African gold mining company announced that it was able to produce electricity from solar power at 1.1 c/kWh (US$). This pricing is nearly on par with the best international solar pricing 1.04 c/kWh, achieved in competitive bidding in Saudi Arabia. The fact that South Africa has world-class solar and wind resources is gaining traction with both government and industry, particularly in the light of the fact that it is cheaper to provide electricity from South African renewables than it is to provide power by importing foreign gas.

tk-Uhde combines unique technological expertise and decades of global experience in the engineering, procurement, construction and service of chemical plants. The company is developing innovative processes and products for a more sustainable future, contributing to the long-term success of its customers in almost all areas of the chemical industry. Its portfolio includes leading technologies for the production of basic chemicals, fertilisers and polymers as well as complete value-chains for green hydrogen and sustainable chemicals.

Wismut GmbH was established in 1991 to remediate uranium-mining sites in southeast Germany left behind by the SDAG Wismut, the world's largest single uranium producing enterprise during the cold war. Wismut now increasingly focuses on developing innovative and sustainable solutions for mine closure and post-closure development and remediation.

www.thyssenkrupp-industrial-solutions.com



A schematic diagram of a Renewable Underground Pumped Hydroelectric Energy Storage scheme (RUPHES).

Zest WEG customers can now buy online – anytime

Zest WEG is pioneering an E-Commerce facility linked to its new website, allowing its customers to make purchases online. Johan van Niekerk, Zest WEG national sales executive, says this will make the company's products more readily available to customers.

First phase of roll-out includes standard products like low voltage electric motors, variable speed drives, soft starters and switchgear.

Zest WEG has introduced an eCommerce facility linked to its new website, which allows customers to make purchases online and incorporates features such as technical tools and other capabilities including access to stock availability levels.

"The E-Commerce facility is part of Zest WEG's continuous drive to serve customers better, making it easier and quicker for them to deal with us," says Johan van Niekerk, Zest WEG national sales executive. "This is just another way to make our products more readily available to customers."

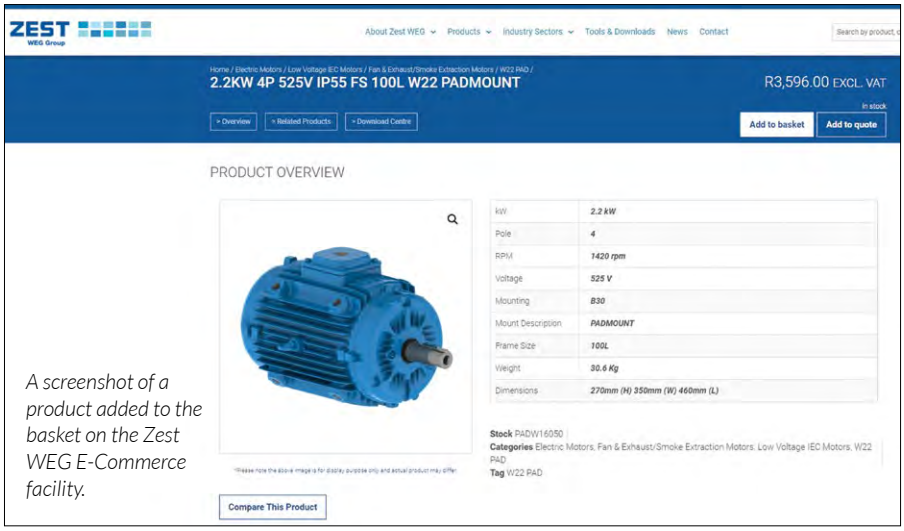
Around South Africa, customers can now conveniently place orders on this new Zest WEG E-Commerce site, which in its first phase of roll-out includes standard products such as low voltage electric motors, variable speed drives, soft starters and switchgear.

Van Niekerk highlights that the design and programming for this kind of site – which includes a wide range of technical products – has been quite demanding. The company began the thought process long before the COVID-19 lockdowns were implemented, and has since prioritised the roll-out. "The digital world around us, and especially electronic or internet trading, is developing very rapidly," he says. "It was therefore important for us to develop our E-Commerce capability as part of our philosophy of ongoing improvement and customer service." He emphasises that customers requiring assistance will still have access to the staff that currently provide them with service support. "The E-Commerce site is an important value addition to our new corporate website, which has been redesigned partly to facilitate easy integration with the E-Commerce element," he says. "The website is now easier to navigate and offers an even greater depth of technical information and brochures, as well as more tools that customers will find useful."

Zest WEG's fleet of delivery vehicles will deliver goods ordered online, within the existing areas of coverage ensuring the same high levels of logistical reliability, and the normal returns policy will still apply to these products. Van Niekerk advises that emergencies should be dealt with through direct personal contact to ensure the customer's requirement is well understood and to achieve the best and quickest service.

"We are confident that customers will find the added flexibility of Zest WEG E-Commerce valuable, giving them access to an ordering system at all hours of the day or night," he says.

www.zestweg.com



A screenshot of a product added to the basket on the Zest WEG E-Commerce facility.

Traction transformers for rail network

As an established supplier to South Africa's rail sector, Zest WEG will be supplying specialised traction transformers for new substations serving rail lines in Gauteng and the Western Cape.

According to Dillon Govender, sector specialist at Zest WEG, the company is supplying six 6.0 MVA units that will step down from 88 kV to 1 220 V, and two more 6.0 MVA units stepping down from 44 kV to 1 220 V. All the transformers will feature a dual output, as well as tertiary windings for small power applications like lighting in the area. "This is part of an important fast track project, and the order follows a number of successful deliveries of these complex transformers by Zest WEG over the years," says Govender. "The units are designed to customer specifications and manufactured in line with global standards."

Through its workshop facilities in Gauteng, Zest WEG has become well known as a 100% local manufacturer of power, distribution and traction transformers for customers within South Africa, and has supplied well beyond the borders. "We have established considerable local capacity in transformer manufacture, reflected in the growing confidence of customers in our design and production capabilities," he says. "We are also able to leverage the value of being part of the WEG Group by drawing on the skills of experts from our Brazilian facilities."

"Zest WEG's depth of expertise means that we can also conduct design work locally, to meet the specific requirements of customers," he says. "Our strong local footprint includes offering the necessary service support to customers, ensuring that we can provide the necessary backup for all our equipment," he concludes.

www.zestweg.com

Turnkey Energas natural gas power plant

An international manufacturer has awarded a contract to Energas for the delivery of a turnkey natural gas power plant in South Africa.

Load shedding, unreliable power supply and increasing electricity costs are realities that businesses in South Africa must contend with. This was a key factor in the decision by an international manufacturer to consider own-power generation using natural gas.

Leading supplier of high-end and specialised equipment to the oil and gas industries in sub-Saharan Africa, Energas Technologies, was the ultimate choice to deliver the complete turnkey project. It entails the supply and installation of a new gas reticulation pipeline; gas engines (gensets); a new gas-fired steam boiler; a waste-heat boiler, which will use exhaust heat from the engines to produce steam; interconnecting piping; a new gas engine building and associated electrical infrastructure.

The gas pipeline, explains Energas Product Manager, Laetitia Jansen van Vuuren, will take gas from a new high-pressure customer metering station to the gas generator sets and steam boilers. The R Schmitt Enertec (RSE) G500 gensets will be installed in a new building that Energas will supply.

The exhaust heat from the engines will be used in a waste heat boiler. This free steam will result in a substantial annual saving in the gas bill. Projections show that a substantial saving can be realised, compared with importing electricity from the grid in the first year of operation. The accumulated saving over 10 years, based on inflation and price assumptions, is substantially more than the project value.

"With the equipment offered, the supplier and Energas can monitor the operation of the engines. Various engine parameters can be monitored to ensure the most efficient operation. Very few plant operation and maintenance staff are required to oversee the gensets and steam plant," says Van Vuuren.

"We are convinced that the solutions offered will reduce the overall energy cost to the customer, meet environmental requirements and ensure efficient operation. Our team is capable of executing the project successfully and we are set to complete the project in December this year," she adds.

"Heat recovery from engine exhaust gas makes it a very interesting project," says Van Vuuren. "Usually, the heat is discharged into the atmosphere. "However, the overall energy efficiency is significantly increased if the exhaust gas can be used."

The client has operated a coal fired boiler, but this will now be replaced with a waste heat steam boiler. When more steam is required than what could be recovered, the additional steam will be supplied using the gas fuel source. The waste heat boiler is a combination boiler; it works by recovering energy from the exhaust heat and also has a gas burner. "When the waste heat boiler is being serviced or the engines are not working, there is a standby gas boiler to ensure continuous supply of steam to the plant," she explains.

The Energas waste heat boiler is a combination boiler that works by recovering energy from the exhaust heat from the engines, while also having a gas burner to ensure demand is met.

In addition, having four smaller 4×500 kW engines instead of a single 2 MW engine allows continuous power supply to the plant. When one engine is serviced, the other three can still operate. Or if the plant's usage is low, adds Van Vuuren, one or two engines can switch off while the other operates at a higher and more efficient load.

Energas' proven ability to offer turnkey solutions was key to being awarded this contract. "Engineering and integration of whole systems and solutions," says Van Vuuren, "is what we do best."

The core competence of Energas is finding and implementing engineering solutions in the energy and natural gas industry. The company has been a supplier of equipment and solutions to the industry since 2001, when natural gas was first introduced in South Africa. Energas specialises in solving engineering challenges in collaboration with its long-term consulting partners and trusted equipment suppliers.

"Energas employs graduated mechanical, electrical and process engineers and technicians with more than 70 years of combined experience in the industry. When we handle large turnkey projects, we focus on the project management and quality assurance of the projects and use consultants and our suppliers to do detailed design," says Van Vuuren.

In conclusion, she urges businesses to consider the natural gas energy route because of the documented benefits. "We believe several industries should consider own power generation with natural gas. It will reduce their energy costs and also make them more independent of the grid, especially when combined with heat recovery. Companies can save millions of rand over a few years and ensure that their production is not affected during load shedding," concludes Van Vuuren.

www.energas.co.za

Energas specialities

Energas supplies engineered solutions and equipment to the oil and gas industry in sub-Saharan Africa. The company's products and services find application from the gas well, through the distribution and reticulation network up to the end user.

Areas of speciality include:

- The design and supply of skid mounted pressure reduction, metering and heating skids for easy installation in remote areas.
- Solutions for generating electric power from various gas sources with alternative power generation and waste heat recovery becoming a priority .
- Sizing and supply of storage tank safety equipment for the chemical & petrochemical industries.
- Through in-depth engineering experience and knowledge in the oil and gas industry Energas is also able to offer custom engineering support to clients.

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Wind Atlas Project: WASA 3

The South African National Energy Development Institute (SANEDI) hosted an online seminar in October to announce the completion of the latest phase of its wind atlas project, WASA 3.

The panellists at the SANEDI-hosted online seminar to announce the completion of WASA-3 were chaired by SANEDI's Karen Surridge, with representation by people from the Department of Mineral Resources and Energy (DMRE), the Council for Scientific and Industrial Research (CSIR), the South African Wind Energy Project (SAWEP), the South African Weather Service (SAWS), the University of Cape Town (UCT) and the Technical University of Denmark (DTU).

Nomawethu Qase, the DMRE's director for new and renewable energy, said that WASA 3 used new and improved software that increased the speed of processing while reducing computer power requirements. The 19 sites, covering 75% of South Africa's land area where observable readings were taken, have provided wind data that has been used to validate the WASA wind resource modelling for the entire country. Qase expressed appreciation for SANEDI's efforts in driving the WASA project.

The seminar explained the need for a Wind Atlas, the process by which it is being compiled, how the data is being used, and made a presentation relating to the work of collecting the data, compiling it and modelling the results.

SANEDI's interim CEO, Lethabo Manamela, explained that the Wind Atlas provides a graphical representation of the wind resources available in various areas of the country. This information is primarily used by investors wishing to build wind farms in South Africa, she said.

As a signatory to the United Nations Framework Convention on Climate Change, South Africa is obliged to reduce its carbon emissions dramatically within the next 30 years. Electricity generation and transport have been identified as the two largest emitters of CO_2 in the country. Both of these industries need to reduce emissions by transitioning towards clean resources.

The United Nations Development Programme (UNDP) focuses on climate change and the 'greening' of South Africa's economy. The UNDP's Ayodele Odusola, commended South Africa, saying that the country's Renewable Energy Independent Power Producers Procurement Programme (REIPPPP), which is internationally respected, sets an example for other countries to follow. Good practices in South Africa can be replicated in other African countries and abroad, he said.

Independent studies show that the cheapest way to transition away from coal as the primary source of energy is to switch to solar and wind derived electricity. Wind and solar farms can be built wherever land space and suitable solar and/or wind resource are available.

Andre Otto, from the South African Wind Energy Project (SAWEP 2), explained that to place wind turbines in places where they will benefit from the available wind resource, one needs to know where the best wind resources are. Nineteen masts were erected over a period of ten years to collect data about these wind resources.

In the physics of wind, Otto said, wind power is proportional to the cube of the wind speed. Therefore, the energy that can be extracted from the wind is highly affected by the speed of the wind. Computer-derived digital (or numerical) modelling is used to convert global wind data through a process of meso- and microscale modelling, with each step increasing the resolution and incorporating the land topography to estimate the local wind resource.

Although it is possible to build a wind farm anywhere in the country – wherever land is available – there are some areas that are better suited to the production of electricity from wind than others. But how does one know where the best wind resources are to be found? This is where a Wind Atlas comes into play. This online seminar provided information from the persons involved in the collection and analysis of wind data and the compilation of the atlas.

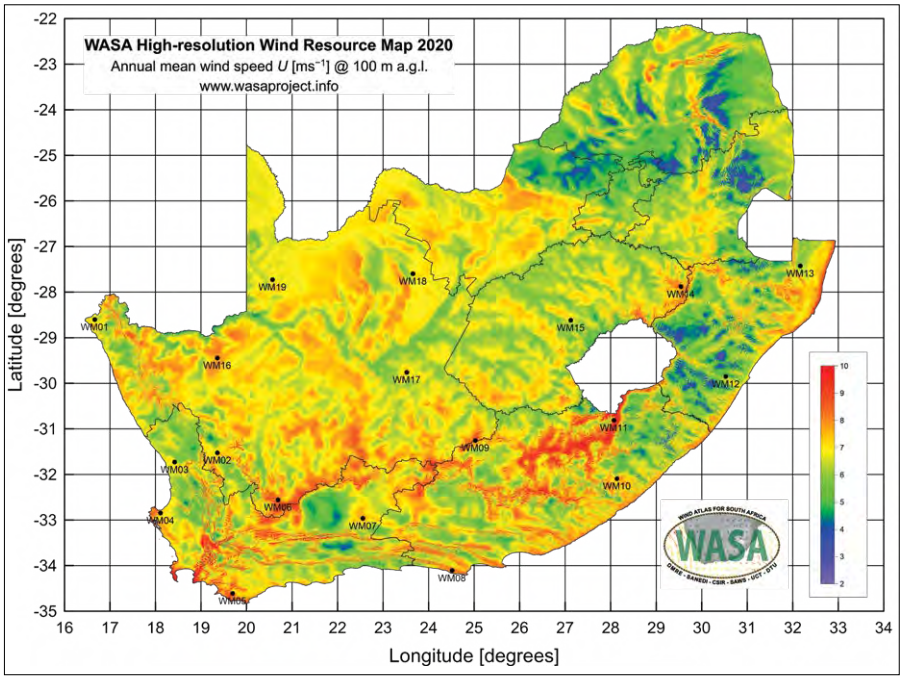
In addition to the data collected from the 19 masts, further data has been supplied by the South African Weather Service (SAWS). SAWS has 111 weather stations which hold 50 years' worth of wind data. This data has been compacted to a range of wind speeds between 36 and 44 m/s. Where wind speeds were below 36 m/s, they were increased to 36 m/s; and where they exceed 40 m/s, they are capped at 44 m/s.

The WASA website holds a great deal of data including guidelines for the use of the data and how to access it, GIS maps and reports. Upon registration, this information stored on the site is accessible to the general public and those who wish to plan new wind farms.

In closing, SANEDI's Karen Surridge summarised the key points of the seminar, highlighting the value that WASA brings to government and the private sector, and handed over to Nomawethu Qase who thanked the panellists and the teams at the various organisations and institutions who had made the release of WASA 3 possible.

She added that work on a prospective fourth phase – WASA 4 – would begin soon.

www.wasaproject.info



The confirmed 2021 WASA 3 mean wind speed map for South Africa.

PwC's climate targets validated by SBTi

SBTi Validation Affirms PwC's approach and timeline to achieve its net zero greenhouse gas (GHG) emissions commitment by 2030, which includes a 50% absolute reduction in business travel emissions.

PricewaterhouseCoopers (PwC) has announced that it has received validation for its science-based targets and reaffirmed commitment to achieve net zero greenhouse gas (GHG) emissions by 2030.

The Science Based Targets initiative (SBTi) validated PwC's targets to reduce greenhouse gas emissions by 50% in absolute terms from 2019 levels by 2030 in line with a 1.5 °C temperature rise limit scenario. Importantly, PwC's targets go beyond scopes 1 and 2 emissions to include PwC's largest indirect scope 3 emissions.

Bob Moritz, Global Chairman of PwC, says: "Climate change is one of the most urgent problems facing our planet today. As part of our new strategy – The New Equation – we are renewing our commitment to be part of the solution. Like our clients, we need to build trust with our stakeholders and deliver sustained outcomes – and tackling our climate impact is crucial to both."

Colm Kelly, Global Leader for Purpose, Policy and Corporate Responsibility for the PwC Network adds: "As we support our clients and suppliers in transforming their businesses to achieve net zero, we recognise the importance of actively reducing the climate impact of our own operational footprint – including the Scope 3 temperature rise limit target of 1.5 °C."

As outlined in PwC's New Equation global strategy, PwC has committed to transforming its business model to decarbonise its value chain, increasing transparency and support the development of robust ESG reporting frameworks and standards. PwC's commitment involves four key areas:

- Operations: PwC will reduce its emissions in line with a 1.5 °C climate scenario, including a 50% reduction in scope 1 and 2 emissions and a 50% absolute reduction in business travel emissions from a 2019 base by 2030. In addition, PwC will accelerate its transition to 100% renewable electricity and, to mitigate its impacts today, PwC will continue to offset its emissions through high-quality carbon credits.
- Clients: PwC will work with its clients to support their efforts to make the net-zero future a reality for all. Building on existing client work in sustainability and net-zero transformation.
- Suppliers: PwC will engage with key suppliers, encouraging and supporting them to achieve net zero. "We commit that 50% of our global purchased goods and services suppliers will have set their own science-based emissions targets to reduce their climate impact by 2025.
- Climate agenda: PwC will continue its long-standing programme of research and collaboration with business, policy makers, and NGOs to accelerate a net zero economy.

Berno Niebuhr, Net Zero Leader for PwC Africa says: "Parts of Africa are likely to feel the impacts of climate change to a greater degree than many others. Due to the high levels of income inequality and poverty rates, it is therefore imperative that we take action to mitigate our contribution to climate change to as great an extent as possible."

Across PwC Africa, we will be activating several initiatives to support our ambition in reaching 50% reduction in scope 1, 2 and 3 by 2030. These initiatives will include emissions reductions and efficiencies, carbon offsets and net zero value chain strategies and frameworks. Climate change affects everyone, so we need to drive systematic change in society and business."

Jayne Mammatt, PwC Sustainability and Climate Change Lead adds: "South Africa remains one of the world's biggest greenhouse gas emitters and has been ranked the worst G20 performer in terms of carbon intensity at 599 t CO_2 per million US$ of GDP, more than double the global average.

"The SBTi initiative has raised the bar for companies to address their emissions reduction targets in line with climate science," she says.

www.pwc.com

ABSA building awarded C-rating EPC certificate

In December 2020, the Department of Mineral Resources and Energy (DMRE) gazetted 'Regulations for the Mandatory Display and Submission of Energy Performance Certificates for Buildings'. Under these regulations, buildings in South Africa must have their energy performance assessed by an accredited party, who then issues an EPC, which rates the building from A to G for energy efficiency. At least a D-rating must be achieved to be compliant with the minimum energy efficiency requirements contained in the national Building Regulations.

As an agency for the DMRE, the South African National Energy Development Institute (SANEDI) has been tasked with developing, hosting and maintaining the National Energy Performance Building Register in terms of the regulations.

Absa has been a pioneer in this regard, being the first bank to achieve compliance with the country's new building energy performance regulations. For Energy and Systems at Absa, Edwin Mavhungu, says: "We are delighted that the Absa Oude Bloemhof Building in Stellenbosch has received an Energy Performance Certificate (EPC) after a comprehensive building energy performance assessment in accordance with SANS 1544. With a C-rating, the building performs above average and complies with the new government regulations.

The Absa Oude Bloemhof Building in Stellenbosch has received an EPC in accordance with SANS 1544.

"We will be looking to improve on this rating in the future, in line with our Road to Green strategy," says Mavhungu. ❑

Collaboration in the industrial ecosystem

Eplan CEO, Sebastian Seitz, talks about the Eplan Platform and how it promotes collaboration among the various process participants across the industrial automation ecosystem.

Today's ecosystem of industrial automation is characterised by many media disruptions during the processing and transfer of documentation. It is essential to resolve these issues within the development process for machines and plant systems – via targeted collaboration among all stakeholders and systems.

Data created in the engineering process must be shared with everyone involved in the process. The ideal goal: machine builders and system integrators, control cabinet manufacturers, component manufacturers and also machine or plant system operators all work together in a network

The ecosystem of industrial automation

What does this process – the collaboration among the various process participants – look like today? In the planning phase, the characteristics of the desired machine or plant system are described. If the company has particular supplier specifications, these are also detailed and then passed on to the operator, who takes the specifications into account when designing the machine or system.

The planning phase is followed by the preplanning process. Additional information such as devices, release lists from Excel, specifications in Word or preplanning tools such as Eplan Preplanning are taken into account and, in turn, are used by the basic engineering designers to prepare a quote, for instance.

In the case of more complex production lines, this is traditionally taken care of by a system integrator, who is also responsible for the detailed engineering and for generating electrical and fluid-power schematics.

Data is enriched in the Eplan Project

Projects created with systems on the Eplan Platform – Eplan Electric P8 or Eplan Fluid, for example – can now be transferred to the control cabinet manufacturer. This manufacturer creates the virtual prototype of the switchgear system in the form of a 3D assembly of the control cabinet, using Eplan Pro Panel. The control cabinet is then built, approved and commissioned by the operator.

With the delivery of the switchgear system, the control cabinet manufacturer processes are complete. The company hands over the Eplan Project, which has been enriched with data, back to the machine builder or system integrator, who commissions the machine or plant system based on the final project data. The project is then made available to the operator, who can access the current documentation, for instance, using Eplan eView. In the event that servicing or maintenance becomes necessary, any changes can be digitally documented using the redlining function as needed.

This process describes the daily work in the ecosystem of industrial automation. The challenge, however, is that all the data for an automation project is created and added at various stations along the value chain. Often, all the project participants are working with partially inconsistent data, which ends up making the process even more time consuming and error prone. For instance, the drive power of a motor is changed at some later point in a project, but this change isn't taken into account when the machine or plant system is commissioned. As a result, the documentation is not up to date.

A 'data container' as the central source of information

This is where the latest Eplan innovations come in. The systems of the upcoming Eplan Platform 2022, in combination with the new Eplan eManage cloud service, network together machine builders and system integrators, control cabinet manufacturers, component manufacturers and the operators of machines or plant systems.

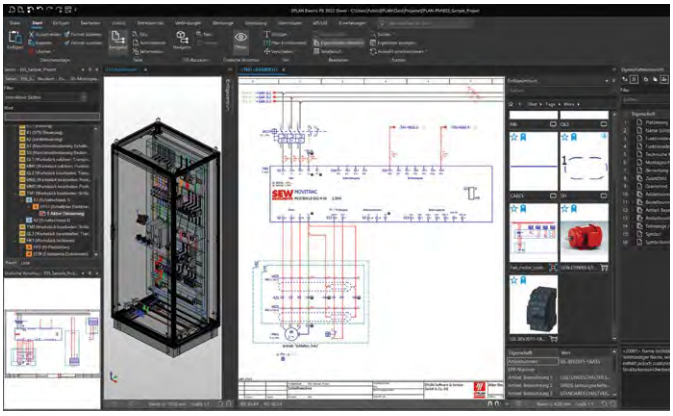
Eplan CEO Sebastian Seitz explains: "We connect companies with their clients and suppliers via the cloud, for easy and secure data sharing. The Eplan Project, as the central, digital model of an automation solution, supplies all processes with the necessary data. What we're talking about is a sort of 'data container' that is fed from the systems of the Eplan Platform.

This generates added value in the digitised collaboration of all participants – through secure data transfer and central access to the Eplan Project."

A new feature includes the connection to the cloud via Eplan ePulse, which also significantly improves mobile working in design and engineering.

Cross-project collaboration via the cloud

Using the new Eplan eManage, projects can easily be uploaded to the cloud and managed and shared from there. More specifically, this brings together the worlds of on-premises software and the cloud. Clear access rights via role management ensure



Left: The new Eplan Platform 2022 with a completely redesigned user interface. The practical ribbon bars use modern technology to flexibly adapt to the application. Right: All changes in a project are centrally available in Eplan eView, ensuring project documentation is always up to date along the entire product life cycle and into operation and service scenarios.

data security and provide flexibility for accessing projects. Users of Eplan Electric P8 and Eplan Pro Panel can conveniently upload their projects to the cloud and transfer them to the Eplan Platform for further processing.

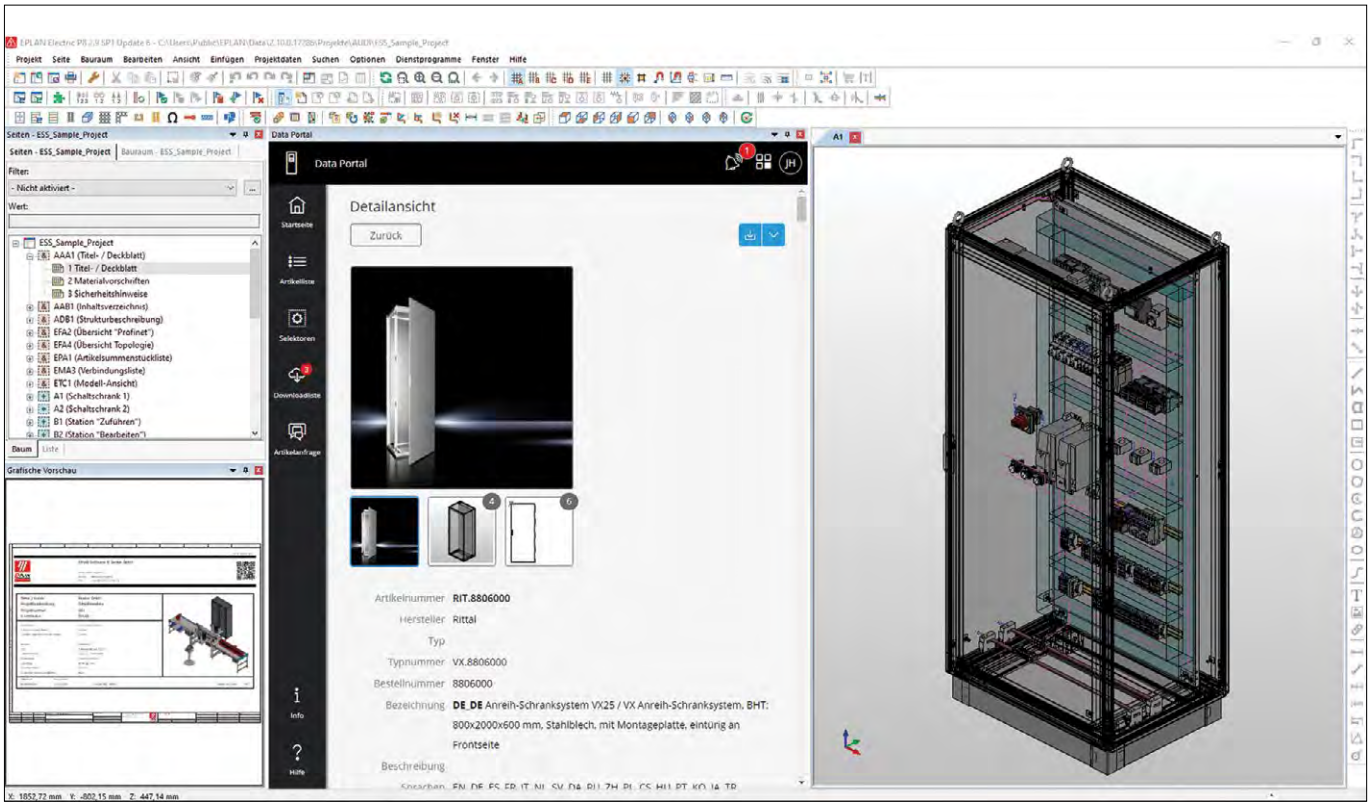
This is accomplished without the time-consuming sending of project data via email or using an FTP server. And the centralised, clear availability in the cloud also enables all project participants to search quickly for specific content.

With Eplan eView, all the changes in a project are centrally available. The advantages are obvious: project documentation is always up to date – along the entire product life cycle and into operation and service scenarios. An important component of this method of working is device data, which is provided on the Eplan Data Portal.

Seitz says: "What matters here is the quality and depth of the data, something we are intensively advancing with the Data Standard. Comprehensive, integrated and end-to-end digital data serves as a project accelerator. And don't forget, the data is consistent and the data transfer is secure," he adds. High-quality digital device data is a key factor in processing orders in shop floor management and deriving production orders; controlling automated machine fleets such as Rittal Automation Systems; and providing information to partially automated workstations, simplifying wiring processes with Eplan Smart Wiring, for example.

Seitz concludes: "With these optimised processes and increased efficiency, companies can optimise their machine and plant system design processes and sustainably increase the availability of their machines and plant systems. Collaboration among all participants ultimately increases the quality of the data and thus the added value."

www.eplan.co.za



An important building block is device data, which is provided on the Eplan Data Portal. What matters here is the quality and depth of the data, something being intensively advanced with the Data Standard.

WorldsView launches Topcon laser scanner

WorldsView recently launched Topcon's leading 3D GLS-2200 laser scanner, a flexible, survey-style solution with user-friendly processing software that reduces lengthy surveying processes into fast workflows. An upgrade from its GLS-2000 predecessor, it has integrated HDR image capture technology that delivers high-quality, colourised 3D point cloud data with reduced noise, across a wide range of applications.

The GLS-2200 is the ideal solution to develop accurate, 3D 'digital twins' or detailed digital models of an environment. This means it can be used for both simplified scanning and extensive workflow processes.

The scanner also offers better image quality to capture real-world scenes with varying light ranges and high contrast. It can also produce a sharper and more vivid colour 3D model rendering when using software such as Bentley's Context Capture. The scanner is flexible, versatile and ideal for construction and infrastructure inspection, road/slope surface measurement, tunnel cross-sections, facilities and maintenance assessment and Building Information Modelling (BIM) applications.

"With its compact design, multi-mode and smart functionality, this lightweight scanner is the ideal solution for any surveying worksite," concludes Moyana.

The new GLS-2200 laser scanner is available in southern Africa through WorldsView.

www.worldsview.com

The paper industry: the epitome of the circular economy

The pulp and paper manufacturing and recycling sector has been adopting production innovations to reduce its environmental footprint, divert waste from landfill and stay ahead of the circular economy curve.

The circular economy is a continuous closed loop that involves taking, making and re-using, as opposed to a linear process of taking, making and discarding. The problem with the linear model is clear. When we treat raw materials such as wood, water and energy as infinite, we end up with waste. Waste costs money, which in itself is waste, especially when you consider the costs of landfilling, the loss of reusable materials, and the livelihoods that could have been supported. There are also losses at the expense of the environment – greenhouse gas emissions when waste degrades, for example.

The circular economy, however, is based on three core principles: reducing waste by design, retaining materials in circulation and restoring the systems from which resources are extracted.

Contrary to popular belief and opinion, the paper industry has for many years adopted the circular approach. We all know that paper comes from the wood of trees – even the fibres in recycled paper came from a tree at some point in their lives. In South Africa's case, these trees are sustainably farmed in plantations, with stringent management of their impact on water, soil, neighbouring indigenous landscapes and biodiversity.

The sustainable forest: Gone are the days of detrimental, wall-to-wall afforestation. Today, forestry companies work in tandem with wetlands, riparian zones and high conservation value areas to create a mosaic of planted trees and conservation spaces. Sustainable forest management balances economic, social and environmental needs. While forestry practices optimise the land's ability to mitigate climate change through carbon sequestration, they also act as buffers for protected indigenous areas.

Depending on the species – usually eucalyptus or pine – trees for the paper industry take around seven to ten years to reach maturity. The reason we use exotic species is because they are fast-growing and we cannot – and will not – use indigenous trees for wood or paper products.

Currently, South Africa has 850-million trees growing over 676 000 hectares reserved for pulp and papermaking. Of these, less than 10% of this total area (67 600 hectares) is harvested each year. The same area is replanted with new trees or saplings, often at a ratio of two trees for every one harvested. This is the first cycle: plant, grow, harvest, replant.

The natural cycle: The circular economy in forestry extends to leaving forest residues in-situ as a mulch for the next generation of trees. After harvesting, bark, limbs, leaves and small parts of the harvested trees are left on the forest floor, offering sustenance and refuge for creatures that aid in the decomposition of organic matter, which in turn attracts birds – and so we have another cycle.

In addition, through photosynthesis, trees remove carbon dioxide from the atmosphere and convert it into food for growth. They also take up water, from the ground or from rainfall. They keep the carbon locked up in their fibres and give us back the oxygen, and some water is returned to the atmosphere through transpiration.

Circular production: Even pulp and paper mills operate in a closed loop process, by using natural resources efficiently – often more than once. Process water is reused and recycled, lost fibre is recovered and reused, and spent chemicals are recovered for energy production. Even bark and other biomass is used to power boilers, producing steam that generates electricity.

This sees us being better at using more of the tree, ensuring little goes to waste.

The paper cycle: Once pulp and paper are made into what we know – office paper, magazines, books, pizza boxes, cereal boxes,

Paper is sorted and baled into different types before being sent to the paper recycling mill.

cardboard boxes, newspapers, milk and juice cartons, paper cups – the circle starts to hit home. Office paper can be printed on both sides, and boxes can be reused as storage. Magazines and newspapers are used by school children for projects and posters.

Paper fibres can be recycled up to seven times. With a four-year average recovery rate of 70%, paper is the second most recovered material in South Africa. Recovered paper is reprocessed and made into corrugated boxes, tissue, cereal boxes and moulded protective packaging that comes back into our homes, and which we use and recycle. And so the paper cycle continues. The carbon also stays locked up for longer when paper is recycled.

In the laboratory: This is where cycles get really exciting. Some wood-based products are already in circulation in everyday life. Dissolving wood pulp is used in food, pharmaceutical and textile industries. Cellulose is used as a binder, emulsifier and filler. It's in our low-fat yoghurt, cheese and ice cream; it's in the bathroom cabinet in our lipsticks and vitamins.

The paper sector can extract xylitol from wood to make non-nutritive sweeteners, and it can also make bricks and bio-composites from paper sludge, the leftovers from the paper recycling process when fibres become too short for use.

We can make plastic, membranes and films with cellulose, and biodegradable alternatives to fossil fuels from lignin. We have students developing biodegradable fruit fly attractant sheets from nanocellulose, and controlled release fertiliser coated with cellulose, starch and diatomite (silica). We can also make attractants for mosquitoes from cellulose-based materials, to help society in the fight against malaria.

Left: Trees are planted, grown and harvested in rotation, which ensures there are also trees of different ages growing and storing carbon. Right: The paper recovery rate in South Africa is 71.7%.

By increasing the circularity in our sector, we can ensure that we not only increase our contribution to society, the economy and employment, but the forest products sector can be part of the solution to climate change and green economic recovery.

Consumers can play their part too. By using pulp and paper products that are certified and responsibly produced, and by recycling paper products, we can practise sound environmental stewardship and be part of transforming our economy into a circular one.

www.thepaperstory.co.za

WEC Projects brings clean water to bauxite mine

The US$1.4-billion Guinea Alumina Corporation (GAC) bauxite mine is a greenfield project located in the northwest region of Guinea. The mining company maintains a bauxite concession of 690 km^2 between the towns of Boké and Sangaredi with reserves estimated at around 400-million tonnes. Once extracted, the bauxite, used in the production of aluminium, is transported by rail to the Port of Kamsar, where barges are loaded for transhipment of the ore to freight ships located further out to sea.

One of the challenges facing the mine was the ability to supply potable water for 1 000 permanent mining camp employees, water for processing, general utility and dust suppression as well as for fire control. As the mine area is located close to the country's coast, borehole water has a high level of salinity. The mine had been supplying fresh water by tanker, resulting in excessive transport and logistical costs.

As the mining camp lacked the proper sewage treatment infrastructure, portable toilets were used as a temporary measure. However, a permanent solution for a constant supply of clean water and sewage treatment was required. The mine also stores two million litres of diesel on site for its operations, creating a fire risk. In order to ameliorate the risk, a reliable water supply was required.

Desalination and the problem of low tides

The desalination plant features a customised modular and containerised design, which facilitated both transport to the remote site and installation. The system's various processing stages comprise clarification, media filtration, ultrafiltration, seawater reverse osmosis, chemical dosing and remineralisation. As the plant utilises high pressures to process the seawater, an energy recovery system was installed that converts the pressure into power, reducing the overall energy requirements and costs of the system.

A major challenge for the desalination plant was its water source. Seawater is drawn from a nearby estuary. However, the mine's engineers did not foresee the problem of the estuary's highly variable tidal conditions, which adversely affect the water quality. The extremely low tides during the new and full moon periods of the month saw the pumps drawing in large amounts of sludge and suspended solids. The plant was not originally designed to handle such high loads of solids, so a unique lamella clarifier or inclined plate settler had to be added to remove particulates upstream from the plant's DMF and ultrafiltration systems.

These filters protect the delicate reverse osmosis membranes used during the desalination process. By reducing the solids load, the operating lifespan of the filters was vastly increased, resulting in considerable operational savings for the mine.

Wastewater treatment plant

The wastewater treatment plant utilises WEC's standard modular Model B Biological Nutrient Removal (BNR) plant as the basis for its customised design featuring combined activated sludge and clarification plants capable of handling flows up to 300 m^3 per day. Its design allows for easy transport and rapid deployment on site.

Says Wayne Taljaard, managing director of WEC Projects: "The major challenge we faced with this project was the last-minute changes to the plant design, which were required to cope with the unforeseen high solids content of the estuary seawater. This was easily overcome due to the customisable nature of its design. We have extensive experience with projects throughout Africa, so we are used to dealing often with unpredictable conditions." ❑

GEMÜ Systems service: holistic solutions from a single source

The GEMÜ Systems team has specialist skills and technical expertise in various applications, plants and products, and understands customer processes.

The new GEMÜ Systems service offers customised solutions that go beyond the provision of standard products. The department specialises in combining various components into system solutions and to support customers in a number of ways, from inquiries about individual components and ready-to-fit assemblies through to the joint development of complete systems. Three levels of service are available: Simple component assembly; Component assembly with control unit; Control systems and system development. GEMÜ Systems comprises the System Construction and Special Engineering departments, both of which focus on special solutions.

The team in System Construction is, broadly speaking, the creative department, focusing on customer requirements that go beyond GEMÜ's range of modular products. The department optimises internal processes and products, or recreates customers' existing solutions to generate added value for both sides. If GEMÜ System Construction can manufacture a sub-assembly at the same price or at a more favourable price, this reduces the customer's expenditure in the areas of purchasing, incoming goods, quality assurance, warehouse/logistics and lead times, as well as in the areas of capacity planning and capital commitment.

A further capability is in process or product requirements that are not yet available. To this end, the System Construction team finds creative and cost effective solutions.

The Special Engineering department takes on the roles of problem-solver and implementer of improvement ideas within production plants – mainly at the site in Germany, but also further afield. In addition to quick fixes to deal with loss of production during plant shutdowns for short periods, strategic plant design and process improvements are also implemented and new technologies and processes are tested, qualified and introduced for manufacture.

Thanks to many years of experience in measurement, valve and control systems technology, the GEMÜ Systems team has specialist skills and technical expertise in various applications, plants and products and understand customer processes. Thanks to knowledge and use of the latest technologies and manufacturing processes, the team is well prepared and works together with the customer to take the next step towards the future.

With the help of a specification sheet and drawings, the GEMÜ team is available to discuss requirements together with the customer and develop solutions.

www.gemu-group.com

BMG's food and beverage diaphragm pumps

BMG's range of Ingersoll Rand ARO® fluid management equipment comprises FDA-compliant air-operated diaphragm pumps that provide solutions for the food and beverage sector, as well as in pharmaceutical and cosmetic pumps applications.

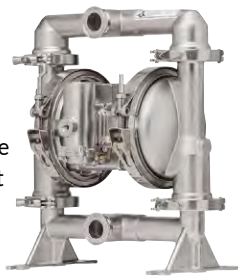
FDA compliant ARO sanitary pumps not only enhance product purity and ensure easy clean-out in environments that require the highest standards of cleanliness, but these pumps also enable safe operation at elevated temperatures. "The ARO Expert (EXP) line ensures high reliability and typically yield about 30% better flow rates than similar pumps. Since fluids are transferred efficiently and gently by ARO diaphragm pumps, shelf life of liquids such as beer is often extended. The gentle pumping action will not froth or separate fluids, thus improving end-product quality," explains Joe Pinheiro, BMG's national product manager for pumps.

"These robust ARO pumps, have been designed with the capacity to handle high volume transfer and dispensing applications, also optimising total cost of ownership for users.

"All ARO EXP pumps feature a patented unbalanced air valve design, which prevents stalling issues associated with conventional pumps. The exhaust valves effectively divert cold exhaust air from ice-prone components, to prevent freezing and minimise downtime. These pumps are able to pass even large shear-sensitive solids without degradation or heat build-up and are also designed to run dry, eliminating the risk of pump damage."

As an expansion to the standard double diaphragm pumps, BMG now offers plant managers and maintenance engineers a reliable choice of two pump ranges for sanitary applications.

BMG's ARO SD series features a Quick Knock Down (QKD) compression clamp system to facilitate easier cleaning and maintenance. This compression clamp band design also facilitates rapid disassembly and re-assembly of components for inspection and maintenance. Centre bodies available in stainless steel provide a durable construction that is compliant in FDA environments, while polypropylene centre bodies are lighter and chemically compatible for most caustic environments.



An ARO EXP SD air-operated diaphragm pump.

In the SD series, flow rates are optimised for improved overall performance, the electro-polished stainless steel 316ℓ construction is FDA compliant and has a higher temperature capability.

An optional single piece composite PTFE diaphragm minimises the number of collection points for the fluid being pumped, which speeds up disassembly, cleaning and re-assembly. The optional electronic interface integrates easily with PC or PLC systems and the ARO controller helps to reduce waste and increase productivity.

www.bmgworld.net

Flexicon introduce access platform line

Flexicon has introduced a new line of anti-slip access platforms to reach elevated process equipment safely, eliminating the need for ladders, scissor lifts and forklift cages. The modular system includes braced frames that can be bolted to the floor, 1 220 mm square deck sections and stairways with elevations up to 2.4 m.

Upper grab rails and mid-height rails bolted to stairway stringers and deck perimeters, together with auto-closing hinged safety gates and anti-slip grating on treads and decks, maximise personnel security.

Modularity allows stacking of frames to attain high elevations, and joining of decks in 1 220 mm square increments to create elevated walkways and extended mezzanine areas in shapes conforming to equipment configurations and plant layouts. Control panels can be mounted to the braced frame, allowing operation of equipment at various elevations.

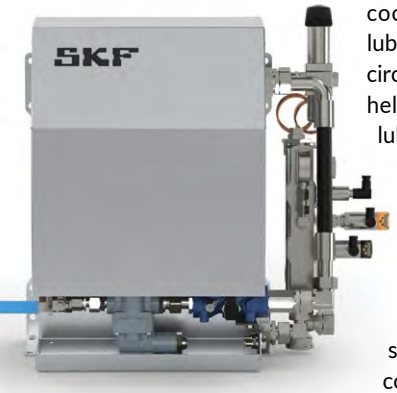
The company also manufactures flexible screw conveyors, pneumatic conveying systems, tubular cable conveyors, bulk bag dischargers, bulk bag conditioners, bulk bag fillers, manual dumping stations, drum/box/container tippers, weigh batching systems, and automated plant-wide systems integrated with new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

www.flexicon.co.za

Flexicon's new modular access platform system includes braced frames that can be bolted to the floor, 1 220 mm square deck sections and stairways with elevations up to 2.4 m.

Conditioning unit raises lubrication oil quality

SKF's Oil Conditioning Unit (OCU) helps to prolong bearing lifetimes by improving the performance of lubricants in service. The plug-and-play unit cools and filters lubrication oil as it circulates. Cooling helps to improve lubricant performance, while filtration removes contaminants. Filtration levels can be selected from coarse to ultra-fine. "All this helps to reduce bearing failures and ensure reliable operations," says Tommi Pitkaaho, product manager at SKF. "It can give a five-fold extension to oil service life." Around half of all premature bearing failures are caused by inappropriate lubrication and contamination. Cleaning lubrication oil, and bringing it to the optimum temperature, helps to reduce the risk of failure. This leads to increased machinery uptime and service life, plus a reduction in maintenance needs and repair costs.



SKF's Oil Conditioning Unit helps to prolong bearing life by improving lubricant performance.

An added benefit is that oil does not have to be replaced so frequently, which helps to reduce consumption. In addition, this helps to reduce the cost of oil disposal.

The OCU range includes a number of options, including stainless steel models for demanding environments, and add-on sensors to allow oil condition monitoring. It can also be bundled with other offerings, such as SKF's RecondOil DST oil treatment, which filters out nanoparticles to further enhance machine performance. This can be extended to an 'oil as a service' agreement. The OCU is widely used in machinery such as gearboxes, fans and large bearing housings. Typical applications are in heavy industries such as pulp & paper, steel and mining for machinery from drives and pumps to conveyors and rotating kilns.

The system can be connected to existing hydraulic and lubrication reservoirs when extra oil recovery is needed. It is typically aimed at OEMs and aftermarket users whose equipment runs at an oil temperature of between 10 and 80 °C and in ambient temperatures from -10 to 40 °C.

www.skf.com

Access and rescue contract for pumped storage scheme

A successful project at the Ingula pumped storage scheme in the Little Drakensberg escarpment in KwaZulu-Natal has resulted in leading rope access expert, Skyriders Access Specialists, clinching a similar project at the Drakensberg and Ingula pumped storage schemes, as well as the Gariep hydro power station on the banks of the Orange River near Norvalspont in the Eastern Cape.

Periodic inspection of the various schemes by specialised structural, civil or mechanical teams has required Skyriders to deploy some of its most highly qualified and experienced technicians to provide the necessary assistance and access, comments marketing manager Mike Zinn.

"A challenge presented by these pumped storage schemes is that we have to take the Mine Health & Safety Act into consideration, which specifies additional regulations and provisions that we need to comply with. It is quite a strict process, but we have been well-guided by the client's own safety team in this regard," explains Zinn.

While this represents one of the most challenging industrial environments that Skyriders has been involved with to date, the contract is a significant extension of the inspection, repair and access work that the company has carried out for electricity utility Eskom over the years for the bulk of its coal fired power-station fleet.

Zinn reveals that Skyriders is keen to introduce the possibility of using its Elios SkyEye drone system to carry out inspection work at these pumped storage schemes, which will not only mean less time taken, but also reduce risks for all personnel involved. "We are currently arranging for a demonstration of our drone service as the first step in the approval process to be able to deploy this technology in environments such as these," concludes Zinn.

www.ropeaccess.co.za

An example of a confined space environment typical of the work undertaken by Skyriders.

Real-time oil analysis reduces SA plant costs

Oil condition analysis equipment that monitors equipment oil in real time, enabling any anomalies in the oil to be detected at a very early stage, is now available across Africa from Bosch Rexroth South Africa Group Company, Hytec Fluid Technology (HFT). Sourced from England-based OEM, Tan Delta, the range of oil monitoring and analysis equipment helps to minimise plant equipment operating costs.

One of the most beneficial features of these sensors is that the oil condition data can be accessed by authorised personnel from anywhere in the world, improving control and efficiency. The solution also enhances plant equipment competitiveness and helps plants meet environmental, social and governance (ESG) objectives.

The Tan Delta range of oil condition analysis equipment from HFT comprises oil condition analysis sensors – including ATEX-compliant sensors – sensor kits and accessories, modems and gateways, and digital display solutions. The range is highly effective and is trusted by leading equipment manufacturers and plant operators around the world.

Appointed as the official Tan Delta African distributor on 19 March 2021, HFT supplies and services Tan Delta's entire standard range of equipment. "We are also in a position to provide tailored oil monitoring and analysis solutions to suit specific client needs," says Wynand Kapp, divisional manager for Industrial Filtration at HFT. The average lead time for imported stock, due to COVID-19 restrictions, is four to six weeks, but most equipment is available from HFT ex-stock, significantly reducing this lead time.

The equipment, with its patented Tan Delta analysis technology, can be used for all applications across all industrial sectors and features prominently in the mining, power generation – including wind generation plants – marine and shipping, and manufacturing industries.

Installation and setup is done after oil profiling so that the oil analysis runs hand-in-hand with the oil profile, including the monitoring requirements. "This enables oil condition monitoring in real time," Kapp says.

"Oil is the life blood of any hydraulic application," Kapp adds. "It is therefore beneficial for plant operators to have this telemetry and data at their fingertips, allowing for immediate intervention before failure can occur."

"Where oil condition issues are indicated," Kapp adds, "HFT has the technology and equipment to resolve them for all oil conditioning purposes." The technology and equipment includes solutions for contamination mitigation or filtration requirements to the niche technologies required for acid remediation, varnish mitigation, vacuum dehydration or electrostatic removal requirements."

All units are supplied as complete Express Kits, which means they come standard with the sensor, small display and data logger unit, along with all the required cables.

"A partnership with a well-established entity like Tan Delta opens the highway of endless possibilities when it comes to correct and effective oil condition monitoring, putting our customers on the best path to total fluid management." Kapp concludes.

www.boschrexroth.co.za

The Tan Delta range of analysis equipment monitors equipment oil in real-time, enabling anomalies in the oil to be detected at a very early stage.

SEW industrial gearboxes for DRC mine

SEW-EURODRIVE's upgraded X.e-Series industrial gearboxes, together with different cooling fans, were chosen for the mine conveyors in the extremely hot and humid environment of the DRC.

SEW-EURODRIVE South Africa found its well-established capabilities and extensive experience tested to the full, when it was contracted by a new copper mine in the DRC to supply conveyer drives capable of operating in an extremely hot and humid environment where heavy rain is also common.

Whereas in South Africa and many other parts of sub-Saharan Africa, dust is typically the main challenge, this project required bespoke solutions for the hot and wet DRC environment. "One of the key considerations was to ensure cooling was sufficient," explains Andreas Meid, head of engineering. "Fortunately, our upgraded X.e-Series gearbox, with the different cooling fans that we have available, was up to the task."

The high humidity in the DRC meant the standard breather used in the typical Southern African environment, for example, was unsuitable. "A standard breather for keeping dust out of a gearbox runs a risk of getting moisture inside the unit, reducing the life of the oil and components," he says. "Our solution was to use a Des-Case breather that removes the moisture from the air and prevents it from entering the gearbox."

The gearboxes were imported from Germany, while base plates and drive trains were manufactured in South Africa to customer requirements. The consignment was then shipped to up to the DRC and installed.

"Over the years, SEW-EURODRIVE has been extending its capabilities to localise the assembly of these products, and our capacity will be further enhanced by our new facility in Johannesburg, which is earmarked for opening in January 2022," Meid concludes.

www.sew-eurodrive.co.za

Grundfos works with international brewer for sustainable efficiency

Grundfos submersible pumps, smart digital pumps and vertical multistage centrifugal pumps have been installed for a Sedibeng brewery's wastewater and water treatment plants. The installation, in line with the brewer's commitment to conserve water optimises water use within its facility.

The water treatment plant, enables clean 'raw' water from the municipality to be purified for brewing purposes. After the beer is produced, beer residues and water used for pipe cleaning are treated in the wastewater plant to meet regulated environmental discharge limits. This water can also be re-used for cleaning, reducing the need to draw on the municipal supply.

According to Raymond Makgoga, Grundfos associate sales engineer, three Grundfos submersible wastewater pumps were provided to transfer water from the brewery to the water recovery plant. After the sedimentation process, water is pumped to the reclamation plant for final treatment. In this circuit, around 6 000 m^3 of water is pumped daily, with the pumps being driven by 15 kW high-efficiency IE3 motors.

"In the water treatment plant, a number of Grundfos Smart Digital S and Smart Digital XL pumps are installed, mounted on dosing skids," says Makgoga. "These must accommodate a range of chemicals: from sodium hydroxide and sodium hypochlorite in the reverse osmosis circuit; to citric acid and anti-scalant in the ultra-filtration circuit. "These systems communicate vital data between the pumps and the PLC so that chemical dosing is accurate and appropriate," he says. "This eliminates over-dosing and ensures that chemicals are not wasted."

In the reverse osmosis section, purified water is pumped using Grundfos vertical multi-stage 316 stainless steel pumps.

The dosing pumps were supplied as a complete package, which includes Grundfos's CIU 500 interface, a standard interface for data transmission between an industrial ethernet network and a Grundfos pump or controller. Other accessories include pressure relief valves, pressure loading valves for maintaining pressure on the discharge line, and pulsation dampers to ensure smooth dosing flow.

Energy efficiency is also an important factor, considering the significant energy consumed by wastewater treatment plants. Some 28% of the Sedibeng facility's energy is consumed by utilities, which are therefore the first port of call for energy saving efforts.

Large pumps in the system transfer about 1 750 m^3 of water per hour around the brewery, pumping 24 hours a day. To monitor and conserve energy, Makgoga says the company uses a Utilities Benchmark Model (UBM), which compares the electricity used with the kilograms of water treated and chemical oxygen demand (COD).

The use of the high-efficiency Grundfos pumps has assisted in reducing energy consumption to about 1.3 kW per kilogram COD treated, from a previous level of over 1.9 kW/kg COD. These statistics are tracked daily, and the new equipment helps to facilitate this data tracking as the brewery works towards ever more demanding energy saving targets.

www.grundfos.com/za

Modern lubricants, viscosity and the role of additives

In Part 2 of her series entitled Diesel emissions – A breath of fresh air, Wearcheck's technical manager, Steven Lumley, talks about lubricant viscosity and the different roles of additives. *MechChem Africa* presents the key takeaways.

Driving the market for cleaner diesel engines are three interacting developments: better emission system compatibility; improved fuel economy; and greater engine durability. Fuel and lubricant manufacturers play a key role in achieving these drivers.

Improved fuel economy

Lubricant manufacturers make use of multiple complex physical and chemical strategies to improve fuel economy, the most common being to reduce the viscosity of the oil, which often necessitates the selection of higher quality base oil, combined with the use of additives such as viscosity index improvers and friction modifiers.

The fuel consumption of an engine is affected by, among other factors, the friction that must be overcome in the engine, for which the engine lubricant plays an important role. In principle, every engine runs more smoothly and economically with a less viscous (thinner) oil. Yet the thinner the oil, the weaker the oil film needed to prevent mechanical contact between the moving metal surfaces. Film stability can be off-set, however, by using friction modifiers and viscosity index improver additives.

Lower oil viscosity grades such as 5W30 and 10W30 are now commonplace in heavy-duty diesel engines. The SAE grading system defines both low and high temperature viscosity requirements – typically kinematic viscosity – which is a measure of an oil's resistance to flow under the force of gravity at specific temperatures.

There is another important type of viscosity, however: high temperature high shear (HTHS) viscosity, which is a fluid's resistance to flow under conditions resembling highly-loaded journal bearings in firing internal combustion engines.

In an operating engine the lubricant is required to protect engine components under hotter and more severe operating conditions, and HTHS dynamic viscosity best predicts the oil's behaviour in these operating conditions. Engine lubricants can have the same SAE viscosity grade but different HTHS viscosity, however, so understanding the relationship between these readings is becoming more important as more engine manufacturers move towards lower HTHS engine oils.

The American Petroleum Institute (API) base oil classification system groups base oils according to their purity and viscosity Index. The system uses physical and chemical parameters to divide all base stocks into five groups – Groups I, II, III, IV and V. Group I, II, and III are mineral oil derived from crude oil, Group IV is a fully synthetic oil, and Group V is for all base oils that are not included in one of the other groups.

Group I base stocks are high in aromatics, sulphur and nitrogen, all of which have a negative impact on lubricant performance, which makes them unacceptable for most modern diesel engine oil formulations. These issues have led many formulators to focus on Group II/II+ and Group III base oils due their lower volatility, aromatic and sulphur contents, better oxidation stability and higher viscosity index.

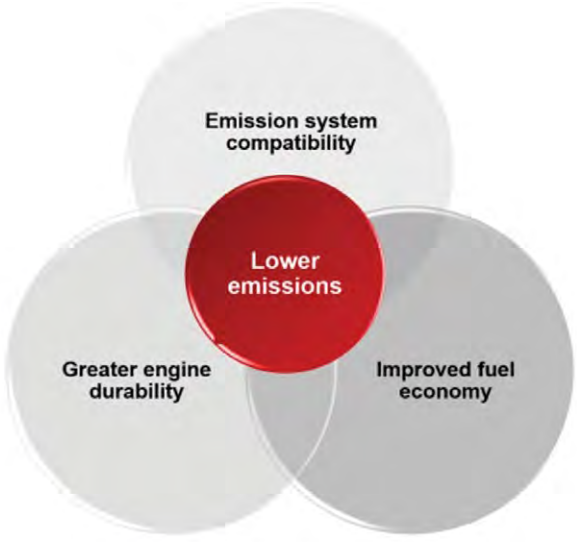
Friction modifiers (FMs)

Friction modifiers are typically used in engine oils to lower metal-to-metal friction between interacting component surfaces, to reduce wear and improve fuel economy. However, their effectiveness is dependent on the lubrication regime within the engine, which is also affected by engine design.

The typical regimes encountered are hydrodynamic or full-film lubrication, where two metal surfaces are completely separated by an unbroken lubricant film; boundary lubrication, where occasional metal-to-metal contact takes place between surfaces and mixed lubrication, which is a combination of the two. For engine components lubricated hydrodynamically, the friction is governed by the viscosity of the oil: thinner oil results in less the friction. For engine components experiencing boundary or mixed lubrication, FMs are used to more effectively reduce friction. For example, engines with roller follower valve train systems have relatively little boundary lubrication and friction modifiers may not deliver significant fuel economy benefits, while engines without roller followers may show significantly more benefit.

Viscosity Index Improvers (VIIs)

Viscosity Index Improvers (VIIs) are large polymer additives that partially prevent oil from thinning (losing viscosity) as operating temperatures increase, thus improved fuel economy. They are also responsible



Key drivers shaping modern emission systems are lower emissions, improved fuel economy and greater engine durability.

Left: Viscosity Index Improvers (VIIs) are large polymer additives that partially prevent the oil from thinning. Right: A blocked diesel particulate filter (DPF). Ash eventually result in irreversible filter blockage, increasing back pressure to the engine and fuel consumption, while decreasing power.

for better oil flow at low temperatures, resulting in reduced wear.

Properly-designed VIIs support higher lubricant viscosities in the hotter engine operating environments for robust wear protection, while maintaining lower viscosities in moderate engine temperature environments, which provides fuel economy benefits. They allow lubricant formulators to meet the minimum HTHS viscosity while lowering kinematic viscosity at the same time.

Emission system compatibility

The most important aspect of modern-day diesel engine oil formulation is its compatibility with exhaust aftertreatment technologies. The chemical composition of a diesel engine oil contains, among other things, sulphated ash, phosphorous and sulphur. These substances provide attributes such as detergency; neutralisation of acids, anti-wear properties and anti-oxidants.

Unfortunately, these chemicals are problematic for current emission technology and as a result, lubricant manufacturers are facing lubricant formulation restrictions aimed at protecting emission control systems.

This has given rise to a new class of low sulphated ash, phosphorus and sulphur (low-SAPS) engine oils. These oils are also designated 'low-ash' due to their reduces tendency to form ash.

While some additives have organic alternatives containing little or no sulphur and phosphorous and which do not contribute to sulphated ash, some important anti-wear and detergent additives do not have organic alternatives.

Until effective replacements are found for these, a careful balancing and reduction in the concentrations of SAPS-contributing additives is required to ensure that the engine oil meets all the performance requirements that engines and emission systems demand.

There are three major mechanisms for possible interference between the lubricants' components and aftertreatment devices: poisoning, deactivation and accumulation of ash deposits.

Sulphated ash: The term sulphated ash relates to the amount of incombustible metallic ash that remains as a result of engine oil combustion. This ash is mostly derived from the engine oil's calcium and magnesium-based detergent and zinc-based anti-wear additives.

Ash from the small amount of oil burnt as part of normal engine operation is trapped in the diesel particulate filter (DPF). During regeneration to remove particulate matter (PM) from the filter, the already burnt ash portion cannot be oxidised and remains in the filter, causing the DPF to become irreversibly blocked. Low SAPS oils are formulated to limit the maximum sulphated ash allowed in the oil, primarily to protect against DPF blockage.

Phosphorus: Anti-wear, anti-oxidation additives known as ZDDPs have been a mainstay of diesel engine oil formulation for more than 60 years. Unfortunately, ZDDPs contain two of the limited substances in low SAPS oils – ash and phosphorus.

Diesel oxidation catalysts (DOCs) are degraded by phosphorous, which deactivates the noble metal catalysts by building up a coating on the active catalyst sites, causing irreversible damage over time. This enables harmful emissions such as NOx, CO and HCs to pass through the catalysts unchanged.

Catalyst poisoning by phosphorous can also significantly decrease filtration efficiency of both catalysed (C-DPF) and uncatalysed DPF substrates, which also results in reduced soot regeneration efficiency.

Sulphur: Sulphur emissions in an diesel engine originate from two sources: from the fuel and from the lubricant. Lubricant-derived sulphur emissions are under increased scrutiny because of the lubricant's contribution to total SO_2 emissions, which has a tendency to significantly hinder NOx adsorber catalyst (NAC) performance.

Heavy-duty diesel engine oils are composed of approximately 75 to 85% base oil. The sulphur concentration in these base oil can range from zero, for synthetic base fluids such as polyalphaolefins, to as high as 0.5% by weight in Group I base stocks.

Additive systems such as anti-wear agents (ZDDPs), corrosion inhibitors, detergents and friction modifiers are also a major source of sulphur in lubricating oils. Once in the exhaust stream, sulphur can inhibit the effectiveness of the DOC, C-DPF and SCR systems, while also increasing particulate emissions, which leading to blockages of the NAC and reduced engine performance.

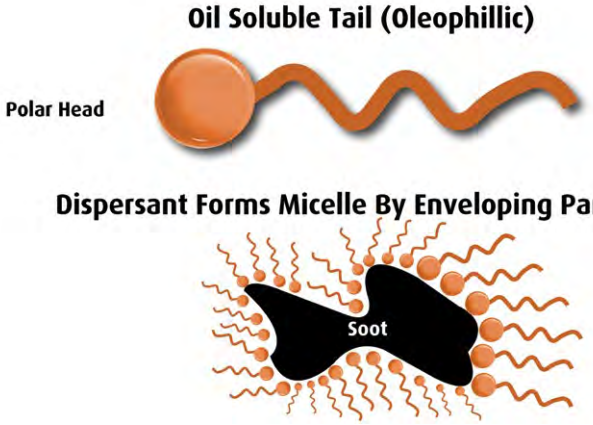
Diesel fuel also contains sulphur derived from the original crude oil source, which can still be present after the refining process. About 98% of this sulphur in diesel fuel oxidises in the combustion process to sulphur dioxide (SO_2) that contributes to the formation of smog and acid rain.

Euro V to VI-rated diesel engines have advanced aftertreatment systems for particulates and NOx, but these systems are sensitive to the sulphur content in diesel fuel. For this reason, most engine manufacturers have progressively limited fuel sulphur content to 10 ppm, which is known as ultralow-sulphur diesel.

DPF regeneration is also affected by higher sulphur because it decreases NOx formation in DOCs. This leads to performance loss in passive DPF systems that depend on upstream NOx from the DOC to oxidise the soot. Higher back pressure and more frequent active regeneration result in higher fuel consumption.

South Africa's fuel improvement initiative, in support of global greenhouse gas reduction agreements, were planned to meet Euro V standards by 2017 through the Clean Fuels 2 (CF2) programme, but the programme stalled due to uncertainty around the cost recovery mechanism for refinery upgrades, which in 2009 was estimated at US$3.9-billion.

Sasol introduced 10 ppm diesel to the market in late 2013 as part of the initial roll-out strategy, but to date 10 ppm is still not widely available. This limits the availability of new engine technology as low sulphur fuels are key to enabling advanced control technologies and fuel-efficient designs.



Dispersants are cleaning agents that inhibit sludge-formation by keeping insoluble contaminants like soot dispersed in the lubricant.

Durability and extended drain intervals

There are also additional trends affecting future diesel engine oil formulations such as increased oil drain intervals, smaller sump levels, higher running temperatures and shear forces, all of which put increased stress on the lubricants. Additives tasked with achieving all of this include:

Detergents: Detergents are cleaning agents that contain metals. They work at high temperatures in pistons, rings, liners and valves to reduce or remove deposits on surfaces and in the bulk of the oil. They also neutralise acidic compounds formed during the combustion of diesel or due to base oil oxidation. The Total Base Number (TBN) of the oil is an expression of this neutralisation ability.

The majority of metallic detergents are based on either calcium or magnesium attached to an oil-soluble organic soap, typically sulphonates, phenates or salicylates. However, because magnesium-based detergents provide a higher TBN per unit of sulphated ash produced, they are now favoured in formulations.

A reduction in TBN is expected with many low-SAPS oils. While the TBN of new oil is important, the ability of oil to retain TBN over extended drain intervals is arguably more critical than the absolute value in the new oil.

Dispersants: Dispersants are non-metallic, ashless cleaning agents that inhibit sludge-formation by keeping insoluble contaminants such as soot dispersed in the lubricant and preventing them from coating metal surfaces. The soot particles themselves are sub-micron in size when formed, but with progressive fuel usage these particles will eventually agglomerate.

EGR system recirculate a small amount of cooled exhaust gas, which in turn reduces the NOx gases. However, recirculating exhaust gas also creates a multi-pass opportunity for soot to accumulate in the engine oil, causing sludge to form on rocker and front engine covers, bearings to fail, valve bridges and fuel injection links to wear, and filters to plug – and this is further exacerbated by extending oil drain intervals.

In response to this issue, lubricant blenders have had to increase the treat rate of this additive and dispersants are typically one of the major components % of the additive package. However, the thickness of the polymeric-based dispersant becomes problematic, resulting in the use of lighter base stocks, resulting in higher volatility lubricants.

Anti-oxidants: Oxidation is a form of irreversible chemical deterioration of the lubricant. It is caused by the base oil combining with oxygen, sulphur and nitrogen to form harmful compounds. Oxidation creates oil-insoluble, high-molecular-weight molecules that increase the viscosity of the lubricant, accelerate wear and eventually lead to varnish-formation, typically on pistons and valves in engines. The use of EGR systems can increase the rate at which the oil oxidises as many of these systems rely on the engine's coolant system to reduce exhaust gas temperatures, which increases the engine running temperature.

Anti-oxidants are a group of additives that minimise oxidation and deposit-formation by decomposing reactive hydroperoxides and free radicals before they can lead to oxidation of the base oil. There are two types of antioxidants: primary and secondary antioxidants. Primary antioxidants are free radical scavengers typically comprised of aromatic amines and hindered phenolics. Secondary antioxidants are peroxide decomposers typically composed of phosphites and certain sulphur-containing compounds.

Ashless-type oxidation inhibitors have helped to replace the oxidation performance of ZDDPs, with recent additive systems making use of aminic and phenolic chemistries. The use of molybdenum-based chemistry for improved antioxidancy performance has also gained popularity in recent years.

The API has introduced two new standards to take into account the latest technology in diesel engines. API CK-4 and FA-4 first appeared in the API service symbol donut in 2017. These new service categories improve upon existing standards by providing enhanced protection against oil oxidation, engine wear, piston deposits, shear stability as well as providing better compatibility with emission-controlling devices.

API CK-4 was introduced to reflect the upgraded performance benefits beyond API CJ-4 for engine lubricants with a minimum HTHS viscosity of 3.5cP. New API CK-4 lubricants must pass more stringent oxidation and aeration limits with increased shear stability, providing greater protection for heavy-duty diesel engines. CK-4 is backward-compatible with older API categories such CJ-4.

Conclusion

It is widely acknowledged that there is more to be done in the drive to further reduce harmful gases, improve air quality and mitigate the effects of global warming. As former UN secretary General Ban Ki-moon famously said: "There is no plan B because there is no planet B".

How far we have come, though. 30 years ago, one heavy on-highway truck produced the same level of particulate matter as 100 heavy goods vehicles produced in 2019. Now isn't that a breath of fresh air!

www.wearcheck.co.za

Scan the QR code opposite to access the original pdf

RUNNING IN CIRCLES

How the paper industry is the epitome of the circular economy

Even before extended producer responsibility (EPR) was mandated by Government in May 2021, the paper manufacturing and recycling sector had been embarking on process and production innovation to reduce its environmental footprint, divert waste from landfill and stay ahead of the circular economy curve.

The circular economy is a closed loop; taking, making and re-using, as opposed to the linear "take-make-waste" approach. When we treat raw materials (such as wood and water) and energy as infinite, we end up with waste. Waste costs money – the costs of landfilling, the loss of reusable materials, and livelihoods that could have been supported. The environment also loses out – greenhouse gases are emitted when waste degrades.

The principles of the circular economy include reducing waste by design, retaining materials in circulation and restoring the systems from which resources are extracted. The forest products industry has adopted the circular nature of doing business for many years.

By increasing our sector's circularity, we increase our contribution to society, the economy and employment, and are part of the solution to climate change and green economic recovery.

Circles in the forest

We all know that paper comes from wood – even fibres in recycled paper came from a tree at some point. In South Africa's case, such trees are sustainably farmed in plantations, with stringent management of their impact on water, soil, indigenous landscapes and biodiversity.

Gone are the days of detrimental, wall-to-wall afforestation. Today, forestry companies work in tandem with high conservation value areas to create a mosaic of planted trees and protected spaces.

Sustainable forestry is circular in nature with planting, harvesting and replanting happening in rotation.

Sustainable forest management balances economic, social and environmental needs. While forestry practices optimise the land's ability to mitigate climate change through carbon sequestration, they also act as buffers for protected indigenous areas.

Depending on the species – usually eucalyptus or pine – these trees take around seven to 10 years to reach maturity. The reason we use exotic species is because they are fast-growing and we cannot – and will not – use indigenous trees for productive purposes.

Currently, South Africa has 850 million trees growing over 676 000 hectares reserved for pulp and papermaking. Less than 10% of this area is harvested during the year. The same area is replanted with new trees – saplings – often at a ratio of two trees for each one harvested.

This is the first circle: *plant, grow, harvest, replant…*

Circles of life

The circular economy then extends to leaving forest residues as a mulch for the next generation of trees. After harvesting, bark, limbs, and leaves are left behind to offer sustenance and refuge for creatures that aid in the decomposition of organic matter, which in turn attracts birds and other critters – and so we have another circle.

In addition, through photosynthesis, trees remove carbon dioxide from the atmosphere and convert it into food for growth. They also take up water, from the ground or rainfall. They keep carbon locked up in their fibres and give us back oxygen, and some water is also returned to the atmosphere through transpiration.

Circles in the mill

Pulp and paper mills operate closed loop processes, by using natural resources efficiently – often more than once.

Process water is recycled, lost fibre is recovered and reused, and spent chemicals are recovered for energy production. Even bark – a biomass – is used to power boilers, producing steam that generates electricity.

This makes us better at using more of the tree, ensuring little goes to waste.

Circling the bin

Once pulp and paper are made into office paper, magazines, books, pizza boxes, cereal boxes, cardboard boxes, newspapers, milk and juice cartons, the circle starts to hit home. Office paper can be printed on both sides, and boxes can be reused as storage. Magazines and newspapers are used by school children for projects and posters.

Importantly, paper fibres can be recycled; how we dispose of paper products creates another circle. With a four-year average recovery rate of 70%, paper is the second most recovered material in South Africa.

By putting them in our rubbish bin, paper products go to landfill – or if retrieved by a waste collector, they might get to a recycling mill.

Ideally, we want paper products separate from wet waste. Even the simple act of placing clean recycling in a separate bag or box for a waste collector makes a considerable difference.

Recovered paper is reprocessed and made into packaging and tissue that comes back into our homes, and which we use and recycle. And so the paper "circle" continues. The carbon also stays locked up for longer when paper is recycled.

Circles in the laboratory

Some wood-based products are already in circulation in everyday life. Dissolving wood pulp is used in food, pharmaceutical and textiles. Cellulose binds and emulsifies – low-fat yoghurt, cheese and ice cream; lipsticks and vitamins. Wood can produce xylitol, a non-nutritive sweetener.

We also make bricks and bio-composites from paper sludge, leftovers from paper recycling when fibres become too short for use, and biodegradable alternatives to fossil fuels from lignin.

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Lights-out manufacturing feasible from the late 2020s

Lux's new framework report entitled, 'The Path to Lights-Out Manufacturing' explores the roadmap for automating different types of manufacturing tasks. The report predicts that complete 'lights-out' manufacturing automation will be feasible before the end of this decade.

As more tasks become automated across manufacturing, these environments will rely less and less upon manual human labour, with the ultimate goal of 'lights-out' manufacturing, a production methodology in which manufacturing is fully automated and requires no human presence at all, so that the lights and even ventilation systems can be shut off.

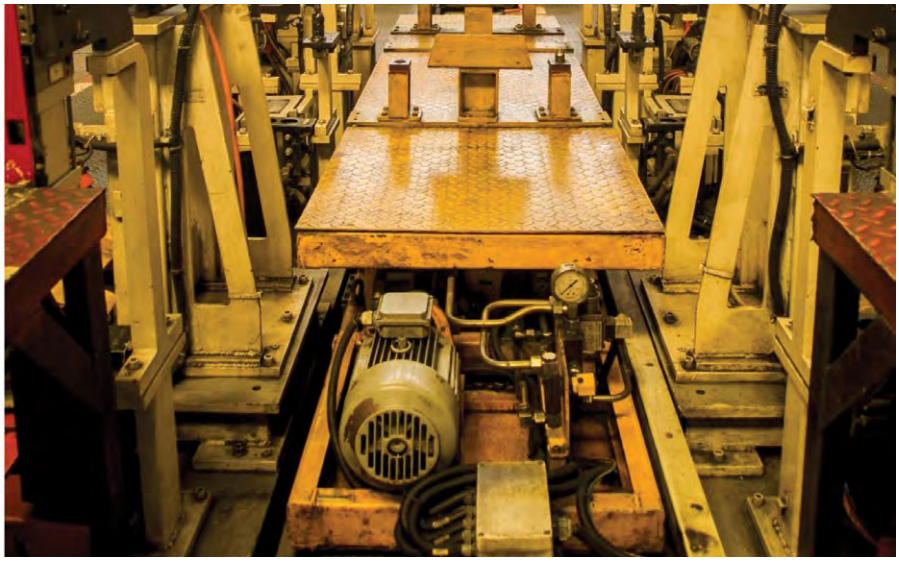
Achieving lights-out manufacturing is a major goal for many companies, but it might not be realistic due to significant barriers and a prolonged timeline, according to new analysis from Lux Research, a leading provider of tech-enabled research and innovation advisory services.

Lux's 'The Path to Lights-Out Manufacturing' report explores the roadmap for automating different types of manufacturing tasks, including the robotics technologies involved, the main drivers and barriers to automation, and a lights-out manufacturing timeline for different manufacturing tasks. Furthermore, Lux presents a framework that can be used across all industries to visualise the timeline of lights-out manufacturing moving forward.

While lights-out manufacturing sounds futuristic, the concept has been circulating for a couple of decades now. In fact, many organisations have operated several forms of lights-out factories:

- IBM built a lights-out plant in Texas in 1980 to assemble computer keyboards. However, the project was shut down due to fixed tooling, which made the plant too inflexible to adapt to product variations.
- GE operated a light bulb factory in Virginia from the early 1990s to 2010 that produced more than 10 000 units per hour with only a few human workers assigned to perform maintenance on equipment.
- Fanuc has been running 22 lights-out factories since the early 2000s that use robots to manufacture CNC machines. The robots can go unsupervised and without maintenance for as long as a month at a time.
- Philips has been running lights-out manufacturing plants to produce electric razors with a team of 128 robots and nine quality assurance (QA) workers.

According to the Lux Tech Signal, there has been a steady rise in activity and interest in lights-out manufacturing from stakeholders in the past five years, and ideas developed in the late 20th century are now seeing a resurgence because of modern technologies such as advanced robotics, computer vision systems, the industrial IoT, machine learning algorithms and advanced computing.



Based on the Lux Research report's findings, most manufacturing tasks requiring one or two highly mature robots will be automated between the late 2020s and the early 2030s.

Similarly, funding in robotics and automation in manufacturing has also increased significantly since 2015. While most of the funding is in the form of venture capital (VC) investments in emerging start-ups, public companies have also raised millions in post-IPO (initial public offering) funding, with North America and Asia being the two biggest investors in robotics and automation for manufacturing.

"Achieving lights-out manufacturing will require the use of robotics technologies to automate physical processes, such as moving materials, cleaning tanks and inspecting products and assets, alongside software-based automation of logical processes," explains Miraj Mainali, Senior Research Associate at Lux Research and lead author of the report. "While there are dozens of robotics technologies that can automate physical tasks, we have identified the most important ones, including robotic arms, autonomous mobile robots (AMRs) and legged robots, and assigned an average technology maturity to each one based on findings from interviews and other research in this space."

In addition to the most influential robotics technologies, Lux also identifies the main drivers of and barriers to lights-out manufacturing. Once identified, the drivers' and barriers' significance is evaluated. The combination of the technological maturity and the significance of the drivers and barriers in play for a given lights-out manufacturing task allows Lux to create a scatter diagram, weigh the benefits of the automation of each task, and place it on a timeline.

While lights-out could put tens of thousands of factory workers out of work, it will also create demand for a new type of workforce that designs and develops the necessary hardware and software for these systems, which will add to the already existing talent shortage in the skilled workforce in areas such as data analytics. The report also identifies the excessively high cost of the technologies required as a barrier to adoption, especially for small manufacturing companies, while cultural pushback and unemployment are creating rising demand for regulations against large-scale automation.

Based on the report's findings, Lux predicts that most manufacturing tasks requiring one or two highly mature robots will be automated between the late 2020s and the early 2030s. However, highly unstructured tasks such as equipment repair and installation will probably always require some human intervention and never be fully automated.

While achieving lights-out manufacturing is the ultimate goal for many manufacturing companies, it might not be realistic because of the many challenges involved and the lengthy timeline.

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