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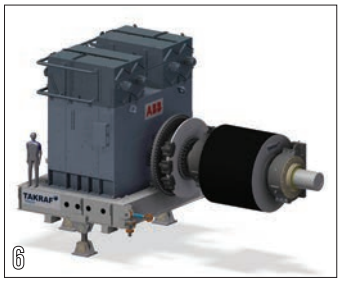

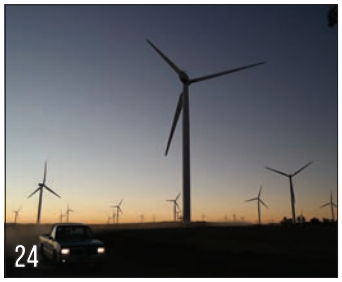

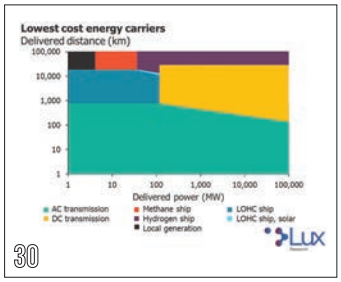

CROWN PUBLICATIONS

Published bi-monthly by
Crown Publications (Pty) Ltd
Cnr Theunis and Sovereign Streets
Bedford Gardens 2007
PO Box 140, Bedfordview, 2008
Tel: +27 11 622 4770
e-mail: mechchemafrica@crown.co.za
www.mechchemafricamagazine.co.za

Editor: Peter Middleton
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Design: Katlego Montsho
Publisher: Karen Grant
Deputy publisher: Wilhelm du Plessis
Circulation: Brenda Grossmann

Transparency You Can See
Average circulation
Jan-Mar 2020: 4 003

Printed by: Tandym Print, Cape Town

CESA
Consulting Engineers South Africa
Publisher of the Year 2018
(Trade Publications)

SpaceX launches a new era of human achievement

Peter Middleton

COMMENT

On Saturday May 30, while the global coronavirus pandemic was changing the world as we know it, I sat watching the launch of SpaceX's Falcon 9 rocket coupled to the Crew Dragon space capsule, which was carrying two astronauts from the United States – commander Douglas Hurley and joint-operations commander Robert Behnken – to the orbiting International Space Station (ISS).

The ISS itself is hardly new, so I did wonder exactly how novel the event was. Having first been occupied in 2000, 20-years of continuous human presence in space will be realised in November this year. In this time, ISS modules have been launched regularly by Russian Proton and Soyuz rockets, along with US Space Shuttles, which were routinely ferrying supplies and crew, who carried out regular upgrades, expansions and experiments.

But this SpaceX launch captured my imagination. Perhaps because it was preceded by the 50th anniversary celebrations of the Apollo 11 moon landing last year; or the Mars Netflix series, which cleverly interplays comments from SpaceX founder, Elon Musk, and other space professionals onto a drama exploring the colonisation of Mars and its potential challenges.

Or perhaps it was just because I was in lockdown at the time.

So on Wednesday May 27, I watched the first launch attempt, which was aborted due to Tropical Storm Bertha, but on the Saturday, I saw an extraordinarily precise lift-off, which went far more smoothly than any space drama would have deemed entertaining.

That same evening, having heard it was possible to see the orbiting ISS – and in the hope that we might see the SpaceX Crew Dragon capsule chasing it – I was out just after sunset looking up at the sky. The ISS came from the West, a fast moving and easily visible dot of light that steadily moved across the night sky, disappearing from view in the East within five minutes or so.

Crew Dragon, however, did not reveal itself.

The next day, I was avidly watching NASA's live stream of the Dragon capsule arriving at the space station. After a period of test manoeuvres that showed off the use of the capsule's 16 Draco thrusters to precisely position the spacecraft in the vacuum of space, the process of docking the ship with the space station began.

It was a slow and precise process, boring to watch for some, but I found it amazing. For a vehicle to travel into space, orbit the Earth, chase down the ISS and couple – to millimetre accuracy – with a football field sized space station, I find remarkable, exciting and uplifting.

Why is the mission historic? The Demo-2 mission is the first private/commercial venture to carry astronauts into space. Although still a test flight, the mission demonstrates SpaceX's crew transportation system and is described as heralding "a new era of human spaceflight as American astronauts once again launch on an American rocket from American soil"; the first time since the conclusion of the Space Shuttle Programme in 2011.

Making commercialisation possible is SpaceX's development of reusable spacecraft. The Falcon 9 boosters used to lift the Dragon capsule into orbit were recovered for reuse. NASA says SpaceX can begin reusing Crew Dragon vehicles and Falcon 9 first stage boosters on crewed launches beginning with the second post-certification mission, or Crew-2, which is scheduled in 2021. This will follow the Crew-1 mission, SpaceX's first operational astronaut flight, which is scheduled for launch in mid-September this year.

This all depends, of course, on the successful completion of the Demo-2 mission. The Crew Dragon still has to bring the astronauts safely back to Earth. This will have to precede the Crew-1 mission, so the Crew Dragon capsule will probably drop Hurley and Behnken gently into the Atlantic Ocean sometime in August.

Like many on Earth, the two astronauts have been in isolation, too. They will have been communicating with their loved ones remotely via the likes of Zoom and Teams. As well as their fantastic space experience, though, they will have experienced the best of international cooperation, interacting on space projects with people from Russia, Canada, Japan, the Russian Federation, the United States, and from the European Space Agency, Belgium, Denmark, France, Germany, Italy, The Netherlands, Norway, Spain, Sweden, Switzerland and the United Kingdom.

They may be coming back to a world changed by COVID-19, but they have played their part in extending global human achievement. Most importantly, this demonstration mission, the ISS projects and the long-term SpaceX endeavour to take humankind to Mars, are all unifying, in stark contrast to the dangerously divisive rhetoric that has emerged across the world in recent times.

Let's hope the uplifting aspect of this technical achievement outweighs the politically divisiveness and negativity that COVID-19 is likely to be leaving in its wake. ❑

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TRI-SHARK from Zwick – exceptional performance
everything one needs in a control valve

Valve & Automation South Africa presents the features and advantages of the TRI-SHARK Throttling Trim Cartridge valve from Zwick, a valve that combines the advantages of leak-free triple-offset valves (TOVs) with high-performance control valves into a single valve solution.

When choosing zero leakage valves for open/close functionality, triple eccentric valves, also known as triple-offset valves (TOVs), are becoming increasingly popular. This valve type provides many advantages, including zero leakage, compact design, frictionless functionality and maintenance-free operation – and all these reasons contribute to their popularity increase.

Within fixed limits, TOVs can also be used for control and/or throttling applications. To extend the range and to transform these valves into efficient, high-performance control valves, however, Zwick has further developed the triple-offset TRI-SHARK valve range.

The TRI-SHARK Throttling Trim Cartridge valve

The combination of Zwick's Throttling Trim Cartridge and its TOV TRI-CON series to create TRI-SHARK has resulted in a very high-performance, zero leakage shut-off and triple-offset control valve. The latest design offers control performance equal to that of globe or rotary plug valves, but incorporates much better shut-off capabilities while having a much lighter weight.

This valve combination provides numerous advantages. On one hand, it includes all the advantages of triple offset valves, while on the other, it features all the special qualities of an excellent control valve. It enables one single style of valve to be used for both on/off and control applications.

The Throttling Trim Cartridge is designed to be fixed into the valve body while the valve disc pivots, enabling the flow between the disc and cartridge to be as low as possible. Furthermore, the cartridge is manufactured with multiple, optimised slots, which divide the flow and clear an exact calculated cross section while opening or closing the valve.

Equal percentage flow characteristics

With the TRI-SHARK Throttling Trim Cartridge, the valve's characteristic is changed to equal percentage flow, which is the preferred characteristic for the majority of flow applications. TRI-SHARK's flow characteristic makes sure that the valve is able to provide an effective control range from 5 to 30° of opening, which is the control area where traditional high-performance butterfly valves seem to reach their limits. Typical TOVs and ordinary high performance butterfly valves have good control limits between 30 and 70° of travel. TRI-SHARK valves extend this range as a result of the characteristics of the Throttling Trim Cartridge. With respect to streamed flow, the cartridge and valve design are engineered for ideal flow in this control area.

TRI-SHARK control valves have an effective control range that extends from 1% at 5° of travel to 100% at 90° degrees of travel, and its equal percentage flow characteristic fits the vast majority of control loop requirements.

Low to high flow capability

The TRI-SHARK Throttling Trim Cartridge eliminates the low angle instability inherent in most quarter-turn control valves. For instance, ordinary high performance butterfly valves exhibit poor control at angles of opening that are less than 30°. TRI-SHARK technology greatly extends the control range of quarter-turn valves to as low as 3° of valve opening, while also providing noise attenuation and anti-cavitation benefits.

As the TRI-SHARK disc turns within the Throttling Trim Cartridge, the flow is first controlled via the clearance between the disc edge and the solid, tapered portion of the cartridge; then through the multiple, optimised slots; and finally through the additional open area of the valve.

Anti-cavitation properties: Further advantages of TRI-SHARK valves include anti-cavitation properties. TRI-SHARK's 25% higher incipient cavitation index allows for higher pressure drops than ordinary high performance butterfly valves, while exhibiting much less noise, cavitation and damage. Even if cavitation does occur in higher pressure drop situations, the shorter vapour jets produced by the slots will avoid 'super cavitation' damage that would normally be caused by larger vapour jets.

The cartridge is manufactured with multiple, optimised slots, which divide the flow and clear an exact calculated cross section while opening or closing the valve.

The flow is divided through the slots, which reduces cavitation because the stream bubbles occurring in the cartridge slot area are smaller because of the lower flow rate within each channel. Therefore, less energy is released when the stream bubbles implode. Furthermore, especially at small opening angles, TRI-SHARK valves are able to keep water jets concentric to the pipeline's centreline, thereby reducing their kinetic energy to a lower level prior to contacting the pipe wall.

Flow laboratory tests have verified that individual water jets impinge upon each other at approximately one pipe diameter downstream from the TRI-SHARK control element, thereby transferring kinetic energy to the fluid prior to contacting the pipe wall, which significantly reduces the pipe wall damage that can occur.

In addition, since the mass flow is divided into smaller streams through TRI-SHARK's throttling slots, the sound frequency rises, with the result that sound can be absorbed more easily through the pipeline, and at a

with simplicity

TRI-SHARK's dynamic torque requirements are 60% less than ordinary high-performance butterfly valves, which means a smaller actuator requiring less power can be used.

ZWICK TRI-CON Triple Offset Valve (TOV).

frequency in the range where the human ear notices it less – and optional resistance plates can be added for even more sound attenuation.

More control with less torque: Another important aspect of the throttling trim cartridge is that the dynamic torque is reduced by the changed pressure field. With regard to the necessary dynamic torque, this means that at critical opening angles and flow conditions, a smaller actuator requiring less power can be used.

TRI-SHARK's dynamic torque requirements are 60% less than ordinary high-performance butterfly valves, even at high end CVs. This provides exceptional stability throughout the valve's control range.

The valve's triple-offset metal-to-metal valve seat requires lower breakaway torques than either high-performance butterfly or rotary plug control valves, and its extended torque reversal point allows for an expanded range of control.

Standard types and applications

TRI-SHARK valves can be supplied in standard body styles including wafer, lug and double flanged versions, in sizes up to DN900 (36").

By combining Zwick's Throttling Trim Cartridge and TOV technologies, a single valve style can accommodate on/off and control applications. This solution is the smart choice for today's control systems' engineers delivering on applications for chemical and synthetic fuels, oil and gas production, power generation, pulp and paper, water treatment, mining and metals, and shipbuilding.

In comparison with other control valves, TRI-SHARK offers realisable benefits with respect to acquisition costs; weight and geometrical dimensions; and leak tightness and control characteristics, especially in larger diameter piping systems.

Ultimately, this valve makes it possible for plant operators to reduce their total costs of ownership (TCO) and improve sustainability and profit margins. ❑

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This, together with after sales technical support and reconditioning facilities, reduces the total cost of ownership (TCO) thereby helping customers to increase production, reduce costs and reduce emissions.

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TAKRAF conveyor technology for large world copper mine

In 2019, Chile's Chuquicamata mine – one of the largest copper mines in the world – was converted from an open-pit to an underground mine. In 2015, Tenova company ,TAKRAF, was contracted to supply the principal ore transportation system to move crushed copper ore from underground storage bins to a surface processing site. Mario Dilefeld, head of Belt Conveyor Systems at TAKRAF, tells the story.

Owned by Codelco, Chile's state-owned copper mining company and the world's largest producer of copper and second largest producer of molybdenum, the Chuquicamata mine has been in operation since 1915. Over 100 years of open-pit mining have resulted in a mine that is some 1 000 m deep, 5 000 m long and 3 000 m wide. Once mined by drilling and blasting, the ore and waste material were transported to the surface by trucks for processing or disposal.

It has become uneconomical to mine deeper ore bodies using this process, however, and longer truck routes combined with a larger number of vehicles have resulted in high costs for vehicle maintenance and fuel, not to mention greater environmental pollution and safety concerns.

In 2015, TAKRAF was awarded the contract to supply a new conveyor-based ore transportation system for moving crushed copper ore from underground storage bins to the surface processing site. The system called for no redundancies, which means that for this project, high system availability, minimal system wear and easy maintenance of components were all imperative.

The project scope essentially called for:

- Removal of crushed ore from 60 m high underground storage bins with a conveying capacity of 11 000 t/h.
- Transportation to the surface with a minimum number of material transfer points.
- Conveying from the underground tunnel exit to the existing processing plant whilst taking into account existing infrastructure (railway lines, mine roads, pipelines, etc).
- Ensuring high system availability, minimal system wear and easy maintenance of all components.

Motor alignment during assembly.

All images supplied by TAKRAF

Storage bin discharge

The conveying system supplied by TAKRAF starts at the underground storage bin discharge point. Two material stores in the form of vertical cylindrical openings with a diameter of 6.0 m and a height of 60 m separate the flow of mined material from transport-to-ore processing. The use of conventional belt feeders was originally planned for controlled material discharge. With this conveying method, material is transported from the discharge area along a 30 m conveyor route to a transfer point using a flat belt with vertical chute sidewalls.

Optimisations made to the system after the contract was awarded, however, led to a change in the system. By employing a feeder conveyor, the conveyor belt now has a 45° trough angle along the entire conveyor route, with the only chutes being in the storage bin discharge area. As with a belt feeder, the contour of the material to be conveyed is specified by a shear gate and the flow of discharged material is defined by varying the conveying speed. The elimination of vertical sidewalls along the conveyor path means less wear and thus reduced maintenance costs, combined with energy savings of around 25%.

Transporting material to the surface

Two conventional trough conveyors connect the material discharge of the feeder conveyors with the loading point of the inclined conveyor, about 900 m away. Installed in a tunnel that extends some 6 400 m to the surface, the inclined conveyors overcome a not insignificant difference in elevation of 950 m. Each underground transfer point along the tunnel requires an underground chamber with a crane for maintenance work, power supply, transformers and electrical and mechanical drive technologies, with adapted

ventilation and suitable access paths.

In order to minimise the number of transfer points, the inclined conveyor section was successfully developed employing just two conveyors. To achieve this feat, St 10 000 quality conveyor belts from ContiTech were used for the first time; they employ newly developed components that redefine the performance limits of belt conveyor technology. Operating belt safety ratings of S=5.0 required belt connections with a reference fatigue strength of over 50%. This value was proven on the belt test rig at the University of Hannover in Germany.

In addition, new high levels in terms of installed drive power of 10 000 kW per drive pulley and 20 000 kW per conveyor were achieved. In cooperation with the drive motor manufacturer, ABB, TAKRAF engineers developed a drivetrain consisting of 5 000 kW synchronous motors and membrane couplings to connect the pulley and rotor shafts.

Complete and fully-assembled factory-tested motors were delivered to site so that no motor assembly had to be performed in the dusty environment.

A simple alignment and motor air gap adjustment system was used during installation of the drive and this enables simple readjustment in the event of motor air gap deviations from the setpoint. Maintenance of the air gap between the rotor and stator is a crucial requirement for the operation of the motors. The air gap, which is 14 mm, must only be allowed to deviate from the setpoint within small tolerances. Deviations in the air gap reduce the efficiency of the motor, and if rotor and stator were to make contact with each other, this would damage the motor. The air gap itself is continuously monitored during operation. If deformations and/or subsidence in the steel structure or in the motor foundations lead to a deviation in the air gap setpoint, the stator has to be realigned. To simplify this process, the spacing between the rotor and stator at the non-driven end of the motor was fixed by a support bearing.

A membrane coupling also compensates for the deformation of the pulley shaft caused by belt tension. The adjustable motor frame facilitates alignment of the motor during installation and ensures simple realignment if necessary. Eccentrics and spindles allow the stator to be adjusted in all directions.

In the event of an accident, a simple separation system for disconnecting the pulley from the motor has been installed to ensure continued operation of the system for a short time with a reduced number of drive motors. Should a motor fail, it can be quickly moved into a disabled position by opening the membrane coupling and adjusting the spindles. The system can then continue to operate with reduced power.

Connecting the underground tunnel to the existing processing system

The landscape surrounding the processing plants has been shaped by over 100 years of mining at Chuquicamata. In addition to the various processing systems, waste heaps, train tracks, roads, pipelines and buildings scar the landscape. The challenge for the new conveyor system was to design a system that took into consideration this landscape for its entire length, from the end of the underground tunnel to the processing plant more than 5.0 km away.

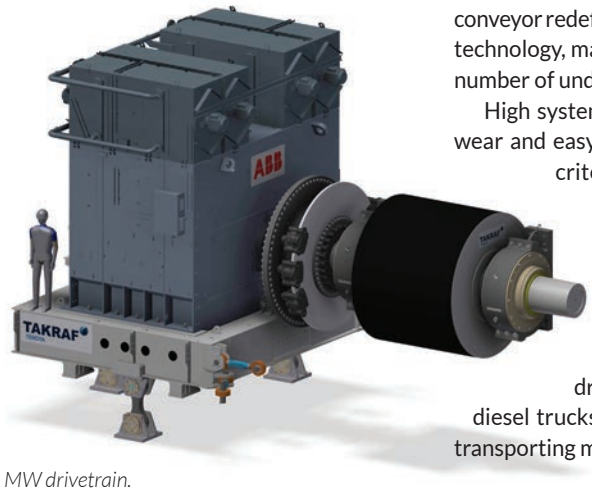
A continuous single flight conveyor with the following notable features was developed:

- A point to point distance of 5 330 m between the material loading point and material discharge with a height difference of 287 m.
- Horizontal curves with tight radii (1,600 m to 2,300 m) on more than 60% of the conveyor length.
- Approximately 50% of the conveyor length is on elevated structures with variable lengths adapted to local conditions and foundations positioning, and with support intervals of up to 96 m

The conveyor design again revolved around ensuring high system availability, minimal system wear and easy maintenance of components. All loading points along the conveyor route were optimised to reduce conveyor belt wear. The arrangement of the rock boxes and grizzly fingers was verified with simulations using the Discrete Element Method (DEM).

Newly designed transfer chutes allow wear plates to be replaced quickly and easily. To replace idlers, a specially designed TAKRAF maintenance vehicle is able to travel along the conveyor path, enabling the conveyor belt to be lifted and worn idlers to be safely and efficiently replaced. At the material discharge point, a bunker building performs a limited material storage function. Two feeder conveyors remove the material and feed it to the processing plants.

Three 5 000 kW direct drive motors drive this conveyor, and a St 6 800 conveyor belt with a belt safety of S=5.1 is used. Vibration behaviour of the belt during start up and braking was analysed across all operating conditions using dynamic belt calculations.



5 MW drivetrain.

Overland conveyor OLC-01 passing over existing infrastructure.

TAKRAF maintenance vehicle for safely lifting the belt and replacing the idlers.

In conclusion, the St 10 000 conveyor belt with its 20 000 kW of drive power per conveyor redefines the limits of belt conveyor technology, making it possible to reduce the number of underground transfer points.

High system availability, minimal system wear and easy maintenance were essential criteria when designing this system, resulting in numerous innovations, six patents and a modern, powerful and environmentally friendly conveyor system. As an added bonus, highly efficient electric drive motors have now replaced diesel trucks, reducing CO_2 emissions for transporting material by more than 66%.

www.takraf.com

Industry learns the complexity of chute design – the hard way

Chute design is one of the most complex and under-rated aspects of materials handling – as a number of large equipment suppliers have discovered to their cost, argues Weba Chute Systems' MD, Mark Baller.

"As a company with 30 years of experience designing bespoke transfer chutes, it has been interesting over the years to watch who enters – and exits – our market," says Mark Baller, managing director of Weba Chute Systems. "For instance, of a number of global players who started producing chutes about 20 years ago; most have had to withdraw from this activity to refocus on other areas of strength."

This highlights the widespread perception in the mining sector that anyone can build a transfer chute, says Baller, and that the construction is little more than platework. It is this misunderstanding that has lured companies into thinking chute manufacture poses an easy opportunity to fill a gap in their broader product offering.

"Nothing could be further from the truth," he says. "For a start, the transfer point in any materials handling system needs to accommodate very specific conditions related to its application – so it cannot be an off-the-shelf item. It must by its nature be custom-designed if it is to be fit-for-purpose."

The material's size distribution and density – as well as its speed and trajectory – are just some of the key variables that will determine the most efficient design. Baller highlights that Weba Chute Systems has spent decades perfecting both its scientific understanding of material flow and its capacity to design and construct chutes based on these sound principles.

"A well-designed chute must also enhance the performance of other equipment in the system, especially expensive items such as conveyor belts," he says. "It must ensure, for instance, that material does not free-fall onto a belt and cause costly damage and downtime."

Then consider the harsh operating conditions and demanding duty that the chute must withstand, he says. A sub-optimal product will not only wear quickly but will create environmental hazards such as dust and spillage. To reduce these dangers and extend wear-life, Weba Chute Systems employs design techniques such as discrete element modelling (DEM), which models the interaction between individual particles and boundaries to predict bulk solids behaviour.

"This tool can model moving boundaries to give us a better understanding of particle flow dynamics," he says. "We apply these findings to enable ultimate flow velocity and direction control through our chutes, which improves productivity, safety, environmental impact and cost-effectiveness."

Baller emphasises that the company's ongoing product development combines field experience with constantly improving technologies – leveraging its learning from almost 5 000 chutes already installed across the globe. Professional chute design can therefore not be done on the strength of just a training course with the relevant software.

"We welcome competition in the marketplace, as it helps keep everyone on top of their game," says Baller. "However, entering this market without the necessary knowledge and experience – especially when it is not core business – does not really make sense."

He urges stakeholders rather to collaborate with expert businesses that have proved their worth, so real value can be added to the end-customer's operations. The alternative poses considerable risk and cost – not only to a new entrant but to the mining customers themselves.

He concludes by emphasising that, despite its relatively low value as a proportion of overall plant costs, the transfer chute represents a critical item. "Any failure of a chute to perform optimally can easily undermine – if not bring to a halt – the smooth operation of a plant," he says. "This makes it worthwhile to work with proven service providers who offer quality bespoke designs." ❑

Left: *Weba Chute Systems employs design techniques such as discrete element modelling (DEM), which models the interaction between individual particles and boundaries to predict bulk solids behaviour.* ***Right:*** *Chute design is one of the most complex and under-rated aspects of materials handling. Weba Chute Systems has spent decades perfecting its scientific understanding of material flow and its capacity to design and construct chutes based on these sound principles.*

BOT model can transform mining and boost emerging contractors

Opening the doors of the mining sector to junior miners and emerging contractors can be boosted by partnerships based on the build-operate-transfer (BOT) concept, according to B&E International. Company director of plant and engineering, Ken Basson, explains.

As an expert in integrated crushing, mining and mineral processing solutions, B&E International brings its experience of operating crushing plants and designing and locally manufacturing its own innovative equipment, says Ken Basson.

"A committed Level 1 B-BBEE contributor, we understand the importance of transforming our industry by building local expertise and capacity," he says. "We have therefore partnered with junior miners and emerging contractors to assume some of their initial risk in mining projects and to give them a firmer basis for sustainable growth."

He highlights that new entrants to the mining sector face financial and technical hurdles. Sourcing a fit-for-purpose processing plant is frequently a 'bridge too far' in terms of capital expenditure. Financial institutions usually require a strong balance sheet, which many young companies do not have. There is also the risk that a new plant may not run smoothly or to specified capacity, demanding a depth of technical expertise not yet developed by a new contractor.

"With our experience of running plants, combined with our in-house design and manufacturing capabilities, we shoulder a large portion of this initial risk for the smaller players," he says. "We design and build the plant to suit our BOT partner's operational needs, and then run the plant ourselves. The partner pays us only for the final saleable product from the plant."

The arrangement is a close collaboration with the partner, who must be assured of meeting its contractual obligations to the end-customer – in the case of a coal-producing operation, for example. The production experience in B&E International – which has for decades run crushing and screening operations for its own account – is what puts its BOT partners' minds at ease.

"The 'transfer' aspect of the BOT contract is also an important step in growing a new generation of miners and contractors in South Africa," he says. "This allows for our BOT partners to take ownership of the plant after an agreed period of time, should they wish to take over processing operations."

This, in turn, allows a junior miner to build its balance sheet and skills base over a manageable timeframe, while mitigating its operational risk and ensuring a sound growth trajectory. Basson also emphasises the value of B&E International's local manufacturing experience, especially given the steady deterioration of the Rand against the US dollar and Euro – the currencies in which most mineral processing equipment is sold.

"Our Rand-based manufacturing capability has always been cost effective, and is becoming increasingly so," he says. "This further improves the economics of our plants' performance and maintenance." ❑

B&E International designs and builds plants to suit BOT partners' operational needs. B&E then runs the plant with junior mining partners only paying for the final saleable product from the plant.

Custom-built screen solutions for tonnage and lowest TCO

Customised screening and feeding solutions are developed by Kwatani's in-house team of experienced mechanical engineers and metallurgists. This results in designs that deliver the optimal processing performance and tonnage at the lowest total cost of ownership (TCO).

When a South African diamond operation needed to improve the performance of its degrit screens, Kwatani customised a bespoke solution that doubled the feed-rate.

The customer was operating a number of multi-slope screens to dewater product between 0.8 mm and 5.0 mm in size, before it was treated by dense medium separation (DMS). However, the screens were causing a severe carry-over of water onto the conveyor belt to the DMS.

"The feed-rate on each screen was being limited to about 250 t/h," says Kwatani CEO Kim Schoepflin. "We tackled this by designing and manufacturing a customised multi-slope screening machine to fit the customer's existing footprint."

Schoepflin says Kwatani's replacement was able to double the feed-rate to about 500 t/h, with minimal water carry-over. As a result of the success of this unit, the customer requested that Kwatani replace the whole bank of screens.

In another contract, a customer asked for assistance with underperforming screens that could not deliver the original design parameters and also wanted to improve the tonnage throughput by 17%. "We conducted a careful evaluation in collaboration with the customer, and came up with an innovative and economical solution," Schoepflin says. "Simply replacing the existing screens with Kwatani's new larger screens would have been costly and time-consuming, so we decided instead to replace the screen's existing gearboxes."

The replacement gearboxes delivered greater vibration, but without exceeding the output torque that the existing drive motors could provide. "Drawing from our portfolio of locally designed and manufactured exciter gearboxes, we were able to implement this solution very quickly," she says. "The two new exciter gearboxes were delivered to site and were in operation within two weeks – successfully and immediately increasing the screen's throughput."

The benefits to the customer did not stop there, says Schoepflin. The newly optimised operating parameters meant that the material bed depth was lower, so the drive motors drew a lower amperage, reducing the cost of power consumed.

"Our customised screening and feeding solutions – developed by our in-house team of experienced mechanical engineers and metallurgists – are based on consultation with each customer," she concludes. "The result is a design that delivers the optimal processing performance and tonnage at the lowest cost of ownership." ❑

On-site sievebend tests at metal refinery

On-site test work at a base metal refinery in South Africa has allowed Multotec to prove its sievebend solution for improving the quality of the customer's end product. Process engineer, PJ Pieters explains.

According to PJ Pieters, process engineer at Multotec, a base metal refinery customer approached Multotec looking for the most efficient way to reduce impurities to less than 200 ppm in the product stream.

"As the contaminants were found mainly in a specific size fraction, the aim was to remove this fraction by classification using a sievebend," says Pieters. "To test this proposal, we used our mobile sievebend test unit, which we could take onto the customer's site and link up to one of the product streams in the plant."

This provided a convenient way to conduct testing under normal plant operating conditions. It also meant there was no need to remove any valuable mineral product from the site, which could demand onerous security compliance procedures. The tests took only a week to conduct, once the mobile units were installed.

"The tests were conducted to reduce impurity levels and to measure the effect of the sievebend on the downstream screen scroll centrifuge," he says. "We managed to achieve the product quality goal, while also maintaining optimal centrifuge performance in terms of the customer's product moisture requirement."

The addition of a sievebend to the process does not increase the energy costs, as the machine is operated under normal gravity conditions and is compact enough to fit inline between existing process equipment.

To withstand the highly corrosive application, the sievebend and its housing were manufactured in stainless steel. By using appropriate sampling techniques, the test work was able to deliver very representative results. This gave the customer an accurate expectation of the precise results that a full-scale installation would deliver.

"This kind of testing adds confidence to the customer's decision to invest in a specific solution," Pieters says. "It is also part of Multotec's contribution to continually improve customers' process efficiency – we work to provide customers with the best knowledge and products to optimise their plants."

Another element of the value added by the sievebend, says Pieters, is that the refinery is likely to save on potential penalties arising from impurity levels in the saleable product. Multotec also provides after-sales optimisation and support to ensure on-going benefit from the innovations applied. ❑

BMG Bearings: an overview

BMG business unit manager for bearings, seals and gaskets, Wayne Holton, summarises his division's bearing product offering and takes us through some of the different bearing types and their applications.

Bearings are at the heart of all types of machinery. They are essential components for reducing friction and supporting loads wherever two connected parts of a machine are required to rotate or move relative to one another. In addition to enabling low-friction movement, bearings also maintain alignment and accuracy, support the transmission of power and are a key component for the efficient and reliable operation of any equipment that involves rotating shafts or accurate movement.

BMG Bearings' offering includes the full range of bearing types, including ball, roller and linear bearings ranging in size from miniature to extremely large. "Our product offering is backed by technical expertise to support our customers, firstly with suitable bearing selection to best match both new and existing applications, but also with respect to condition monitoring, reclassification and repairs, bearing modification, manufacturing of assemblies and bearing and housing interchanges.

"In addition, technical training is available to all of our own internal staff, to promote a culture of ongoing learning and expert knowledge of what BMG Bearings has to offer. This training is also available to our customers to support them in their understanding of our bearing products and the maintenance practices that are likely to extract the best reliability, life and value from an investment," he tells MechChem Africa.

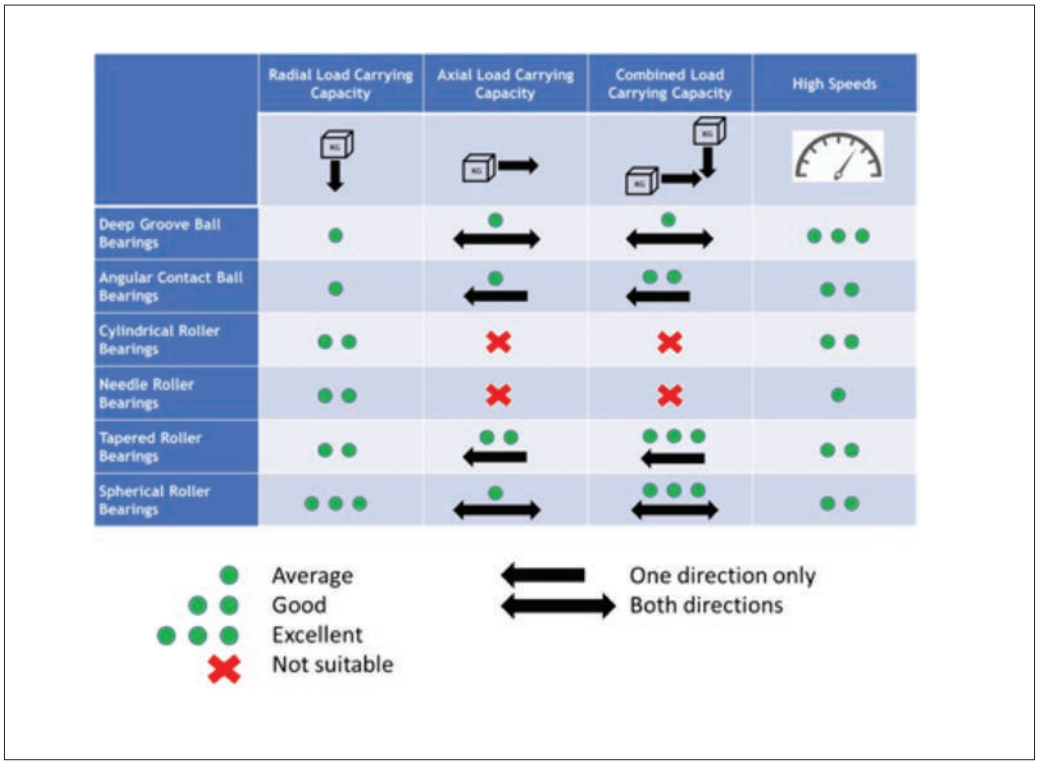
"Our focus is on each customer's process needs and the formulation of integrated product solutions using multi-disciplinary approaches enables us to translate an enquiry for a bearing into a comprehensive long-term solution for a machine. On occasions, this may result in a solution to an ongoing problem but, more regularly, we are able to systematically improve machine performance, reliability, maintenance intervals and service life. Ultimately, this approach to bearings drives down the total costs of owning and operating an asset, which in turn maximises investment returns," Holton notes.

Describing the technical function bearings play, he says that a bearing is used to permit constrained relative motion between two parts, typically rotation or linear movement. While enabling relative motion between two parts, bearings also allow for the transmission of forces while rotating or moving in a linear direction. These forces can be in a radial (perpendicular to the shaft axis) or axial direction (parallel to the shaft axis) – or a bearing can be designed to accommodate a combination of both radial and axial forces.

Bearings are classified according to the type of motion they allow (rotating or linear); to their principle of operation (ball, roller, plain or linear bearings); and according to the directions of the applied loads they can support (radial, axial or combined).

"Ball bearings make point contact on the adjacent raceways allowing for high speed operation, while roller bearings offer line contact surface on the raceway giving the ability to carry greater radial loads but at a lower rotational speed, for example," Holton explains.

Referring to a summary table Holton says that, for high-speed applications that do not require excessive load carrying capacity in either the radial or axial direction, deep groove ball bearings might be ideal, but if very high load carrying capacity in both directions is required, then tapered roller bearing assemblies might be a better fit.



A summary table of the relative speed and load carrying capabilities of some different types of bearings.

Rolling ball bearings

Going through some of the key features of key bearing types, Holton says that single row deep groove ball bearings are the most

common of the rolling bearings and are particularly versatile in their use. "Radial and axial loads can be applied in both directions and these bearings are suitable for applications where high speeds are required: electric motors, compressors, idler rollers for conveyors and a host of industrial applications.

These bearings are offered in open type variants or sealed with either steel shields or rubber seals assembled on one or both sides. Both radial and axial loads can be supported and, while generally seen as a solution for high-speed applications, low speeds can also be accommodated. Sealed bearings are pre-lubricated with grease and BMG can offer polyamide, steel or brass cage assemblies.

Angular contact ball bearings are designed to accommodate combined radial and axial loads. These are formed by combining two bearings as a 'duplex pair'. Possible combinations include face-to-face, which have the outer ring faces together, back-to-back, or both front faces in the same direction. Applications include gearboxes, clutches, pumps, machine tools, steel mills and on wind turbines.

Self-aligning ball bearings typically have a double row of bearings, each with its own inner raceway, in an outer ring with a single spherical raceway. These bearings are designed to accommodate minor angular misalignment of the shaft relative to the housing, which could be caused by a machining or mounting error or because of eccentric loading from the application. On the agitator shaft of a mixing system, for example, a self-aligning bearing might be used to compensate for shaft deflection and reduce housing deformation.

"Self-aligning ball bearings generate less friction than other styles of bearings, which allows them to run at higher speeds without building up as much heat," adds Holton.

Cylindrical roller bearings

Cylindrical roller bearings offer high radial load capacity, because each cylindrical roller is in line contact with its raceway. Different types are designated by NU, NJ, NUP, N, NF for single-row bearings, and NNU, NN for double-row bearings, depending on the bearing design.

Cylindrical roller bearings with no ribs on either the inner or outer ring enable the rings to move axially relative to one another. These are used as free-end bearings where no axial load is required. Where the inner and outer rings have ribs, axial loads can be accommodated in either or both directions, depending on the bearing design.

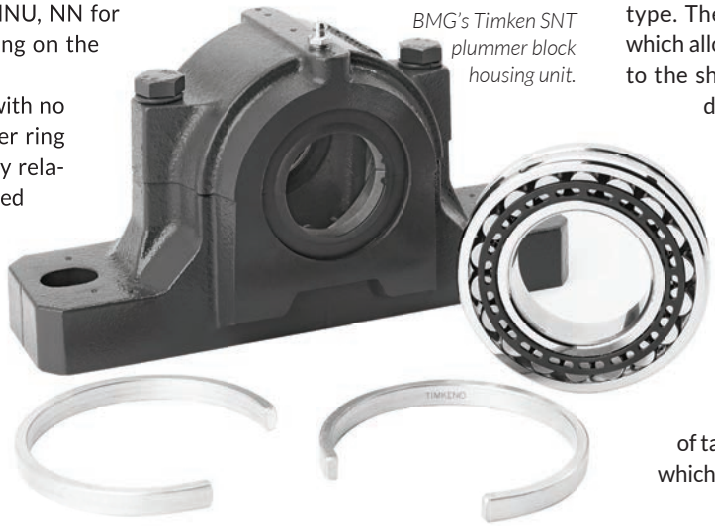
"A variant of the cylindrical roller bearing is the needle roller bearing, which contains many slim rollers with a length of 3 to 10 times their diameter. As a result, the ratio of the bearing's outside diameter to the inscribed circle diameter is small, giving needle roller bearings a high radial load carrying capacity," he explains.

BMG offers a complete bearing re-manufacturing and repair service.

BMG's NSK HPS spherical roller bearings.

Needle roller bearings offer a low-cost per kg of capacity and are of particular advantage where space is limited. They are widely used on automated assembly equipment.

Spherical roller bearings are another roller bearing variant, which – like spherical ball bearings – have two rows of barrel-shaped rollers running in a single spherical raceway. "Spherical roller bearings are self-guiding and can accommodate angular misalignment. They are particularly suitable for use where there is heavy and/or impact loading," Holton adds.



BMG's Timken SNT plummer block housing unit.

Split bearings are another roller bearing type. These have a split-to-shaft feature, which allows them to be fitted where access to the shaft ends is difficult or where the drive side is challenging or costly to disassemble. Using a split bearing allows the shaft to be raised and the split components to be assembled without having to remove other elements from the rotating shaft.

Tapered roller bearings

Where high axial or thrust forces are required, various variants of tapered roller bearings are available, which use cone shaped rollers guided by a

backing rib on the cone which runs against a mating outer race called a cup. These bearings are capable of supporting combined radial and axial loads in one direction.

If mounted as opposing pairs, however, axial loads in both directions can be achieved – and double-row and four-row tapered roller bearings are also available to cater for increasing load capacities.

Thrust ball bearings

For axial-only rotating applications, where one ring needs to rotate while in contact with another, thrust ball bearings, needle roller thrust bearings, spherical roller thrust bearings and slewing rings also from part of the BMG range.

Bearing housings and units

As well as the bearings themselves, bearings are often mounted in industry standard housings that securely hold the bearing outer ring in place, preventing it from rotating. The most common of these are plummer block housings, which are bolted onto a support structure to secure the position of the bearing assembly on its rotating shaft.

Typically produced from cast iron, these housings enable easy mounting and dismounting onto pre-assembled shafts. They come with various sealing arrangements to protect the bearing inside and with built-in grease nipples for bearing re-lubrication.

For the most challenging circumstances, spherical roller bearing solid-block housed units are available. These come as assembled bearing units in cast-steel housings with spherical roller bearings. They offer high load capacity and accommodation for moderate misalignment. "The housed bearing units are easy to mount and align, offer reduced risk of damaging or contaminating the bearing during installation, and multiple levels of sealing to ensure contaminants are kept out, even in the most arduous environments," Holton notes.

In addition, housed ball bearing units are available in many formats: as pillow blocks; square, round and oval flanged units; flange bracket units; adjustable flange units; and take up units.

"To enable us to offer a comprehensive range of solutions, BMG Bearings has secured distribution and service agreements with some of the world's most respected manufacturers of bearings, including NSK, NTN, Timken, IKO, TR, Rollway, FSQ and Rollix," says Holton.

"Our extensive bearings portfolio is carefully selected in terms of consistent quality controls, compatibility, standardisation, reliability and extended service life," he concludes. ❑

Special gear units for mixing systems

For mixing, stirring, blending, aerating and kneading applications in a range of applications from food and beverage to biotechnology, pharmaceuticals, water treatment and chemicals, SEW-EURODRIVE can supply standard gear units in a special agitator design. SEW-EURODRIVE projects and business development manager, Jonathan McKey outlines the offering.

Gear units in an agitator design are often equipped with an extended bearing housing optimised specifically for use in mixers and agitators, using tried-and-tested standard gear unit series. SEW-EURODRIVE is able to supply these gear units to cover blender, agitator, aerator, mixer or kneader applications in a range of industries.

The benefits of these gear units in an agitator design include FEM-optimised housings for particularly high permitted overhung loads. What is more, no additional bearing is required to absorb the axial and radial forces generated by the agitator shafts. The shaft and flange dimensions are compatible with standard dimensions.

Different options and design variants are available to accommodate a range of applications, including a special explosion-proof design for hazardous areas. Full customer support and technical back-up are also available from SEW-EURODRIVE to assist customers with their specific design requirements.

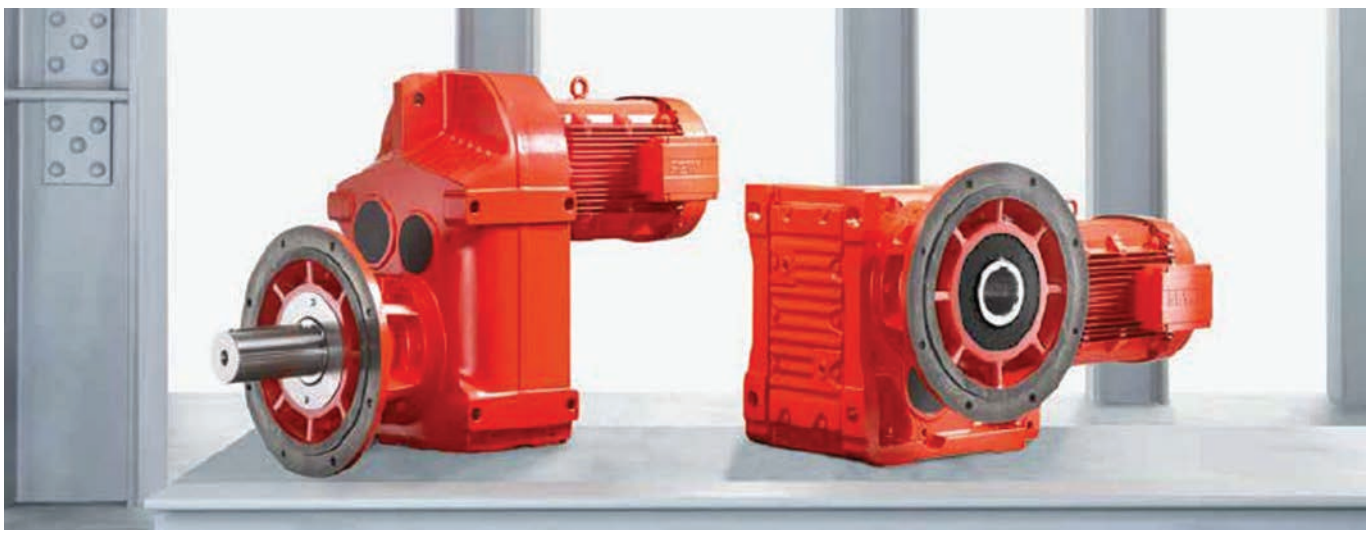
For helical gear units, the RM series has been a long-standing variant for mixer and agitator applications. New to the portfolio are the parallel-shaft FM/FAM helical gear units, and the bevel-helical KM/KAM gear units.

In many cases, parallel-shaft and helical-bevel gear units are also used for this type of application. These gear variants enable more efficient utilisation of existing footprints, while the agitator shafts with mixing element can be inserted directly into the hollow drive shafts. In addition bearings can be dispensed with in many cases, thereby reducing costs and maintenance requirements even further.

The permissible overhung loads range from 20 000 N to 135 000 N, with motors best suited for these sizes in the power range 0.12 kW to 200 kW. Maximum permitted gear unit output torque ranges from 820 Nm to 20 000 Nm.

Features of the specific agitator design include a double oil seal on the output side for additional protection against leaks, and reinforced bearings opposite the output side to increase the permitted overhung load.

Particularly for high output speeds and low gear ratios, there is a grease nipple for further greasing of output shaft bearings, and a dry-well design with a leak sensor to prevent the product from being contaminated by leaking lubricant.❑



Ring-geared mill drive system for copper mine

ABB has won a contract with Zijin Mining Group to install its state-of-the-art ring-geared mill drives and control systems at the Veliki Krivelj Copper Mine – a surface mining operation with an annual ore processing capacity of 2.5-million tons.

Technology leader ABB has entered into an agreement with Zijin Mining Group to install its state-of-the-art ring-geared mill drives and control systems at Veliki Krivelj Copper Mine.

Veliki Krivelj, located in Borski, Serbia, was acquired by Zijin Mining Group in 2018 as part of a deal with Serbia's Bor Copper Mine, which included three open-pit mines, an underground mine and a smelter. The US$350-million investment is one of China's largest investments in Serbia to date. Zijin Mining Group expects to invest €200-million to transform and expand the existing production capacity of Serbia's Bor copper mine and smelter.

As part of the modernisation project, ABB will provide ring-geared mill drives and intelligent control systems for one SAG mill (2x6.5 MW) and one ball mill (2x7.5 MW), including electric control systems, drives, motors, transformers and end-to-end services, which will increase productivity, reduce downtime and boost energy efficiency.

ABB's solution provides dual pinion mill drives, frozen charge detection, controlled roll back, automatic positioning, variable speed and cascade monitoring functionalities. The dual pinion mill drive is a variable speed technology, which will effect low mechanical stress impact on the pinion and ring gear by realising precise load sharing between the two motors of each mill.

"ABB's mill solutions reduce energy consumption, reduce mechanical stress, improve the service life of equipment, and boost operational performance," says Stephen Zhu, lead of ABB Mining, Aluminium and Cement in North Asia and China.

The solutions incorporate a host of modern mill protection, operation and maintenance features, including:

- Frozen charge protection: The ABB mill controller detects frozen charge by analysing the mill's angle and dynamic torque during the starting period. A dedicated algorithm enables even detections of smooth cascading. The mill is therefore protected against mechanical damages caused when a frozen charge is dropped.
- Coupling supervision: The drive train fault supervision system monitors deviations in torque between the two pinions. In the case of slippage or a failure on one or both of the couplings, the drive detects it and trips, preventing major damage on the drive train.
- Soft starting: Using a variable frequency converter, the system starts the motor's rotor synchronously with its rotating stator field, instead of asynchronously. This results in a smooth start-up free from mechanical shock. The current drawn from the network during starting is also significantly lower and increases steadily in proportion with mill load and speed.
- Frozen charge remover: ABB's patented method for detaching frozen charge from a tube mill applies superimposed torque pulses onto the mean motor torque to loosen any frozen charge from the shell. Both torque and speed are always positive so as to maintain positive contact between the pinion and ring-gear, so preventing backlash.
- Mill load sharing for dual pinion: While motor speeds are identical as a result of the fixed mechanical coupling created by the ring-gear, torques are maintained even by means of the mill application controller. This guarantees load sharing between the two pinions during the whole speed range including starting and stopping.
- Controlled rollback: This function allows the mill to be brought smoothly to a standstill, reducing both speed and torque to zero. The load inside the mill is kept balanced, thus preventing material from falling or rolling over while maintenance is performed inside the mill.
- Creep mode: This is a maintenance feature that allows an adjustable low speed to be programmed so visual inspections can be performed or for grinding out the mill. A fast stop rate can be individually set in order to avoid overshoot in creeping mode.
- Automatic positioning: To perform liner changes, the main drive automatically brings the mill to an operator-selected angle or liner reference, independently of the load condition. This function includes real time calculation of the lifting angle and fast stop slope for accurate and rapid positioning, thereby reducing downtime needed for liner changes.

ABB has worked with Zijin Mining since 2018 providing strategic consultancy, project expertise and drawing on ABB's track record of supplying total integrated solutions to the mining industry across electrification, automation, digital, drives and motors and infrastructure. In 2019, ABB supported Zijin on both the Phase III technological upgrading project of Xinjiang Zijin Zinc Industry and the Majdanpek (MS) copper mine in Serbia.

Haibo Jing, head of ABB Process Industries, North Asia and China said: "We are glad to be working with Zijin Mining on the Veliki Krivelj copper mine project and to be bringing our technology to further support the success of the company in its 'Belt and Road Initiative.' ❑

ABB is installing ring-geared mill drives and control systems at the Veliki Krivelj Copper Mine in Serbia.

Same-day VSD solution for East Rand client

BI product manager, Andries Barnard, talks about Varispeed VDrivePlus and AlphaDrive-Micro VSDs.

When a manufacturing facility on the East Rand in Johannesburg required an urgent replacement variable speed drive (VSD) for an extraction fan in its welding facility after the existing drive broke down and halted production, it turned to leading supplier BI (Bearings International) for a solution.

"Not only did BI have a 75 kW VSD available ex-stock, its technical department assisted the customer with the installation, integration and commissioning of the new drive so it could be back up and running on the day it was supplied," says product manager, Andries Barnard.

"The VDrivePlus is specifically designed for variable torque applications and ease of integration with existing control configurations," Barnard explains. VDrivePlus and AlphaDrive-Micro VSDs are electronic motor control solutions from Hudaco Group Company, Varispeed, available from BI as part of its integrated solutions approach.

The Varispeed's VDrivePlus ranges from 0.4 kW to 400 kW and is available in 240 V and 400 V versions. This advanced VSD features motor control based on DSP technology, together with 'smart' auto-tuning. Additional features include flexible inverter control, dual high-resolution analogue inputs and free mappable I/O channels.

The AlphaDrive-Micro VSDs are smaller and compact frequency inverters in the 0.2 to 5.5 kW range and are also available for use with 240 or 400 V input supplies. Together with the VDrivePlus, these VSDs offer the best performance-to-cost ratio on the market, without compromising on quality and reliability.

Varispeed VSDs are readily supplemented with electric motors from the Bauer range from BI. "With our range of cast iron and aluminium motors, we can assist customers with a wide range of drive solutions from 0.18 kW to 355 kW at 400 and 525/550 V," Barnard adds.

Applications include pumps, conveyor belts, sanding machines, cooling towers, crushers and pedestal drilling machines, among others. A major advantage for end users, and one of the best-selling features of the cast iron range, is that the feet are removable and interchangeable, making it a highly flexible multi-mount motor.

BI, a member of the Hudaco Group, is a leading distributor of bearings and power transmission products in Southern Africa. With its customer-focused approach, BI is committed to delivering value to all its stakeholders, while offering quality solutions that make a real difference to optimising plant availability and turnaround time.

www.bearings.co.za

VDrivePlus VSDs from Varispeed, available in South Africa from BI, feature motor control based on DSP technology, smart auto-tuning, flexible inverter control, dual high-resolution analogue inputs, and free mappable I/O channels.

Accumulator testing, refurbishment and recertification

Hytec Fluid Technology (HFT) workshop foreman and technician, Tony Greef, talks about the company's accumulator refurbishment, testing and recertification service on offer from the Bosch Rexroth company's Johannesburg facility.

As part of its part of its accumulator service package, Hytec Fluid Technology (HFT) conducts legal parameter conformance testing on hydraulic accumulators followed, where necessary, by refurbishments and recertifications.

The offering proves bladder accumulator conformance to PER and SANS 347 standards. HFT is able to test, refurbish and recertify Bosch Rexroth, Olaer and Hydac bladder accumulators in the capacity range 1.0 to 50 ℓ.

Other bladder accumulator brands, if accompanied by design drawings and parameter specifications, can also be tested at the company's accumulation certification centre in Spartan, Johannesburg.

To test accumulator vessel expansion, vessels are subjected to a hydrostatic pressure test to 1.25 times the vessel's working pressure – overseen by the Authorised Inspection Authority (AIA). Certified accumulators conform to the OHS Act (PER and SANS 347) with accumulators classified for 'Industrial & Factory' use being certified for 36 months and those classified with 'Mine Health & Safety' certification for 24 months.

HFT conducts conformance testing on hydraulic accumulators, followed by refurbishments and recertifications

"Testing accuracy on all parameters of reference is done to six decimal points," notes HFT workshop foreman and technician, Tony Greef. "This allows for extremely accurate parameters to reflect and, subsequently, the most on-point certificate to be issued."

Vessel wall thickness is verified using a five-point ultrasonic thickness test. In addition to recertification, the accumulator service includes: accumulator stripping; double cleaning; and reassembly with a new bladder, seal kit and anti-extrusion ring. Protective paint also forms part of HFT's vessel refurbishment and recertification service.

Three accumulator units can be bench-mounted, harnessed and tested simultaneously, facilitating an approximate 60-minute testing turnaround per vessel. All test work is carried out on the HFT onsite accumulator test bench, an R800 000-investment developed by fellow Group Company, Tectra Automation. "Downtime prevented or minimised for our clients due to this swift turnaround is directly in line with our motto: 'We move – you win'," Greef says.

"All safety and legislative boxes are ticked before we release a serviced and compliant accumulator," he adds. "This means we give our customers peace of mind along with their recertification certificate."

He further points out that new regulations pertaining to accumulator certification compliance are under discussion by the relevant authorities. "HFT will guarantee compliance with all new or revised regulations when conducting certification testing."

Hytec Fluid Technology, a member of the Bosch Rexroth South Africa Group of Companies, is an ISO-9001 accredited company. ❑

HFT fluid conditioning equipment for hire

To aid plants that are unable to procure capital equipment for their fluid power applications, Hytec Fluid Technology (HFT) offers a range of Hy-Pro Filtration fluid conditioning equipment for hire. These units are available on a day-to-day or month-to-month rental contract, bringing flexibility to the offering. A comprehensive equipment inspection checklist ensures all equipment is production-ready before leaving HFT's premises in Spartan, Johannesburg.

HFT's fluid conditioning equipment hire range consists of:

- Transfer units (filter carts).
- Vacuum dehydration units.
- Compact filter units.
- Soluble varnish removal skids.
- Diesel coalesce and filtration skids.
- High viscosity filter carts.
- Portable fluid monitoring devices.
- Heated filtration systems.
- Phosphate ester conditioning systems.
- COT turbine oil conditioning systems.

"Compared to the industry norm, our equipment provides the best technical performance to required specifications in a short time," says Sandor Bottyan, HFT general manager. "All equipment is sufficiently versatile in that it can be used to suit a variety of applications without any major modifications."

He adds that the running costs of Hy-Pro fluid conditioning equipment "are significantly less than those from competitor companies".

Generally used for applications in the power generation, steam, marine, aviation, process and injection moulding industries, as well as in refineries, all hired equipment is available directly from HFT.

"Making this equipment available to plants for rental periods is another example of how we live our motto – 'We Move, You Win'," Bottyan concludes.

Hytec Fluid Technology stocks and supplies a wide range of fluid conditioning equipment backed by expert technical support. The company is ISO-9001 accredited. ❑

A Hy-Pro Soluble Varnish Removal Skid, which is available for hire from HFT.

E-Pulse hydraulic pumps deliver higher flow, convenience and precision

Chantelle Janse van Rensburg, Enerpac product manager for BMG, introduces a new range of portable hydraulic electric Enerpac E-pulse pumps for providing power to various hydraulic systems and tools in the pressure range up to 700 bar/10 000 psi.

BMG's recently-launched portable hydraulic electric Enerpac E-pulse pumps have intelligent auto-cycle functionality and an efficient power-to-weight ratio to ensure dependable operation and high-productivity in challenging industrial applications.

BMG has recently launched a new range of portable hydraulic electric Enerpac E-pulse pumps, which are ideal for all 700 bar/10 000 psi operating hydraulic systems. These E-pulse pumps have intelligent auto-cycle functionality and an efficient power-to-weight ratio, to ensure dependable operation and high-productivity in challenging industrial applications.

E-Pulse pumps, with a compact design and well-organised components are fitted with a smart, brushless dc motor and controller that automatically varies the speed to maximise flow at any pressure.

"Our new lightweight Enerpac pumps are able to provide power to various 700 bar/10 000 psi hydraulic cylinders, nut cutters and torque wrenches quickly and efficiently. E-Pulse pumps are able to operate hydraulic tools as fast as pumps with motors larger than 0.75 kW. These pumps are currently the only hydraulic torque wrench pumps on the market with intelligent auto-cycle functionality and are the only pumps available that allow an operator to vary the speed between 25% and 100% of full speed," says Chantelle Janse van Rensburg, Enerpac product manager for BMG.

E-Pulse hydraulic electric pumps have an adjustable speed-dial which allows the operator to adjust the speed to suit the specific task, ensuring precise control of large and small hydraulic cylinders and nut cutters, as well as quick and safe completion of work.

For bolting applications, the operator can set the pressure and operate the torque wrench pump in either 'manual' or 'auto-cycle' mode. The intelligent auto-cycle function enables press-and-release actuation to the cycle wrench until final torque is achieved, significantly improving completion speed in every application.

The E-pulse range features a new interactive pendant that delivers visual and tactile feedback, as well as programming and diagnostic status to the operator. "The IP 67-rated pendant, with protection against the ingress of dust and water, can be stored in the handle of the pump and is secured via a magnet. Operation, programming and diagnostics status are communicated to the operator through yellow, green, and red light emitting diodes (LED) as well as vibration pulses. Fault-codes indicate any issues related to voltage, temperature and button malfunction, or if professional service is required," says Janse van Rensburg.

The new E series pump is a high-performance pump with an 85 hp direct-drive motor and has a six-piston block design that provides even-flow and smooth operation of connected tools. Various models are available from BMG, with a choice of five valves: 3/2 jog, 4/3 jog, 3/2 dump-and-hold, 3/2 dump and 4/2 torque wrench. Flow at rated pressure is 32 in^3/minute, with a maximum operating pressure of 10 000 psi.

Additional features include a 24 V dc power regulator, built-in thermal protection, a 20-ft pendant cord on the torque wrench pump and a 10 ft pendant cord on the other four pumps. All models in the range are fitted with a convenient cord management system.

BMG's E-series pumps feature an IP 54-rated durable aluminium housing, which encloses the system components for maximum protection and easy service accessibility. These torque wrench pumps are fitted with an Enerpac Speed-D-Coupler pre-calibrated (certificate included), 4-inch gauge and feature an integrated heat exchanger that cools the pump during operation. System components are enclosed for added protection and housing fins provide heat dissipation. Other features include impact absorbing, vibration dampening feet and an integrated roll-cage design.

This system has been designed for easy access to components during maintenance procedures. The pump has an oil-level indictor, convenient oil-fill port as well as automatic breather which needs no adjustment. Draining of oil is not required for pump element maintenance.

BMG's range of Enerpac high-pressure hydraulic equipment ensures quick, safe and dependable operation in many industries, including mining, oil and gas and power generation, as well as infrastructure and manufacturing. ❑

Altair 2020: The most significant release in the company's history

On June 3 and 4, 2020, Altair held its Altair 2020 Global Experience virtual conference to release an expanded range of solutions in all products for all user types. *MechChem Africa* summarises the opening presentation by James Scapa, chairman, founder and chief executive officer of Altair; and presents chief technical officer (CTO) James Dagg's take on enhanced integration in the new release.


Altair CEO, James Scapa.

A global pioneer in simulation-driven product development software, high-performance computing (HPC), and data analytics, Altair has updated all of its software products, which have been enhanced with advancements in terms of user experience and countless new features, including intuitive workflows that empower users to streamline product development, allowing customers to get to market faster.

The update expands on the number of solutions available for designers, engineers, data analysts, IT and HPC professionals, facility managers and more. It broadens the scope of the new user experience, enables access to more physics, data analytics and machine learning and makes the Altair software delivery method more flexible and accessible.

"Our teams are always driven to develop and provide access to a range of different technologies that enable our customers to break through complex problems and explore and discover on their own terms," said James Scapa, chairman, founder and chief executive officer of Altair. "This software update release is the largest collection of our applications for design, simulation, and data analytics."

In the opening Altair 2020 presentation, Scapa noted that Altair is no longer a company specialising only in simulation. "The vision for the company is really about transforming company decision-making: using simulation, but also with data analytics and high-performance computing (HPC) – and this envelope really makes Altair different," he believes.

Looking to the future, Scapa sees algorithms and mathematics driving decision making, not just in engineering, but also in business, commerce and "in all aspects of life and society."

Scapa reveals that, as well as simulation, physics solvers, and design modelling and visualisation tools, in recent years Altair has acquired and developed data analytics expertise and tools, along with high performance and cloud computing and industrial internet of things (IIoT) capabilities.

In the future, Scapa sees increasing convergence of these simulation, data analytics, and high power computing solutions as the world moves towards "smart connected everything" technologies. "We are living in a smaller world where strong user experiences are driving product value," he says. Simulation, data driven design models, and high performance computing, all working in concert, are likely to "make the difference."

By 2022, more than half of our new business systems will have continuous intelligence, capturing data and using machine leaning models to constantly upgrade and automate decision making – and the HPC market is expected to be between US$22- and $44-billion by 2025. "These are hot areas that are growing fast.

"Today, we have open source deep machine learning algorithms that can be applied to real engineering problems giving accurate results. These can also be summarised and stored as solution repositories, which can avoid having to re-simulate similar future problems. The combination of simulation; mixed, multilevel machine learning models; and human creativity lead us to expect superfast solutions and multi-disciplinary optimisations that prove very accurate when applied in real life," says Scapa.

Why Altair for simulation? Already offering best-in-class simulation and visualisation the new releases of Altair's solutions offer smarter than ever product design, spectacular ease of use, and a host of increasingly integrated interoperable solvers and software solutions.

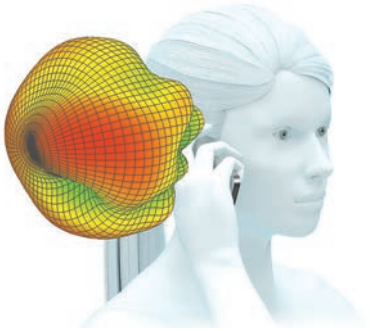
As an example, Scapa lifts out the Altair SimSolid™ solver, which is now integrated into Altair Inspire™ enabling the evaluation of support and connector reaction forces and instantaneous reaction time modelling for large PolyNURBS, which significantly simplifies and improves the geometry generated from optimisation.

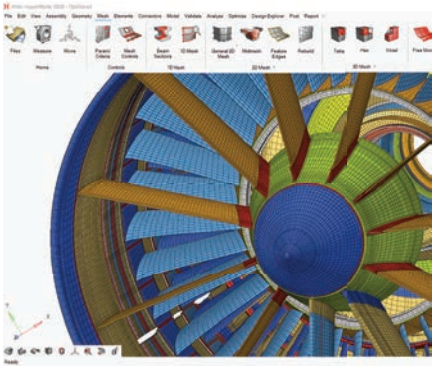
He also highlights Altair's recent

acquisition and integration of EDEM, the market-leading discrete element modelling-based software solution for bulk material flow, which can quickly and accurately simulate and analyse the behaviour of bulk materials such as coal, mined ores, soils, tablets and powders. "Along with multibody dynamics simulation and hydraulics, EDEM is an ideal add-in for heavy equipment and agricultural applications," notes Scapa.

With respect to Altair's data analytics capabilities in the new release, he highlights Altair Panopticon™, the platform for user-driven monitoring of real-time data that includes a major update of cloud-based deployment. "Panopticon enables users to build, modify, and share custom-designed functions and content easily via standard web browsers." For data analytics, "it offers an end to end pure cloud native solution".

And for HPC and cloud computing, Altair Access™ offers updated work-from-home features; more responsive 3D remote visualisation; better job resource charts; two-factor authentication and single sign-on; and mobile phone share support. In addition, Altair Accelerator™, the high-throughput, enterprise-grade job scheduler is now 10x faster for dynamic workloads with support for the likes of Microsoft Azure, Google Cloud (GCP), Amazon Web Services (AWS) and Oracle Cloud; while Altair PBS Professional™ offers





Left: *The new releases of Altair's solutions offer smarter than ever product design, spectacular ease of use, and a host of increasingly integrated interoperable solvers and software solutions.* ***Right:*** *Altair Hyperworks™ 2020, with enhanced multi-physics and simulation tools such as OptiStruct, offers "on-demand flexibility to access Altair's entire portfolio with freedom, flexibility and value."*

scalability improvements towards exascale, Cray Shasta support, container enhancements for converged AI and HPC workloads and better system maintenance support.

"We offer HPC solutions that are user friendly and highly robust, with the latest open source MPI interface and throughput rates that are suitable for short runs using a single CPU to very large and complex multi-processing applications," says Scapa.

Also included in the software update release is the introduction of Altair Units, a flexibly tiered pricing model. "Altair Units offers users the freedom to scale and compute from anywhere, using their own hardware or the cloud.

"We believe we can offer unparalleled value to suit each user's personal and different subset of tools, from industrial designers less familiar with software design tools to mechanical designers familiar with the likes of Altair Hyperworks™ and the multi-physics analysts and simulation specialists. The model offers on-demand flexibility to access Altair's entire portfolio with freedom, flexibility and value," he adds.

"And we are coupling Altair Units with Altair One, our new common app-based delivery platform, which makes our whole offering, including software, add on tools and customer support available from a single online-platform," Scapa concludes. ❑

The integration of SimSolid into Inspire

"We're committed to accelerating innovation by breaking down barriers to design and making high-performance simulation more accessible," says Altair's CTO, James Dagg.

Altair Inspire™, the fully integrated topology optimisation and rapid simulation solution defines the concept of simulation-driven design. Instead of being used exclusively for validation, simulation has become integral to the entire process. As a result, users can and should test more alternatives at the earliest possible stage of development to identify the most efficient solutions faster. Inspire makes it easy to realise these benefits, because it can be learned in just a few hours.

Altair CTO, James Dagg.

Altair's commitment to both simulation-driven design and design democratisation made the acquisition of Altair SimSolid a perfect fit. As many readers will appreciate, SimSolid represents a ground-breaking approach to structural analysis. With accuracy that has been independently verified by NAFEMS, it enables simulation of complex assemblies directly from CAD files. The skilled and time-consuming tasks of geometry fixing and meshing are eliminated. Results are delivered in seconds or minutes, rather than hours or days.

The integration of SimSolid into Inspire is therefore a logical progression – and exactly what users will find in the latest Altair 2020 release of Inspire. Alongside the proven industry solvers, Altair MotionSolve™ (multi-body system simulation) and Altair OptiStruct™ (structural design and optimisation), Inspire now provides seamless support for a third, SimSolid.

Within Inspire, users can make design changes directly on their models without having to go back to the original CAD system. Interactive design modifications such as geometry edits, dimensional changes – and part replacements – can now be immediately re-analysed on the fly with the SimSolid solver.

Inspire can also run simulations on a laptop or a workstation and has no need for expensive graphics processing units (GPUs) for it to solve large problems fast. The benefits extend throughout the design community. By putting fast simulation within reach of all engineers, product leaders will cut development costs and time to market and, by running more iterations themselves rather than having to refer to simulation specialists, product engineers will be able to make better design decisions.

And going forward, even more SimSolid functionality will be embedded within Inspire, which means unleashing the creative capabilities of more people for many more successful product design and development cycles. ❑

Open Integration Partner Programme enables IIoT exploitation

Softing industrial automation has joined the Endress+Hauser Open Integration Partner Programme, reinforcing this Open Integration network of 13 leading instrumentation, actuation and communication manufacturers. Endress+Hauser's Jörg Reinkensmeier and Thomas Hilz from Softing Industrial Automation explain the important role the partner programme plays for the ongoing success of IIoT solutions.


Jörg Reinkensmeier

How can field instruments and components be easily integrated into automation systems? The answer to this question is becoming increasingly important as the digitalisation of industrial production progresses. The Endress+Hauser Open Integration Partner Programme unites 13 manufacturers who want to ensure the streamlined interaction of their products and communication specialist, Softing Industrial Automation, joined the programme at the beginning of 2020.

These open Integration partners test and document the interaction of their products for typical process automation applications. Users profit in two ways, by being able to combine the best products for each application and through fast commissioning. Automation technology suppliers value the advantages of the Open Integration Programme as well. For these companies, it's important to be able to detect potential problems early and solve them prior to installing their products at the customer site.

"We go well beyond the established test methods within this programme, by scrutinising the functionality of complete system architectures in a lab environment," explains Jörg Reinkensmeier, marketing manager at Endress+Hauser. "We do that for specific fields of application or customer solutions. After successful completion of the tests, the so-called reference topologies are published in the form of mutual recommendations."

Thirteen companies currently belong to the programme. All the partners are suppliers of control technology, fieldbus infrastructures, measurement technology or actuator technology: Auma Riester, Bürkert, Festo, Flowserve, Hima Paul Hildebrandt, Honeywell Process Solutions, Mitsubishi Electric, Pepperl+Fuchs, Phoenix Contact, Rockwell Automation, Schneider Electric, Turck and, most recently, Softing Industrial Automation.

Softing Industrial Automation is a leading provider of software and hardware products designed to integrate technologies and data in factory and process automation environments. "Our companies have enjoyed many years of successful co-operation, which has now manifested itself in our decision to join the Open Integration Partner Programme," says Thomas Hilz, Softing Industrial Automation.

"The reliability and outstanding quality that we know from Endress+Hauser is also a top priority at Softing Industrial Automation. The company and I are looking forward to the coming years in which we will be helping our partners with the connectivity of their sensors," Hilz adds.

"Softing Industrial Automation strengthens our partner programme with further expertise in the area of data exchange and providing information at the field level," continues Reinkensmeier.

"Apart from networking process control technology, connectivity is playing an increasingly important role for IIoT solutions. Our aim is to exploit this potential together with all of our Open Integration partners," he concludes.

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How AI can mitigate RSA's energy crisis

"The energy industry is rapidly expanding its use of mathematical optimisation across a wide array of business areas, from supply chain management to clean energy production," says Mark Collingwood, FICO vice president for decision management solutions in Europe, the Middle East and Africa. "The adoption of FICO Xpress Optimization at enterprise level will streamline and improve energy providers' existing decision processes, while building on the success of previous projects."

South Africa presents itself as the perfect candidate for Xpress Optimization as it has had an ongoing energy crisis leading to load shedding, dating back to 2007. According to the CSIR Energy Centre, load-shedding has cost the economy as much as R338-billion; in 2019 alone, the country experienced 530 hours without power, at a cost of up to R120-billion.

The Renewable Energy Independent Power Producers Procurement Programme (REI4P) was introduced as part of the Integrated Resource Programme 2010-30. Its objective was for 17.8 GW of renewable energy to be produced in South Africa before 2030. The plan was later updated to diversify the energy mix to address the insufficient energy capacity problem. But despite these efforts, South Africa finds itself on the backfoot as the COVID19 outbreak has forced the country to pause load shedding, which was expected to continue for a further few months to ease the load on the energy suppliers.

But what are energy providers across the world doing to optimise energy efficiency in a world that faces this challenge in an ever-expanding global economy?

FICO® Xpress Optimization has the ability to move computing of even the largest energy providers to the cloud, develop new business opportunities and power up global decisioning processes. With Xpress's flexible licensing model, global energy providers, such as Uniper, are now able to upscale cloud infrastructure as needed, delivering faster results and creating new business opportunities.

"Uniper needs the smartest technology available to inform our energy production decisions, which is why Xpress models run at the core of a number of our decision processes," said Colin Silvester, senior modelling expert at Uniper. "The first-class service we've received from the FICO team for the past 20 years only cemented our recent decision to upgrade our Xpress solution to enterprise-level. FICO has earned its reputation as a leader in Optimization technology."

Uniper has used FICO® Xpress Optimization on seven previous projects to maximise value from volatile energy markets over the past 20 years, and with this enterprise-level upgrade, Uniper will be able to further expand its existing projects through better Energy storage modelling; Energy asset management; and Commercial optimisation of heat and power assets. ❑

Own your plant's future now: build a digital foundation

Rockwell Automation talks about the industrial use of digital technology in asset management and makes some foundational suggestions that should be considered in a digital asset performance management tool.

You've decided it's time to invest in digital technology to drive better performance from your industrial plant assets. But how do you get started? There are many options vying for your attention. Different technical solutions from multiple vendors, different pain points you're trying to address, even different priorities and objectives within your organisation.

Should you focus on minimising lifecycle risk? Ensuring you have an optimal quantity of critical spares in your storeroom?

First things first. Before selecting a solution to implement, organisational alignment is the number one factor that can make or break a digital transformation initiative. A clear, shared understanding of each functional team's priorities and desired outcomes is key to ensuring organisational alignment before initiating a project.

One of the most common industrial use cases of digital technology is asset management, and it may be tempting to try to create your own solution in-house. However, it's unlikely you have the staff or tools needed to provide you with a true understanding of all industrial asset management data needed to address business objectives. Product lifecycle is an example – how do you keep track of lifecycle status for the scores of parts you have installed, from various manufacturers?

If you're ready for a fresh start, here are a few foundational elements you should consider in an asset performance management digital technology tool:

Identity and access management

The worst case scenario is not being able to access the data you need to do your job. You'd be guessing at what you should be doing based on what you think you know about your facility. With role-based permissions, multiple stakeholders can access a single, verified dataset and collaborate to make decisions. Data is updated in near real time, so it's always current. And it should be convenient to access from a computer or mobile device so you can easily and securely share information across teams.

Proactive notifications

Wouldn't it be great to receive lifecycle change notifications or product service advisories only on the equipment in your installed base? To be able to actively manage your installed base, you need ongoing visibility into your installed base so that as products change – whether lifecycle status, safety advisory, or other – you can proactively manage the impact of these changes.

Intuitive user experience

You need to be sure that the solution not only has the relevant data to help you address your specific challenges, but also that it's presented in a way that is intuitive to users, based on how they do their job in the facility. There is complexity in accessing data, including variation in how it's stored and pulled together. Dashboards provide at-a-glance views that allow the stakeholder to consume the data easily and see what's changed, and what may be affected in the plant.

The use of data and digital technology can help reduce your obsolescence risk and provide better visibility into your installed base of equipment. With the right digital technology, you'll find it easier to make decisions based on the data available to you.

Knowledge is power, and industrial asset data can help you reduce costs, gain better visibility of your maintenance activities, and drive better asset performance. ❑

An Installed Base Evaluation makes it easy to collect and analyse critical performance information within a facility.

Renewable energy champions rebrand to Zutari

Paul Nel, Energy lead for Africa for the renewable energy champion Aurecon, which has now been renamed Zutari, talks about the brand change and outlines the company's rich legacy of involvement with some of Africa's most prestigious renewable energy projects.

About 70% of utility-scale renewable energy projects undertaken under the Renewable Energy Independent Power Producer Procurement (REIPPP) programme in South Africa to date have seen the involvement of engineering, design, and advisory company Aurecon, according to Paul Nel, Energy Lead for Africa. The company is currently in the process of rebranding as Zutari, after officially announcing the separation of the African business from the Aurecon Group, effective from 1 January 2020.

The new name, Zutari, reflects the company's African heritage and was derived by combining two words in Swahili, the most spoken language on the continent: mzulia (invent) and nectari (nectar).

With a strong engineering presence in Cape Town and Pretoria, the energy division is divided into four business lines, namely generation, transmission and distribution, industrial energy solutions, and power system studies. This ensures fully-integrated solutions for its diverse customer base, which includes international and local project developers, institutional clients such as Zambian electricity utility ZESCO, and local government clients such as the City of Cape Town.

In addition, Aurecon/Zutari is also involved with regional initiatives such as the Southern African Power Pool (SAPP) and, to a certain extent, the East African Power Pool (EAPP), where the main focus is on large interconnector projects. At present, it is undertaking projects in South Africa, Uganda, Zambia, Malawi, Kenya, Mozambique, Madagascar, Ghana, Tanzania, and Nigeria. Apart from the large interconnector studies, the focus here is mainly hydroelectric and solar power, with some clients looking at wind energy in East Africa, for example.

"We have really been involved across the board in terms of renewable energy projects in Africa, including hydro power. We have deep insight into what it takes to connect to the grid at the utility-scale level, but also have specific experience in smaller industrial-scale solar power projects specifically for industry. Here hybrid solutions often provide the best energy mix, especially as battery-storage technology has not yet become cost-competitive with more traditional solutions," Nel explains.

Africa, in particular, requires robust and durable solutions, which often means that clients prefer tried-and-tested technology rather than the latest cutting-edge innovations. Despite this, Aurecon/Zutari remains up-to-date with the latest research and development (R&D) in order to assist the market as it matures. This has resulted in a steady

Aurecon acted as owner's engineer on the 140 MW Cookhouse wind farm project, providing a wide range of technical advisory services to help progress the project through feasibility and financing phases.

As the EPCM contractor for Stortemelk Hydro, a Renewable Holdings company, Aurecon was responsible the entire detailed design, construction supervision, ECO monitoring, contract administration and programming, as well as the health & safety oversight for the Stortemelk Hydropower Project in South Africa.

advance from fixed-access solar energy to single-access tracking. "We are currently looking at supporting some clients with bifacial photovoltaic (PV) technologies on their projects," Nel reveals.

Aurecon/Zutari has also been actively supporting some of its energy clients with advanced data analytics, cutting-edge drone-based construction monitoring and complex, bespoke business decision support solutions. "I believe we currently offer some clients unique, digitally-advanced solutions that no one else in our space is doing. We are also actively looking at ways to increase our digital offering, helping our clients to remain relevant in this fast-changing digital world."

The Kathu Solar Energy Facility in the Northern Cape, which has an installed capacity of 100 MW and a 75 MW PV system mounted on a tracking system to follow the sun throughout the day. Kathu owners Reisa and Building Energy appointed Aurecon as owner's engineer to ensure technical compliance on all civil, electrical and construction issues, and to assist with the resolution of technical queries and disputes.

Nel points out that the need for power and water on the continent is growing unabated, especially because of increasing urbanisation and, to some extent, industrialisation across Africa. This has allowed Aurecon to achieve significant traction in the energy market.

"We are always keen to get involved with difficult problems knowing that, through this, we not only bring tangible relief, but make a significant contribution to the socioeconomic development of Africa. We have strong institutional experience across the continent, but specifically in South Africa, that can assist our country to get back on track in terms of its electricity needs," Nel assures.

The main challenge facing South Africa is its fossil fuel-based energy mix that is heavily dependent on the mining industry for supplying coal and employment opportunities. "We are dependent on the government to free up the power generation sector," says Nel, pointing to the long-awaited Round 5 of the REIPPP programme.

Transitioning from coal-based power to renewable energy is a long and complex journey, as witnessed by the government's ongoing efforts to separate the transmission, distribution and generation business units of electricity utility Eskom. "This unbundling is a prerequisite for the freeing up of the electricity market. Eskom's inevitable reorganisation will be a slow process. What we are ultimately hoping for is an independent system operator mandated to trade power between private and public entities. This will also free up significant investment opportunities for the private sector," Nel says.

In terms of nuclear power, it is vital that options are considered to extend Koeberg's operating life in order to ensure stability of the national grid, especially as this is the only base-load generation capacity in the entire Western Cape. New technology such as Pebble Bed Modular Reactors will likely still have a long development lead-time. Traditional nuclear generation solutions also remain very expensive and complex to develop, and hence Nel believes additional nuclear power will not be considered an option for South Africa's energy mix in the foreseeable future. ❑

First of its kind recycling project launched in Limpopo

A joint separation-at-source initiative between HDPE and PP plastics manufacturer, Safripol, and PET recycling company, PETCO, is being rolled out in Limpopo's Thulamela Municipality to target a cleaner environment and job creation. Gert Claasen of Safripol technology and innovation and Belinda Booker, PETCO's collections and training project manager, report on progress.

Celebrating the launch of the Separation-at-Source initiative in Limpopo are ***(From left)*** *Avhashoni Tshifhango, Thulamela Municipality mayor, Tlou Sebola of PETCO, and JP Tambani, deputy principal of Tshedza Primary School, which was one of the recipients of the waste separation bins. The initiative aims to create more income opportunities for recycling collectors, while reducing waste that ends up in landfills.*

Residents in northern Limpopo are becoming eco-warriors thanks to a new campaign which aims to see environmental waste reduced and much-needed jobs created at the same time.

The separation-at-source project is being rolled out in the towns of Thohoyandou and Sibasa in Limpopo's Thulamela Municipality, thanks to a sponsorship of 200 waste separation bins worth over R160 000 by Safripol, a national company which manufactures high-density polyethylene (HDPE) and polypropylene (PP) plastics.

The handover of the bins was overseen by PETCO – the organisation responsible for PET plastic bottle recycling and collections around South Africa – in collaboration with the Thulamela Municipality; the South African Department of Economic Development; and the Department Environment, Forestry and Fisheries.

The colour-coded green (glass), yellow (plastics), blue (paper) and red (cans) bins will appear at schools and municipal offices in the two towns, allowing residents to separate out their household waste for the first time. This means – at least for the households that take part in the project – that only waste that cannot be recycled will end up in the municipality's landfills.

In turn, the municipality will be able to allow recycling collectors access to the separation waste bins, creating much-needed recycling income opportunities in the area. "We are committed to helping uplift communities and stimulating income generation wherever we can," says Gert Claasen, Safripol technology and innovation executive.

Belinda Booker, PETCO's collections and training project manager, said the support came at a time when the municipality could not afford the separation bins, which are a first for the area.

"The knock-on effect is that the environment will be less polluted, in addition to which the project will bring more attention to recycling as a source of income," she says, adding: "The PET recycling value chain created more than 60 000 income opportunities in 2018 and initiatives such as this underpin that value."

As part of its mission to empower municipalities throughout South Africa to recycle more, PETCO reached out to Thulamela Municipality late last year. "The municipality explained that it lacked the budget to embark on a waste separation at source initiative within Thohoyandou and Sibasa," Booker recalls.

Thulamela Municipality superintendent of waste management Vhutshilo Revele said the project would help create jobs. "We have partnered with recycling collectors within the municipality who will remove the bins when they are full," she assured, adding that recycling was important to the municipality as it mitigated environmental degradation and pollution.

Booker said working with the government to support the concept of waste separation at source would "actively improve the way municipal waste is managed, and consequently divert waste from landfills – all the while sustaining and boosting the green economy".

"Partnerships with government at all levels are key to unlocking meaningful strategies to address waste reduction behaviour in South Africa. PET plastic bottles are not trash and have value – and they should be recycled," she said, adding that it was heartening to see companies such as Safripol taking their extending producer responsibility (EPR) seriously.

"There is a huge need to support recycling, especially in rural areas where waste management is not well serviced or a priority." ❑

According to new statistics released by PETCO, 62% of all polyethylene terephthalate (PET) plastic beverage bottles placed on the market in 2019 have been recycled – a trend that is in line with global PET recycling rates.

Bio disinfectants: a dream job for a process engineer

Process engineer, Phola Kula, talks about the science of her dream job at Biodx – the manufacture of a modern range of powerful, safe, cost effective, renewable disinfectants and preservative solutions "that work with nature, not against it" – and the renewed significance of the approach in combating COVID-19.

At 26-years-old, process engineer Phola Kula has made a habit of overachieving in life. After successfully completing her chemical engineering degree at the University of Johannesburg at just 22, Phola found the perfect match when she applied for a job at Biodx.

Four years later, as Biodx's process engineer, she's an essential part of the company's business and success, and she's found her dream job to boot.

"Yes, I'm one of 'those' people," says Phola with an infectious smile. "I love my job, and it's been such a privilege to be involved with Biodx. I've had the rare opportunity to learn from the ground up, starting with the basics of project planning, implementation and manufacturing.

"A point of pride for me is being able to assist in Biodx's quest to produce the world's first 100% natural organic disinfectant, along with the fact that I'm making a real impact, right now, in the fight against COVID-19, with responsibility for manufacturing our current range of world-class disinfectants. It really doesn't make sense that South African formulators, manufacturers and government are importing and buying old-school toxic active ingredients when they have a far superior product from Biodx on their doorstep here in South Africa."

Phola always had a particular passion for chemistry, initially choosing to study analytical chemistry before moving over to engineering. As someone who has is fascinated by the world of science, joining Biodx fitted her diverse skills and interests like a glove, as she gets to wear many hats in the process engineering space while growing in other directions too.

"At Biodx, we're on a journey to reduce society's dependence on synthetic chemicals. Harnessing the power of biotechnology, we're breaking boundaries, crossing new frontiers, and helping to evolve the future of disinfection – all towards enabling a better world," she says.

"Although I do mainly process engineering work, I'm also involved in production and compliance to meet SABS standards," explains process engineer Phola.

"The best part of my job is that I'm constantly learning new things from my colleagues and even suppliers, who share their knowledge with me. My knowledge base expands all the time and that's what I look forward to each day.

"And now, with Biodx encouraging me, I've also completed a Post Graduate Diploma in Business Administration (PDBA) and enrolled for my Masters in Management."

Phola is a dreamer with big plans for the future, and as the world opens up new doors every day, learning remains her focus. "I believe that life is a continuous learning curve. You can never know everything, and it's so important to grab every opportunity to master new things wherever you can," she says.

She adds: "I'm determined to learn as much as possible to better equip myself for business management. I look forward to one day being able to implement things and be instrumental in decision making".

For this young, dynamic up-and-comer, the hardhat is just the beginning. Phola Kula is definitely one to watch the headlines for, as she continues to engineer her way to the top. ❑

Decrease in air pollution due to SA lockdown

A preliminary analysis of satellite data on air pollution shows a decrease in the concentrations of pollutants over South Africa during the national lockdown in response to the Coronavirus.

This is according to a team of researchers at the CSIR who are working in collaboration with Eloise Marais, from the University of Leicester in the UK, to understand the impact of the lockdown on air quality in South Africa.

Using satellite data, the team is exploring concentrations of pollutants in the atmosphere and at ground-level, that is, at the level at which people breathe, which directly relates to impacts on health.

The preliminary analysis of the satellite data shows that there has been a decrease in the column of tropospheric nitrogen dioxide (NO_2) and sulphur dioxide (SO_2). This data was obtained from the Earth Observing TROPOMI instrument on the Sentinel-5P satellite.

Over the Highveld, NO_2 concentrations decreased by 23% after the lockdown (27 March to 20 April, 2020) compared to the preceding period from 10-26 March 2020 – with SO_2 concentrations to 17 April 2020 being 47% lower.

There is a larger decrease in NO_2 in and around Gauteng, as expected from the decrease in vehicle use. There is also a substantial decline in NO_2 over the industrialised Highveld region. Preliminary results from ground-based monitoring stations in the Highveld domain are less conclusive, as these show large variability in changes of NO_2 before and during the lockdown.

South Africa's large sources of nitrogen oxides ($NOx=NO+NO_2$) emissions are vehicles, industrial activity, and energy generation that mostly comes from coal-fired power plants. There are also natural sources from lightning, bacteria in soils, as well as semi-natural sources, such as biomass burning. These natural sources tend to be seasonal with the burning season in South Africa occurring in late winter through spring.

The largest sources of sulphur emissions in South Africa are coal-fired power plants and industrial activity that uses or processes materials containing sulphur, such as coal.

CSIR principal researcher, Professor Rebecca Garland says: "It would be premature to attribute this change solely to the decreases in emissions from the lockdown. Confirmation with additional surface observations and a model are required."

This work is on-going. ❑

Visual Support remotely assists maintenance personnel

Extraordinary times require extraordinary measures: For this reason, Endress+Hauser released the Visual Support service application ahead of schedule during the coronavirus crisis. In the acute phase of the pandemic, customers were able to take advantage of the remote audio-visual support free of charge – and were enthusiastic about the possibilities of this innovation in the Endress+Hauser service portfolio.

Endress+Hauser has been driving digitisation forward for years – in the product and service area, in customer interaction and for external and internal collaboration. In the coronavirus crisis, the development of powerful digital platforms and offerings has now proven its worth for customers and the company. "We can bridge the physical distance forced upon us by the coronavirus through digital and emotional proximity," says Matthias Altendorf, CEO of the Endress+Hauser Group.

Using live video transmission and screen casting, Endress+Hauser's technical support team can deliver remote service support to customers in a reliable and flexible manner.

This also applies to the service area. Travel restrictions and protective measures as a result of the coronavirus pandemic have regularly made it impossible to use external service providers in recent weeks. In order to carry out critical service work related to instrumentation in a timely and appropriate manner, Endress+Hauser has taken the latest innovation in this area, Visual Support, from the pilot project phase to global rollout.

The Endress+Hauser service organisation has been using the possibilities of a cloud-based platform based on the Salesforce customer relationship management system for some time. The Salesforce Service Cloud module enables completely new ways of serving the customer base. Now Endress+Hauser has integrated Visual Support into its support services portfolio, giving customers access to in-depth technology and product knowledge, including the guaranteed availability and response time from Endress+Hauser's global network of technical experts.

The use of this technology for remote support enables audio-visual support for diagnosis and troubleshooting, commissioning and regular maintenance of field devices. With the help of live video transmission and screen casting, Endress+Hauser's technical support team can work almost as if they were on site, helping customers in a reliable and flexible manner with their service tasks via remote access.

For ten weeks the service was free of charge for customers. During this time, more than 250 Visual Support sessions were conducted worldwide. "Customers have given us a lot of positive feedback," says Franck Perrin, who heads the Endress+Hauser Group's service organisation. "They are enthusiastic about this new form of support and have experienced how Visual Support can save time and money."

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WearCheck Windhoek is open for business

With the recent launch of WearCheck Windhoek, the mining sector and industrial operations in Namibia can now benefit from specialist condition monitoring services.

Hailing from South Africa where it was established over 40 years ago, WearCheck's preventive maintenance expertise is not new to Namibia, the company has provided condition monitoring services to the Husab Uranium Project since 2016. But to enhance accessibility to the company's services for Windhoek-based industries, the WearCheck laboratory that was in Rosh Pinah has now relocated to Namibia's capital city.

Offering the full complement of proactive maintenance services, WearCheck Windhoek provides a 24-hour turnaround time for processing used oil samples. Scientifically analysing the data from the samples helps to improve the reliability of the machinery or components from which the oil originates.

Other preventive maintenance techniques available from WearCheck Windhoek include analysis of fuel, transformer oils, coolants, greases and filters, as well as many reliability solutions services, transformer chemistry services and advanced field services.

Regular condition monitoring helps create an informed programme for implementing remedial action when problems are discovered, thus substantially reducing the chances of a machine failing without warning. Unplanned machine failure can have a disastrous impact on a production line while emergency repairs are carried out and spare parts ordered.

WearCheck provides proactive maintenance services to many industries, including construction, manufacturing, road transport, mining, electricity generation, wind farming and aviation. Helping customers save time and money through condition monitoring is WearCheck's fundamental goal.

WearCheck's network of 17 world-class laboratories stretches across Africa and beyond. The company holds ISO 9001 quality certification, ISO 14001 certification for environmental management, and ISO 17025 accreditation for laboratory-based quality management.

WearCheck Windhoek is situated at 14 Lafrenz Industrial Park, Rendsburger Street.

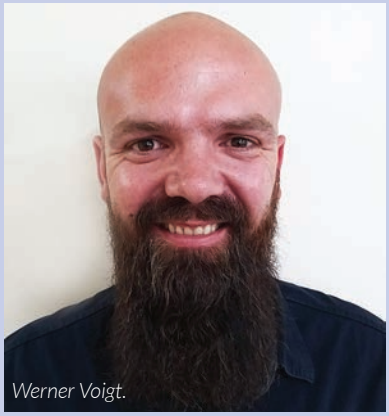
www.wearcheck.co.za

New Hytec project manager

Werner Voigt has been appointed to the position of projects manager, Johannesburg, at Hytec South Africa, effective from April 2020.

Voigt first joined the Bosch Rexroth South Africa Group in 2013 and brings extensive experience and project management expertise to his new position.

www.boschrexroth.africa



Werner Voigt.

GEMÜ expands production capacity

As part of a global production concept, GEMÜ has set the course for further expanding its butterfly valve production capacity from its Shanghai factory.

To achieve this, the manufacturing capabilities have been significantly expanded in order to further increase the effect on production steps that are decisive for quality. In concrete terms, this means that GEMÜ has specifically invested in mechanical machining and coating systems for the valve bodies and butterfly discs, and the company now carries out these production steps itself in its own Butterfly Valve Production Centre using state-of-the-art technology.

In recent months, a new fully automated coating system was fitted and commissioned for this purpose. In addition, GEMÜ has developed a special manufacturing and clamping concept that can be used to achieve narrow shape and positional tolerances.

Furthermore, in recent months, an interdisciplinary project team made up of German and Chinese specialists at GEMÜ Valves China has been working intensively on the fine adjustment of the individual parameters to optimise the production processes. Now that this work is complete, the expanded GEMÜ production centre is fully up and running.

This has laid the foundations for the latest generation of GEMÜ R480 Victoria soft-seated butterfly valve to be produced in accordance with the most stringent quality requirements at the new butterfly valve competence centre in Shanghai, China – with immediate effect.

Gert Müller, managing partner at GEMÜ says: "With the expansion of our factory in Shanghai, we are offering customers significant improvements in safety and flexibility, while implementing our global 'Made by GEMÜ' strategy at yet another location."

Modern robot technology in use at the expanded GEMÜ Valves China production facility in Shanghai for producing GEMÜ R480 butterfly valves.

GEMÜ Valves China was founded back in 2000 and is one of the largest subsidiaries of the GEMÜ Group. Even before expanding production capacities, the company in Shanghai was one of GEMÜ's most modern factories. Thanks to the continued investment in employees, design, production and logistics, GEMÜ Valves China is an important site in GEMÜ's global production concept.

www.gemu-group.com

Skyriders cleans food-processing plant

Usually called upon to conduct maintenance, repair and inspection services at large-scale industrial structures such as smokestacks and petrochemical tanks, rope access specialist Skyriders recently completed an unusual project at a major food-processing plant.

"Our scope of work was to carry out general routine cleaning in inaccessible areas," explains Skyriders marketing manager Mike Zinn. A six-person team carried out the fast-track project over a two-day period, deploying high-pressure washers using food-safe detergent in order to adhere to the strict hygiene and health and safety standards of the food and beverage industry.

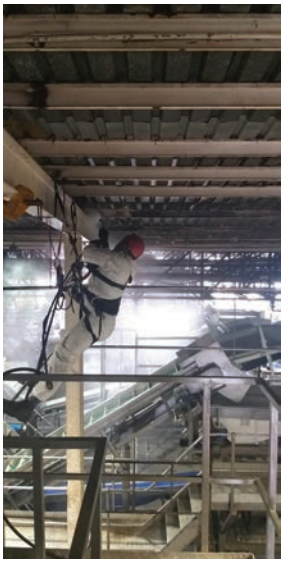
The food-processing plant was offline during the cleaning operation, which increased the pressure to complete the project in as short a time as possible to minimise downtime. Zinn comments that Skyriders has its particular methodology for this client down to a fine art, as it has now completed about four projects at the same plant, each on a different line or section.

"The food-and-beverage industry is an important growth area for Skyriders. Our success with this particular client, a leader in its market, is largely due to how we have aligned ourselves with its expectations and the stringent requirements of the industry itself," Zinn adds.

Previous projects at the food-processing plant have focused on replacing hoses and gas lines, which are suspended from hangers. Here rope access was the fastest and most cost-effective solution, as opposed to traditional scaffolding, which is difficult to erect in a factory environment constrained by conveyors and other structures.

"Working with this major client has been quite unique for us, and it has gone a long way to showcasing our versatility and adaptability. From coal-fired power stations to frozen-food producers, we have the experience, expertise, and skill sets to be able to cope with diverse requirements and environments," Zinn concludes.

www.ropeaccess.co.za



Skyriders, recently completed a cleaning project at a major food-processing plant.

Plascon's Mobihel enters SA coatings market

Never underestimate the importance of finishing well, whether you're referring to a car race, or life itself. In the competitive automotive coatings industry, the perfect finish is what drives customer retention and business growth.

Enter Plascon's flagship brand, Mobihel, a premium European auto refinish product that offers a lifetime warranty. Mobihel, which was launched by Plascon in the South African market in September 2019, has been met with such an excellent uptake that Plascon is already expanding its footprint.

Mobihel's suite of products includes cleaners, degreasers, putties, primers, hardeners, additives, thinners, basecoats, clear coats and fillers. In short, it's a one-stop-shop for those in the automotive refinishing industry.

Although Mobihel is still relatively new to the South African market, the brand comes with 90 years of experience in producing highly accurate colour-matching topcoat solutions. Mobihel has earned its impressive reputation by using the innovative 'first-time-right' system to make the repair process quick and easy – saving time and money.

With the latest in refinishing technology, consumers can be assured that Mobihel will, like other Plascon products, continue to exceed expectations in the automotive industry.

plascon.com

Decarbonising the energy trade

The Lux Research team has released an analysis of how future global energy networks will evolve as a result of the world moving away from the intensive use of carbon-based fossil fuels and towards more renewable and cleaner energy sources. The report's lead analyst, Tim Grejtak, presents some key findings.

Today's global economy is enabled by the global energy trade, with countries around the world dependent on flows of oil, coal and natural gas to keep their economies growing.

As countries move to decarbonise and adopt renewable energy, many are finding it difficult to do so cost-effectively because of fundamental limitations in solar and wind resources. For these countries to fully decarbonise without breaking the bank, they must develop innovative renewable energy carriers and build new zero-carbon energy supply chains.

In a new report, *Evolution of Energy Networks: Decarbonizing the Global Energy Trade*, Lux Research examines these renewable energy carriers and the countries and companies developing them.

Not every country in the world can satisfy its demand for energy from domestically produced renewable sources. Some countries simply lack the land area and resource potential to power their energy-intensive economies.

"Places such as Singapore, Japan and the Netherlands are great examples of countries that cannot meet their energy demands solely through domestic renewable sources like wind and solar energy," says Grejtak, Lux Research analyst and the lead author of the report. "In fact, countries representing US$9-trillion of global GDP cannot meet their energy demands solely through domestic renewable energy production and will require the import of renewable energy from more resource-rich countries," he explains.

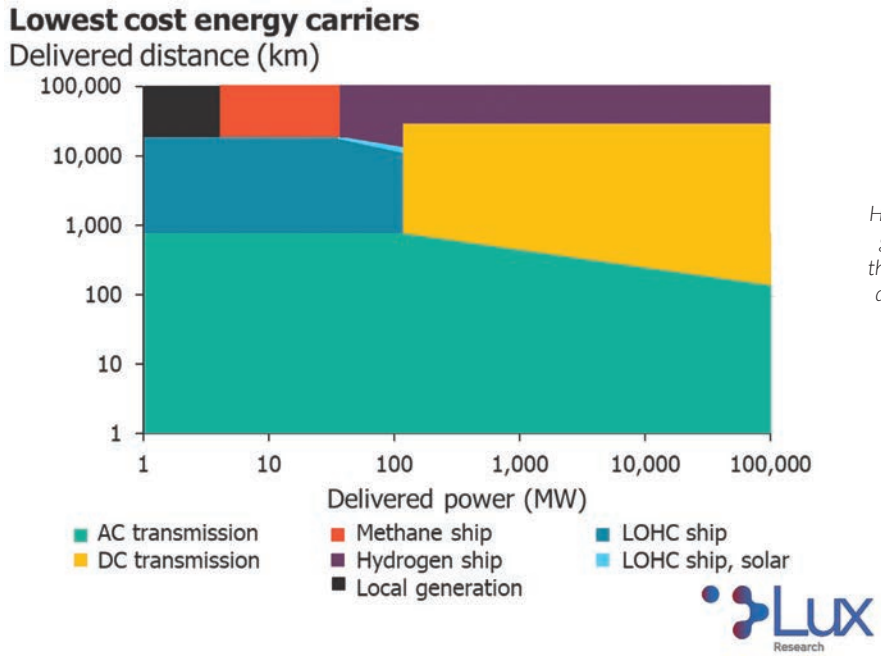
To achieve their decarbonisation goals, these countries will need to find ways to import zero-carbon energy. Some of the ways identified for doing this include:

- Building new electricity infrastructure using high-voltage ac or dc transmission lines as a primary means of importing low-cost solar energy from distant regions.
- Power-to-gas technology using pipelines is limited and shipping liquefied hydrogen, methane or ammonia offers better economics, but only over long distances.
- Imported energy costs can be competitive against other zero-carbon technologies, but no energy carrier can offer costs low enough to replace LNG or oil and offer a global renewable energy trade.

Not only is the demand for energy imports growing; it is also diversifying. New energy carriers such as liquefied natural gas (LNG) tankers are supplementing or, in some cases, substituting the traditional oil and coal vessels that have largely made up the mix of energy imports to date.

"Our analysis shows the expanded build-out of ac and dc powerlines will be the most cost-effective way of importing low-cost solar energy from distant regions, though only up to roughly 1 000 km. At farther distances, other renewable energy carriers such as synthetic fuels are less expensive. It's important to note that imported energy costs can be competitive against other zero-carbon technologies, but no current energy carrier can offer costs low enough to completely replace liquid natural gas (LNG) or oil," Grejtak adds.

Delivering energy via land-based powerlines or pipelines becomes expensive at long distances because of the inefficiencies of powerlines and the capital costs of pipelines. Delivery via ship, on the other hand, is



When comparing all energy carriers across all powers and distances, ac and dc power lines will provide the lowest-cost solution to connecting remote solar power systems to customers. Only at distances greater than 20 000 km when HVDC lines drop in efficiency, or greater than 1 000 km but less than 100 MW when HVAC lines drop in efficiency, does shipping appear competitive.

much more cost-effective at long distances, whether it be liquid organic hydrogen carriers (LOHCs) delivered by tanker or liquid hydrogen delivered using cryogenic carriers like those used for LNG.

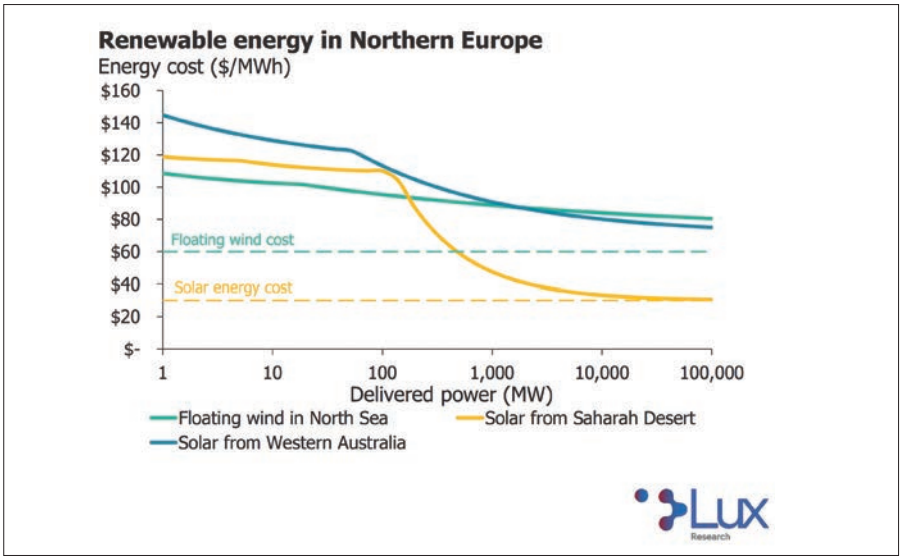
Crucially, Lux's analysis found that across all renewable energy carriers, low-cost solar energy can be delivered to resource-constrained regions at 50% to 80% lower costs than generating that solar energy locally under less favourable conditions. This value proposition will motivate the construction of billions of dollars of new infrastructure in countries committed to reducing their carbon intensity.

The report evaluated the lifetime costs of 15 different renewable energy carriers ranging from conventional carriers, including electricity, hydrogen, synthetic methane and ammonia; to more advanced carrier concepts such as LOHCs, vanadium and aluminium.

Specific energy carriers will dramatically reshape how particular regions access low-cost renewable energy. Combinations of liquid organic hydrogen carriers, high-voltage dc transmission and liquefied hydrogen are expected to enable energy-intensive economies to reach their CO_2 targets from 2030.

The report notes that:

- Successful projects will target multiple high-value applications and industry consortia will be key.
- Focusing on difficult-to-decarbonise sectors such chemicals, heavy transportation and heat will make better use of energy carriers. These sectors intersect around industry, and partnerships among industry, logistics and renewable power generators will be essential.
- New infrastructure projects are not cheap and consortia are critical in order to reduce and share costs. These renewable energy carrier projects will cost of billions of dollars each and such costs cannot be borne by industry alone; governments will also have to play a role.
- A common global renewable energy trade is unlikely. Even with highly favourable conditions, high-volume energy carriers can only just match LNG prices today. If renewable energy displaces hydrocarbons, though, future LNG prices will be lower as demand drops.

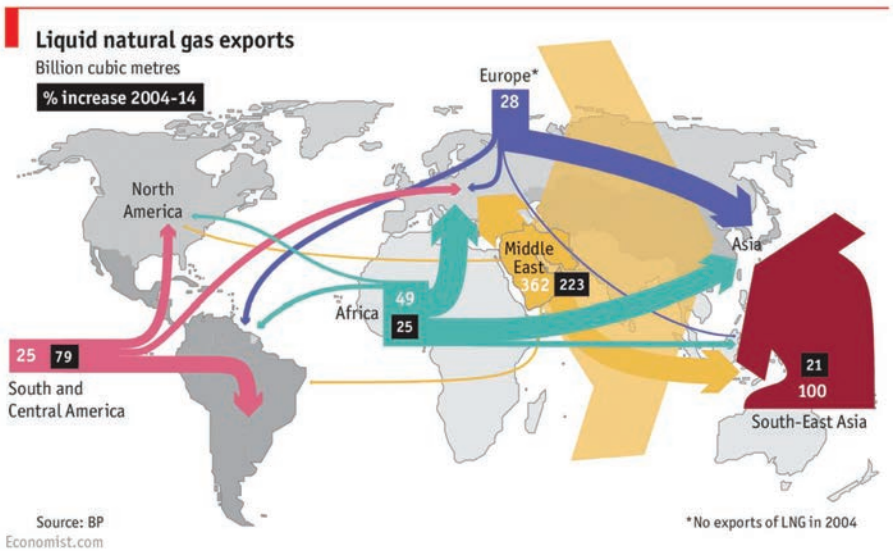


While solar resources in places like Northern Europe might be poor, they do have access to local high wind resources like the North Sea. Floating wind turbines may have higher electricity costs – estimated at $60/MWh versus the modelled $30/MWh value for solar – but, depending on power delivery, may offer lower costs than importing renewable energy from farther away.

Lux predicts the first tipping point for deploying renewable energy import infrastructure will be in 2030, when imported electricity via new HVDC power lines becomes cheaper than low-carbon natural gas turbines. The next tipping point will occur in 2040, when imported liquid hydrogen becomes cheaper than low-carbon steam methane reformation. This gives companies today just 10 years to develop the partnerships and pilot projects necessary to demonstrate such a transformative energy paradigm.

Major companies, including Kawasaki Heavy Industries, Mitsui & Co, Equinor and Shell are already developing their own decarbonised energy trade routes in Europe, Japan, and Southeast Asia, meaning the fight for $500-billion of energy imports in those regions is just beginning. ❑

To view the executive summary of the report can be downloaded by scanning the attached QR code.



Globally, 2 800 TWh of energy per year is transported from resource- rich regions, such as the Middle East, to energy- intensive regions, such as Southeast Asia.

Top solutions for water treatment

Choosing the right pump system and devices is crucial to ensuring reliable water treatment.

In modern industrial societies, the water that flows whenever we turn on a tap is expected to be so pure that we can drink it without a second thought. But, achieving this is more complicated.

Water treatment plays a vital role in ensuring a stable future for our planet and can be broadly grouped into four main applications: industrial water; municipal water and wastewater; desalination; and water supply to commercial and domestic buildings. All require specific equipment and solutions.

Industrial water

Water is used for many different purposes in industrial processes, including as a solvent, a cleaning agent, and for cooling and heating. These processes need various treatment applications to cater for variations in water quality and industry requirements.

Industrial wastewater can either be a pollution threat or be used as a resource to be recycled and reused. The Grundfos dosing and disinfection product range offers equipment, systems, and monitoring solutions to ensure successful production and treatment.

Municipal water and wastewater

Processes, products and solutions used during water treatment must be of the highest quality and reliability – from water intake from sources such as rivers or lakes, to its distribution as drinking water and, finally, its return to wastewater treatment plants.

Grundfos provides water-treatment pumps serving all relevant treatment steps, including substance removal, disinfection, stabilisation, monitoring and control.

All the pumps can be combined in an intelligent way, offering accurate dosing of additives before or during treatment, and all can be supplied with systems that measure and control key parameters.

Desalination

Around 97% of all water on Earth is saltwater. Pollution, population growth and other challenges have led to a decrease in freshwater, and desalination is becoming a vital source of potable water.

All desalination processes produce pure water without any mineral content. Post-treatment – mainly remineralisation and disinfection – must therefore be done.

Grundfos is a market leader in this field, supplying solutions for all steps of the process.

Water supply to commercial buildings

From hotels to airports, Grundfos supplies chemical metering pumps, dosing pumps and chemical pumps for optimised water-disinfection systems.

These systems are adapted for all types of commercial buildings and a wide range of applications, including antiscaling, antifouling and anticorrosion, air-conditioning and heating systems.

In summary, every industry has its own requirements, with different additives and pollutants needing to be handled throughout various processes. Choosing the right pump system and devices is crucial to ensuring a reliable treatment process.

www.grundfos.com/za

Which pipe would you like to see running back into our rivers? Grundfos water treatment product solutions cater for four main applications: industrial water; municipal water and wastewater; desalination; and water supply to commercial and domestic buildings.

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Discover the benefits of Grundfos iSOLUTIONS for industrial water treatment and reuse at **www.grundfos.co.za**

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