



“Monitoring the performance characteristics of the pump regularly keeps you informed of its operation and provides ample time to take a measured response rather than incurring a failure and unplanned downtime,” Weir says

growth curve in vibration readings, which will start to increase gradually,” Weir said. “However, if our team notices a spike in vibration before the end of its service life, then we know something is wrong and requires further investigation.”

When it comes to a pump’s bearing assembly, the service life of this component is heavily dependent on the process and operation, according to Weir. One of the main contributors to premature bearing failure is inadequate gland seal maintenance, which can cause leakage, spraying slurry and water directly onto the bearing assembly. This can be minimised by regularly adjusting the seal and applying correct and consistent lubrication, Weir said.

“Throatbush wear rate has a major impact on the overall efficiency of slurry pumps and in many applications has the shortest life compared to other components,” Weir said.

Weir’s team can spend an hour on each pump adjusting and fine tuning the throatbush to extend the life of the pump by up to 50%, bringing it in line with the lifetime of other components. “This [enables]...the operator to derive the maximum value in terms of cost per tonne from the overall rebuild cost,” Weir said.

The importance of adjusting the throatbush to ensure the optimum gap between the impeller is also vital, Weir said. “To help improve this process for operators, we developed automated rotating and axial adjustment technology, speeding up the process and increasing the accuracy of axial movement.”

Weir’s maintenance investigations don’t stop there. “A drop in efficiency is not always an issue with the pump,” the company noted. “We need to analyse the operating parameters and evaluate the application to identify the root cause.”

This is where its specialists are able to inspect upstream and downstream of the pump to understand if there is anything affecting the pump’s operation.

Integrating expertise

It is a similar holistic approach that has allowed **Metso**’s pumps business to make serious inroads into the mining pumps and pipelines sector, with the company able to integrate several solutions to produce the most productive and cost-effective mineral processing operation.

The company used the recent Bauma fair to showcase several new solutions, including its MDR500 pump for mill discharge applications.

Ready to flow

In a sector often viewed as stationary when it comes to technology development, pump manufacturers are now adapting to the increasingly complex tasks being asked of them by mining companies. Dan Gleeson explores a market ready to evolve

Pumps are continually being asked more of from the mining sector as minerals processing complexity increases and operators delve deeper below ground to extract ore.

Those manufacturing the pumps and pipelines that keep product, tailings and water moving are also doing so against a changing environmental backdrop.

Not only are they being asked to use less water and recycle any they do use, they are also required to carry out tasks through more environmentally friendly means; using diesel-powered engine alternatives and oils and lubricants that come with low-carbon footprints.

Staying regular

Weir has established brands in the mining pumps sector, with Geho® and Warman® in the slurry moving field and Multiflo® in the dewatering space.

The company is a true believer in regular maintenance for slurry pumps, arguing it “extends the wear life, helps avoid unplanned downtime and lowers the total ownership cost for end users”.

Its confidence in this philosophy is backed up with significant digitalisation investments.

For example, its IIoT Synertrex® platform allows operators to closely monitor the health and performance of their pumps and triggers an alert when an issue occurs. When installed on a Warman® pump, Synertrex® can monitor the bearings and gland seal health, detect cavitation and other hydraulic anomalies, track

efficiency and forecast wear life, allowing operators to make condition-based decisions, Weir said.

It is through such initiatives it can say with some certainty that running slurry pumps to breaking point could in the long term be “doing your plant an injustice”.

“Monitoring the performance characteristics of the pump regularly keeps you informed of its operation and provides ample time to take a measured response rather than incurring a failure and unplanned downtime,” Weir said.

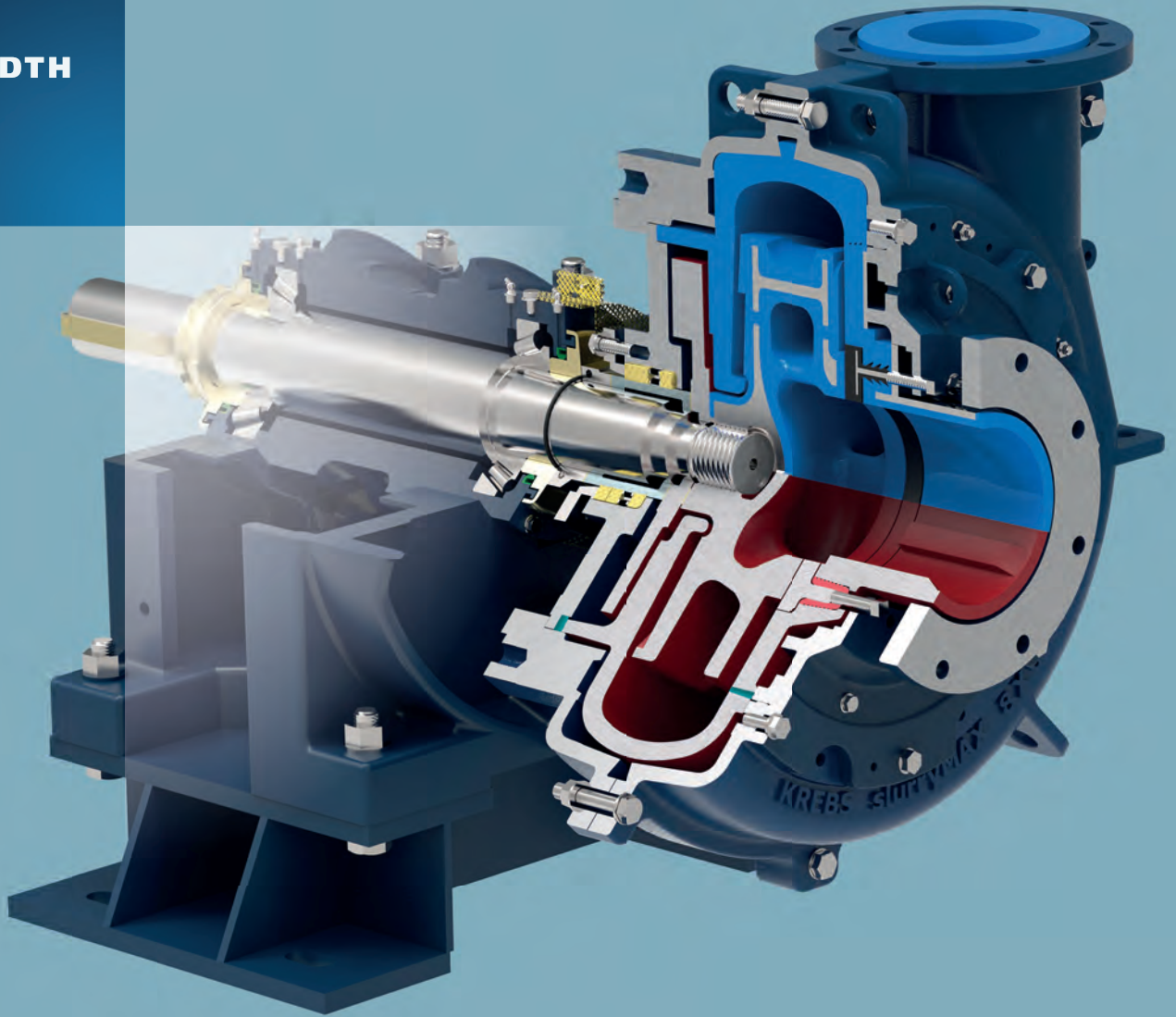
And, from a preventative perspective, there are regular tasks to carry out during these intervals to ensure a pump runs for longer.

Vibration is a key and early indicator of a pump’s health, according to Weir. “The vibration velocity target varies from pump to pump,” the company said, adding that the maximum value target for a large pump will be greater than a medium-sized pump handling water.

“Conversely, when we introduce solids into the fluid, the vibration will increase in relation to the mixture properties and the duty parameters,” Weir said. “When running routine inspections, we always refer to historical data to understand the range of vibration acceptable for that particular pump in that particular application.”

Vibration monitoring is about following a trend on a regular basis to understand if there has been a noticeable change, according to Weir.

“Once the pump reaches the end of its wear life, it’s normal to experience an exponential



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The MDR500 fits on a frame 1400 – the largest frame in the MD series to benefit from an innovative pump maintenance slide base, Metso’s Director EMEA, Pumps business area, Steve Sedgwick told **IM** at the event.

In terms of routine inspection or repair, this design allows the complete bearing frame and rotating element to be removed as a unit; thus, impeller, complete gland seal component and back liner renewal can be carried out rapidly and safely. The inlet and discharge piping can remain in place, which aids health and safety for operations and maintenance teams.

The MD series has been designed specifically for mill discharge, very abrasive applications and cyclone feed duties, offering sustained efficiency and performance, on top of operational reliability and durability, according to Metso.

The company said it uses only high-performance materials for its MD pumps that come with excellent resistance to abrasion and erosion. Special emphasis has also been placed on components able to withstand exceptional wear from coarse heavy solids due to the modern hydraulic design.

While the MDR500 on the Metso stand came with a rubber lining, the company also provides an alternative metal lining for coarse feeds (MDM500).

The MDR500, which as the name implies comes with a 500 mm inlet, has a large diameter, slow-running impeller, on top of double adjustment feature ensuring both suction side and gland side impeller clearances can be set perfectly from new, and maintained throughout the wear life of the components, Metso said.

This specimen on show at Bauma was, by far, not the largest model available, with the company explaining it can meet most flow and head requirements for the intended mining applications.

Last year, the company introduced a new pump test rig at its Sala facility, in Sweden, equipped with a 2 MW motor that could accommodate the company’s largest mill discharge pump – the MDM650 – and larger. Some of the pumps tested on this new rig have already been dispatched to a mining customer in South America.

Sedgwick said Metso had sold pumps to mining companies in several countries in recent years – for base metal and other operations – and was continuing to register good global demand from those focused on gold, iron ore and copper.

He said Metso had also recently made a delivery to a company in the CIS where the pump was being used in conjunction with high pressure grinding rollers in a hard-rock comminution circuit.

Metso doesn’t just supply the pumps that go into these heavy-duty applications. It also helps

integrate the equipment into the operations they were built for by supplying rubber pipes, valves and other solutions.

A case in point is Boliden’s Aitik mine, in Sweden, where an expansion project to take the operation from 36 Mt/y throughput to 45 Mt/y has been going on for the past few years.

This 25% increase in production – that came with a subsequent rise in output of copper concentrate – required every part of the Aitik plant to be optimised, Metso said.

Initial investigation showed if concentrate volumes were to step up with this expansion, the mine would run into capacity limitations with the existing tailings from the plant.

The miner needed a proven solution fast in order to achieve its production goals. It also required one that could cope with environments where temperatures could vary from -40°C to 30°C.

This is where Metso suggested a solution consisting of heavy-duty slurry pumps and rubber-lined steel pipes designed for rugged applications.

The company supplied 16 km of natural rubber-lined pipes, ranging in size from DN200 to DN600, with rubber compensators and branch pipes, and the heavy-duty pumps. The pipes offer five times longer wear life compared with a typical polyethylene pipe, according to the company, and were supplied alongside rubber hoses, and rubber bends equipped with thick long-wear rubber and an “ultra-smooth surface” for low flow resistance to increase the tailing capacity (source: customer story on metso.com).

Differentiated dewatering

At a different location at Bauma, Xylem was presenting new and improved products under its portfolio of tough dewatering and flood protection pumps for the European market.

The exhibition booth highlight was the debut of its latest Godwin smart dewatering pump, the Godwin CD150S. Replacing the CD150M, which has been around for over 30 years, this new pump is able to deliver more than 15% improved fuel economy, 40% less service time and 20% greater uptime compared with the CD150M, according to the company.

IM caught up with Kevin Snow, Global Product Manager for Xylem’s Godwin brand, at the event to hear more about the new product and the company’s wider R&D effort for mine dewatering.

“It’s a manifestation of an investment that started four or five years ago,” Snow said of the CD150S, the second “smart” pump the company



The MDR500 fits on a frame 1400 – the largest frame in the MD series to benefit from an innovative pump maintenance slide base

has launched.

“Around this time, we recognised that the Godwin model – the self-priming pump that used the Venturi principle and came out about 40 years ago – had been copied by everyone. The dewatering pumps business had become a ‘me-too’, or ‘price’ game, as opposed to a ‘value’ game.

“We picked up on this and began investing in differentiated value and innovation,” he said.

Backed by its Voice of the Customer initiative, which identified the major issues its customers were facing alongside the improvements they required, the company outlined its immediate R&D focus areas.

“This Godwin CD150S is a result of that entire gathering of information and redesign,” he said.

The CD150S has already clocked up thousands of hours of development time, according to Snow, with several tests already taking place in mines.

Interchangeable, application-specific impellers were one of the key selling points Snow identified.

“You can take this CD150S pump, which can handle large, non-compressive solids up to 3 in (76.2 mm) in size, and a user can switch out the impeller to a non-clog (NC) impeller,” he said. This NC impeller is based on Xylem’s Flygt N-Technology and enables the CD150S to tackle stringy, modern wastewater applications with the same pump.

The improved hydraulic design – which features a non-return valve with a “much more gentle turn” than the CD150M, Snow said – reduces vibration, and maximises efficiency and fuel economy, according to the company.

An additional sight glass to assess the volume and quality of lubricant, plus maintenance improvements on the compressor belt also provided an added benefit for the customer.

On the latter, Snow said: “Before, when a compressor belt failed or needed replacing, it used to take two people four hours to disconnect everything, put the compressor belt back in and

make sure everything was aligned. Now, nothing has to be taken apart in terms of splitting the pump end and it takes one person 30 minutes to change the belt.”

Reviewing these four improvements to the latest Godwin pump, Snow said: “In terms of total cost of ownership, there is an opportunity to save as much as \$60,000-70,000 over five years with this pump.

“I use the word ‘opportunity’ as you would have to take full advantage of all the benefits to realise those savings.

“But, on fuel economy, specifically, customers will definitely see savings.”

Snow said Xylem’s efforts to comply with both US EPA Tier 4 and EU Stage V engine requirements had recently seen the company adopt a different power generation philosophy for its pumps.

“In the US, historically, the users – and also ourselves – always thought bigger was better; the bigger the diesel engine, the better.

“As the constraints on the engines have come in...we have learned you have to run these diesel engines hot and hard for them to run efficiently.

“If you run the engines too slow, with not enough load on them, they have a tendency to clog up or stop working when you least expect it.”

Pairing the right diesel engine with the right pump has proven key to getting the highest level of performance out of the company’s new pumps.

As the S for smart indicates, there is an element of remote monitoring that comes with the CD150S under Xylem’s Field Smart Technology (FST).

Customers can see how the pump is operating – whether it is turned on/off, how fast it is running, etc – from anywhere in the world, while also analysing longer-term trends and parameters.

Snow said: “We’ve also introduced the capability for a customer to be warned if there is an issue with the pump – either by a telephone call or text.”

Customers identify a hierarchy of contacts under the FST solution and the personnel are contacted accordingly if a problem arises.

Snow added: “The FST effectively allows miners to cut down on their labour force; they can coordinate more centrally to see how various assets are being used within or between mines.”

Xylem has acquired a few sensing, measurement and analytics companies over recent years, including Sensus and Pure Technologies, and expects to continue its investment in FST.

The CD150S on show at Bauma came with a 6 in (150 mm) flange, and Snow said the company had plans to release a 4 in (100 mm) version later this year. “After the 4 in, I would imagine moving into the high lift applications, which is for

mining, and then also go into the higher flow version of these – the 8 in and 12 in models,” he said.

Xylem’s well-oiled R&D pipeline is also working on new power options for pumps; Snow said the CD150S can already accommodate diesel, electric and natural gas. Then, there is new dewatering technology for deeper mines on the radar.

On the latter, Snow said: “That is another trend in the industry – mines are going deeper, having to pump water at higher heads and pressures.

“This is another investment we are making for the future; I can’t give you new product dates, but stay tuned!”

A ‘well-oiled’ program

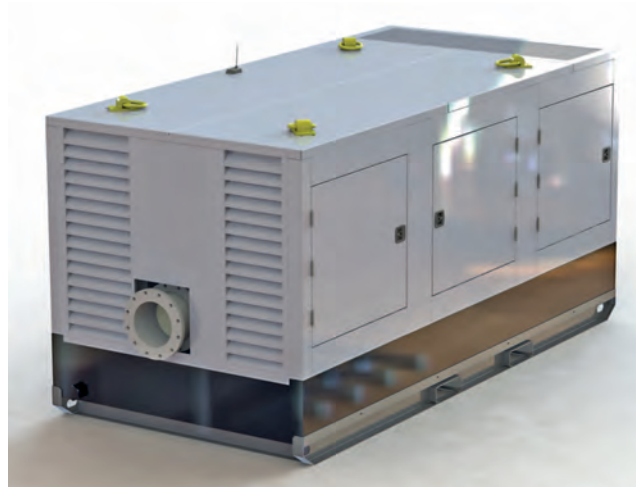
DXB Pump & Power, the UK’s newest mining pump manufacturer will, in September 2019, launch its new range of portable engine-driven pumpsets for sand and slurry applications in mines and quarries using a range of Stage 2-5 engines for different locations. This includes Tier 4 Final /EU Stage 5 emission compliant engines from Cummins for mines in Europe and America.

Built around the Cornell SM and MP range of Hi-Chrome pumps, the initial range of pumpsets will be available in either open frame or sound attenuated, fully bunded canopies with engines ranging from 55 kW up to 250 kW, or 3.8 litres to 9 litres, generating maximum flows up to 900 m³/hr (250 l/sec) and heads up to 140 m (14 bar) while passing solids up to 80 mm in size.

The new range of pumps slot into the same engine/canopy solutions DXB offers for its dewatering and solids handling pumpsets, already supplied by the manufacturer to its global quarry/mining and pump hire companies within Europe and beyond.

Simon Ruffles, Managing Director of DXB Pump & Power, said: “The new dry-prime slurry pumps from Cornell are market leading in terms of efficiency and materials of construction and innovative features, such as the proven Cycloseal, make them perform more efficiently and for less money than any other engine-driven slurry pumps on the market.”

He continued: “Cornell took the heavy-duty bearing housing and 50 cfm (110 m³/hr) priming gear that they have used on their Redi-prime range of dewatering pumps and designed a range of Hi-Chrome pumps with 650 Brinell hardness fluid ends, making them perfect for slurries and silts in the mining industry where the mines need both high-efficiency dewatering



DXB Pump’s new 300 mm s1400/35SAP pumpset

pumps and portable slurry pumpsets where they cannot ensure no solids are in the water, such as settling lagoons.”

The new range of pumps in 100, 150 and 200 mm sizes are matched to suitable engines for each mining region, allowing for ease of maintenance and ownership, especially markets with the more technical aspects of Stage 5 emission compliance, DXB said. With expected inflated specific gravities of as high as 1.8 seen in slurry applications, DXB carefully designed each pumpset to match the expected duty points at various specific gravities without overloading the engines, it said.

The development of DXB’s Stage 5 pumpsets has been ongoing in DXB since October 2018.

Ruffles said: “DXB Pump has worked with six to eight engine manufacturers in reviewing their available products and chosen two key European manufacturers for its future range of Stage 5 engines, ranging from 30 kW right through to 475 kW and will be packaging them in eight different canopy sizes, and over 35 different pump/engine combinations, including dewatering and slurry pumps. This R&D has taken the company over nine months to finalise and has now already resulted in the delivery of its first batch of Scania 9 and 13 litre engines, which are being packaged into pumpsets up to 450 mm in size for its European customers as well as its own pump hire fleet.”

The Scania engines, which incorporate variable pitch turbochargers, allow DXB pumpsets to operate at lower, quieter speeds without causing diesel particulate filtration systems to become clogged so quickly, according to DXB. This reduces the need for frequent “regen” or self-clean of the pumpsets, which could interfere in the user’s normal pumping operations.

“We felt Scania offered a first-class technical solution with an integrated treatment programme that was well designed and supported by the

company. With many years of using these engines in trucks and other on-highway vehicles, they really have optimised the design of the technology allowing us to package them in a manner that make them more compact, lighter and more transport-friendly than any other large pumpsets on the European markets,” Ruffles said.

The smaller range of pumpsets from 6.7 litre (178 kW) down to 2.8 litre (30 kW) include the market-leading 3.8 litre engines capable of over 140 kW from Cummins UK, who already offer Stage 5 engines in the European markets, ahead of the January 1, 2020 deadline.

DXB will also launch a new DXB designed telemetry system with its Stage 5 pumpsets that enables users to not only know where the pumpset is, but how the pump and engine is operating. This goes right down to knowing the inlet and discharge pressures in the pump, the speed, power consumption and fuel economy.

The telemetry hardware is already designed and being supplied by a UK-based manufacturer and will use a major international satellite provider of airtime to allow the fleet of hire pumps to operate anywhere on the planet

without the need to change SIM cards.

The company is also designing some of its pumpsets telemetry systems with WiFi capability to allow direct communication and operation in conjunction with other equipment such as drill rigs and central control locations, enabling monitoring of all equipment in one location.

Ruffles concluded: “We now offer the most comprehensive and environmentally-friendly range of pumps manufactured anywhere in the world reducing our customers cost of ownership and, more importantly, their downtime which has become increasingly important in the last few years.”

Stop-start applications

There are not many pumps able to cope with the conditions at Terrafame’s Sotkamo nickel-zinc operation, in Finland, where temperatures can go from one extreme in the winter to the other in the summer and metal is produced through an exothermic process.

Eight **Flowrox** LPP-T65 pumps have been in operation at the Terrafame site since the start of production almost eight years ago, but, over this period, the pumps were shut down for almost three years when the former owner entered

financial difficulty.

“A clear benefit in Flowrox LPP-T pumps is that they can handle even longer offline periods and still operate at full capacity 24/7 when put back into operation,” Matti Saloranta, Area Sales Manager at Flowrox, said. “They only require flushing of hoses and loosening hose compression of the rotor. The pumps have been designed for continuous duty and can even manage a dry run without damages and overheating.”

Jarmo Juutinen, Terrafame Maintenance Operator, said: “Flowrox LPP-T hose pumps are pumping cake wash water for Outotec Larox RB-SV rubber belt filters. After washing the cloth, water is recycled back into the process through suction boxes. From there, it is pumped back for the next cake wash. Our intention is to save fresh water.”

Juutinen said Flowrox provided on-site training at Terrafame to teach operators how to maintain valves and change hoses and bearings for pumps, which helped the company increase the longevity of its entire processing system.

Designed for heavy-duty industries, Flowrox peristaltic hose pumps are capable of pumping and dosing a wide range of slurries: abrasive,

Metso’s industry-leading crushing and grinding technology status is well known throughout the mining world, but its valves expertise is, perhaps, not as familiar.

Complementing both the minerals processing and pump technology the group produces, Metso Flow Control has been engineering valve solutions for over 90 years.

Neles® has become a household name across multiple industries, renowned for premium engineered metal-seated valve solutions. The company also acquired the Jamesbury® business some decades ago to add a premium-performance soft-seated valve solution to the portfolio.

Ville Kähkönen, Director, Industry Management, Metso Flow Control, told **IM** on site at the company’s Hakkila facility, close to Helsinki-Vantaa airport, Finland, that there is a clear distinction between the two product families.

“Jamesbury valves are used in temperatures below 260°C,” he said, adding that the Neles metal-seated valves are for higher temperatures or when the process media includes abrasive fluids and solids like sand.

Touring the facility and hearing from Kähkönen and Heikki Kärki, Industry Manager, Mining & Minerals Processing, Metso Flow Control, **IM** discovered many of these valves have found their way to global mining operations.

The company manufactures not only the valves, but also the actuators and smart controllers; a fact that sets it apart from many of its competitors supplying just one or two of these elements.

On average, in a minerals processing plant, there can be around 10,000 valve installations across an operation each serving a specific purpose, according to Kärki.

He told **IM** it is not only Metso knife-gate valves – used for isolation purposes in the mill circuit – that are found in the separation and refinery stages of mining operations; the company provides several types of valve solutions that can be tailor made to the specific application.

This wide-ranging expertise is reinforced by a quick scan of the number of valve installations Metso Flow Control has carried out over 2000-2018.

During this period, the company’s supplied base has covered all but one continent (Antarctica the exception), with applications across what it terms “slurry, utility and severe services”.

Metso is rare in having the capability to custom-engineer valves for the harsh, abrasive and acidic conditions that come with autoclave processing. This is a field that has been growing in the nickel, copper and gold space in recent years, Kähkönen said. Standard valves last a matter of weeks in these applications – where pressures can exceed 30 bars, temperatures can exceed 200°C and concentrations can be highly acidic.

A materials technology team with decades of experience, plus an on-going relationship with an autoclave manufacturer, has enabled the company to develop valve solutions offering a robust coating specifically designed to outlast other solutions in the autoclave market.

The company was also keen to highlight its valve digitalisation capabilities during the visit.

Metso already launched its first NPT™ series pneumatic positioner 50 years ago. A digital valve controller – the Neles ND9000 – was introduced by Metso all the way back in 1995 and, since the launch of this product, the company has established smart controllers that collect data to be analysed by Metso’s in-house team or the client themselves, the latest being its Neles NDX® controller.

These controllers have gained such a reputation that other manufacturers regularly acquire them to complement their own valve solutions.

Annually, Metso Flow Control delivers around 400,000 valves to different process industries. Additionally, Metso completes over 20,000 valve overhauls and 3,000 site visits. It also carries out over 250 major planned valve shutdowns a year – ensuring valves keep working over the long term.

And the company has recently enhanced its manufacturing process with the ability to use 3D printing in certain valve components. This process offers previously unavailable engineering options that can, for example, improve some of the design features and decrease the weight of components.

corrosive, viscous, even crystallising media. And it does not matter if the consistency of slurry changes during operation of the pump, according to the company.

Even though Flowrox LPP-T pumps can run 24/7, they are also prepared to stop at any time without risking backflow thanks to a reverse-run capability and design.

MAX pumping

The KREBS slurryMAX™ pump from FLSmidth was developed following specific customer requests for a split case pump that can be easily and safely installed throughout plants in a wide range of applications, yet increases the wear life and efficiency over existing products, according to the company. The unique advantage to the design is that it solves both the grinding and the recirculation problems within the pump, FLSmidth said.

The slurryMAX is based on the millMAX™ range, whose wear ring technology has created an efficient and long-lasting slurry pump. The main difference between the two is that the millMAX is an all-metal pump that does not have an outer casing and inner wear liner (the casing itself is made from the high chrome wear material), while the slurryMAX is a split casing design with replaceable inner liner. The purpose of this design is to provide multiple material liner options to fit in the same outer casing. The slurryMAX features an improved, more efficient impeller and an optional water drain plug for easier maintenance, allowing water that might have settled at the bottom of the pump to be drained quickly, according to FLSmidth.

Brad Moralee, Head of Product Unit Pumps, Cyclones and Valves at FLSmidth, said: “The slurryMAX is the most versatile, efficient and longest-lasting slurry pump of its kind. The slurryMAX pumps are suitable for applications ranging from mill discharge, SAG mill discharge recirculation, cyclone feed, general transfer of heavy duty abrasive slurries and tailings pumping. The pumps are available in sizes from 75 mm to 500 mm and are used across all commodities including copper, iron ore, gold, oil sands, sand and gravel and for industrial processing.”

The slurryMAX design incorporates a patented feature for an online adjustment of the critical impeller to suction side clearance and counters the primary leak path that occurs across the suction face of the impeller on conventional designs. The externally adjustable wear ring enables adjustments while the pump is running, according to FLSmidth. This reduces the suction side recirculation and maintains the design flow while maintaining large clearances near the impeller shroud.

Closure activity

The term ‘closure’ often conveys the wrong impression in the mining space, indicating activity ceases as soon as the ore is exhausted and the miners depart. For ANDRITZ, this part of the mining lifecycle can be one of its most active, with the pump supplier called in to carry out a responsible water management program.

In one of Germany’s former-operating coal mines, owner RAG has a closure plan that involves letting the mine water rise to a point where there is still a safety margin between it and the drinking and ground water, according to ANDRITZ.

“To do this, RAG will have to pump around 110 million cu.m of mine water,” the company said.

ANDRITZ explained: “In the course of the historical shift of mining operations in Germany to the northern part of the country, a largely continuous network of mine workings was created. These connected mines made it possible to combine the pump locations of disused mines to form so-called ‘water provinces’ after closure of the last pits. Thus, the mine water can be pumped centrally from a depth of around 600 m at several combined water drainage locations.

“RAG is currently collecting the mine water from the mines still operating at 13 water drainage locations. When hard-coal mining comes to an end, only six of these original mine water drainage locations are to remain.”

RAG’s longer-term mine water concept, however, is for not only a reduction in the number of water drainage locations, but for all these locations to be converted to drinking wells. This will reduce the number of disposal points, as well as eliminate the need for expensive maintenance of infrastructure.

In order to achieve RAG’s long-term dewatering goals, a pump design with a double-suction submersible motor is required. Only this type of pump can fully compensate for the up to 30 t of axial thrust to be placed on it, according to ANDRITZ.

ANDRITZ’s multi-stage, double-suction submersible motor pumps can fully compensate for the axial thrust and have 50% less flow speed, according to the company. “The economic advantages are maximum operating reliability, minimum wear and an extremely long lifetime of more than 20 years,” ANDRITZ said. “Every pump with heavy-duty mining (HDM) technology is customised from standard modules for the specific application in hand.”

Hundreds of these pumps – including the largest submersible motor pump in the world at over 22 m long – are operating successfully all around the world, according to the company.

For this project, ANDRITZ will manufacture and deliver a total of three double-suction submersible motor pumps based on the patented

HDM technology. Weighing 13,200 kg, the pumps are placed freely in the shaft underneath the shrouding tube. At a speed of 1,470 rpm, these hydraulic machines achieve an efficiency of 81% and convey 530 cu.m/h of water from the depths of the former mine over a head of 830 m.

“In order to achieve the necessary capacity, each of these submersible motor pumps is equipped with a special water-filled, high-voltage submersible motor. This motor provides efficiencies of 91.5% and a rated capacity of 1,750 kW,” the company said.

These are four-pole motors, which are much more robust than two-pole designs. “As a result of the longer lifecycle this provides and the lower wear, these motors guarantee significantly higher operating reliability – absolutely indispensable for this particular application,” ANDRITZ said.

Copper competition

There would have been more than a few companies bidding on the Quellaveco copper project contract in the pumps market.

The asset is one of the few greenfield projects advancing to construction and, with a plan to produce at 127,500 t/d, its pumping footprint is significant.

The lucky winner on the mill discharge side is GIW Industries, which said in April that it was to deliver four MDX 600 cyclone feed pumps to the project.

GIW, a subsidiary of KSB, won the order based on the reputation of its centrifugal slurry pumps and the firm’s commitment to customer support, it said. “Decades of experience in slurry transport means GIW is in the perfect position to partner with Quellaveco,” GIW said.

The Quellaveco project marks a significant milestone for the company as it continues to invest in South America. In 2018, it expanded its service capabilities on the continent to meet the needs of current and future customers.

Local GIW technicians will be on-site to assist Quellaveco for the installation, commissioning, and start-up of the four MDX 600 cyclone feed pumps.

The MDX pump was selected for the Quellaveco project because of its success in copper and gold applications around the world, according to the company. “The MDX product line has undergone extensive development; in fact, the latest technology features a remotely-adjusted mechanical suction liner.”

The company said the pumps for Quellaveco are specially designed to operate in the most extreme duty conditions, with critical wear parts made of GIW’s proprietary white-iron alloy, Endurasite, to extend wear life and optimise pump performance.

“These features, combined, have a direct impact on Quellaveco’s total cost of ownership –

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Leak detection

Atmos International has been producing leak detection systems for pipelines for over 24 years, supporting several sectors.

While it serves the oil, gas, chemical, aviation and mining sectors, Dr Jun Zhang, Atmos' CEO, says providing leak detection to the latter can be complex.

"The geography, with extreme elevation changes, provides challenges due to regular slack events with severe drops in pressure," she told *IM*. "The complex hydraulic changes and nature of mining pipelines require leak detection systems to be carefully implemented. This includes interpreting data from pump signals and the pressure profiles to identify and avoid false alarms."

Gaining better leak location accuracy requires additional pressure sensors, according to Dr Zhang.

"For example, having only two pressure sensors along a 150 km pipeline with multiple elevations means less accuracy," she said. "Adoption of additional hardware provides the operators with a comprehensive solution.

"From Atmos' experience, many slurry pipelines have been designed from the 'same template' using the same equipment, station set-ups and distances and similar operations philosophy."

Atmos' leak detection solutions are able to manage abnormal pressure drops caused by valve stations across pipelines, according to Dr Zhang. "Where there are friction elements that can reduce pressure, by using the pattern of pressure response and the signal from the friction element, false alarms can be avoided."

One of the algorithms used by Atmos Pipe and Wave calculates the friction factor of the pipeline. "This value can be a useful indicator for the client, as more friction means more operating cost," Dr Zhang said. "The algorithms from Atmos Wave can help reveal different events that may be introducing unwanted frequencies on the pipeline operations. These frequencies could lead to even greater issues if no action is taken."

The Atmos Pipe product calculates a corrected flow imbalance and runs a statistical analysis on it. If flow and pressure change, then Atmos Pipe can alarm and notify the operator to the leak.

"Leaks are hydraulic events coming from inside the boundaries of the pipeline instead of outside, as is the case of transients (operational changes such as pump operations)," Dr Zhang said. "With Atmos Wave (the negative pressure wave system), the correlation seen in pressure changes (facilitated by the high frequency data collection units – AWAS) enables the operator to differentiate between normal operating conditions and a leak," she said.

"It can locate leaks within tens of meters."

Atmos Wave Flow, meanwhile, uses a dynamic model based on flow and pressure and uses pattern recognition to identify the unique changes in flow and pressure caused by a leak.

"This pattern recognition allows for faster leak detection in minutes rather than hours," Dr Zhang said.

proving the MDX is the most reliable pump on the market," GIW said.

Hernan Palavecino, South America Region Manager for GIW, said: "GIW recognises the importance of the Quellaveco mine to the region.

"The award is a result of GIW's drive for continuous improvements in slurry technologies. We are committed to offering high-quality service while building a long-term partnership with Quellaveco."

Over the border in Chile, Germany's **Pleuger Industries** has recently installed six robust high-performance submersible pumps at the Collahuasi copper mine.

Pleuger's 10 in pumps enter the Collahuasi flowsheet during the flotation process where they help dewater the copper sludge.

The pumps come with a circa-300 m³/h flow rate and are powered by Pleuger® 2-Pole submersible-motors.

Process pumps like the ones used at Collahuasi are placed under extreme operating

conditions, according to Pleuger: "Copper... quickly oxidises the materials from which pumps are usually made. In order to counteract this process, the engineers at Pleuger Industries rely on a corrosion protection concept specially adapted to the customer when designing the pumps."

This is a mechanical maintenance-free protection concept based on forced increased resistance in the circuit, Pleuger told *IM*.

Automatic adaptations

ABEL Pumps recently fulfilled a brief from a potassium feldspar and silica sand producer looking to improve performance in its filtration process and continue its effort to lower its environmental impact.

The industrial mineral producer previously employed two independent centrifugal pumps for filling the filter press and dewatering the sludge. This, given the size of the filter plates, appeared to initially be the best option.

The company decided to opt for a centrifugal pump with a high initial flow rate of 220 m³/h, which pumped sludge at a pressure of up to 3 bar, ABEL explained. "Once the filling phase of the filter press was accomplished, a piston-diaphragm pump was used to fulfil the most demanding process of pressurising at an initial theoretic feed rate of 25 m³/h."

However, this system showed high operating costs due to frequent spare parts replacement and high energy draw.

"As a solution, ABEL proposed installing only one single piston-diaphragm pump of the HM series, which was best-suited for the high filtering pressure required for the process," the company said.


During the first phase of the filtration cycle, the pump delivers an initial flow rate of up to 50 m³/h, but, as the filter chambers fill, solids collect against the filter cloth and counter pressure begins to build.

"As this happens, the pump will adapt and automatically reduce its flow rate to compensate," ABEL said.

Flow regulation is carried out by a reference signal from the pressure transmitter to the VFD, according to Abel. During the final filtration phase, the pump operates at high pressure while delivering a low flow rate to the filter press to maintain filtration under high pressure.

"The lower speed is more efficient, and provides energy-saving, while pumps using less effective technologies risk incurring high wear and possible damage," ABEL pointed out.

The ABEL HM pump provided a solution with these improvements, according to the company:

- Reduction of maintenance costs;
- Reduction of power consumption;
- Reduction of the cycle time by 25%, and;
- Drier filter cake. 



For RAG's German coal mine closure project, ANDRITZ will manufacture and deliver a total of three double-suction submersible motor pumps based on the patented HDM technology