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For people who are serious about mining

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- Realising the multi-mine, multi-jurisdiction gold producer strategy
- The quest for zero harm in SA's mining industry
- Managing health and safety in remote mining locations

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ON THE COVER

For the past 20 years, Axis House has been a household name in the development of cutting edge reagent solutions in the global mining sector. Central to the company's success over the years has been a strong focus on research and development, a customer-centric approach and continued innovation. See story on page 10.

COMMENT

Breath of fresh air for SA's mining industry?

Munesu Shoko

When COVID-19 hit in South Africa early last year, there was general trepidation throughout the market that commodity prices could fall closer to trough levels in the short term and make significant cuts to mining companies' earnings forecasts.

Production losses were also a cause for concern, especially at the height of the hard lockdown, which called for a complete shutdown of most mines. At the time, the Minerals Council South Africa predicted that the South African mining industry could be losing about R1,5-billion a day. The industry was in panic mode as it considered the likely devastating aftershocks of this 'Black Swan' event.

However, it is encouraging to see that the mining sector in South Africa has had a stellar performance in the face of a challenging operating and economic environment. As you will see in this edition of *Modern Mining*, PwC – in its 13th edition SA Mine analysis – notes that the country's mining sector delivered a robust financial performance for the 2020 – 2021 financial year, despite the current challenging pandemic environment.

With record rand prices for gold, the platinum group metals basket, iron ore and more recently, coal, it was no surprise that the industry's financial performance exceeded expectations on most fronts. Total market capitalisation increased in 2021 to R1,470-billion from R1,047-billion the previous year. For the companies in PwC's analysis, revenue in rand terms grew by 63%. This was mainly driven by higher prices for PGMs and iron ore. In fact, the PGM basket generated the largest portion of revenue.

The 2020 – 2021 period has truly been rewarding for mining industry stakeholders. In my view, this financially sound period might be an opportune time for the industry to deal with some of the pressing issues, such as ESG concerns, digital transformation and labour issues, among others.

On the labour front, it is encouraging to see that the SA mining industry has managed to avoid any notable labour action in recent times, especially at a time when the country's steel and engineering sector is boiling over with industrial action. The winter months in South Africa are generally referred to as 'strike season' because of the inevitable number of wage disputes that occur most years. However, 2020 and 2021 seem to be different for the mining sector.

Leveraging the current good run in commodity prices, some forward-thinking companies have moved ahead to secure long-term wage agreements with labour bodies. For example, Harmony Gold has just concluded a three-year wage agreement for the period July 1, 2021 to June 30, 2024. The wage agreement was reached with AMCU, the Coalition (comprising the NUM, UASA and Solidarity) and NUMSA.

As shareholders and institutional investors demand that companies place more emphasis on environmental, social and governance (ESG), this might be the perfect time for the mining industry in South Africa to start taking active steps on their ESG agenda – identifying their priorities and measuring their performance.

There is widespread recognition in the industry that for South Africa to achieve its net zero ambitions, ESG must be a core component of any mining company's strategy and policies. Mining companies have often been criticised for not doing 'enough' on ESG and are consequently increasingly challenged to make changes to their boardrooms.

Local procurement is another area that needs urgent attention. I strongly believe that this breath of fresh air gives mines the opportunity to start focusing on their local procurement strategies. While local procurement is not a silver bullet in defeating the 'resource curse', it plays an important role in supporting economic development of host communities.

I fully agree with Jeff Geipel, MD of Mining Shared Value, who, in a recent interview with *Modern Mining*, said that in most cases procurement by a mining operation is the single largest potential economic impact in a host country, more than payments in taxes, wages and community investment combined. Local procurement of goods and services by mining companies has tremendous development potential for South Africa, and Africa at large.

Purchasing of local goods and services by mining companies creates local jobs, promotes skills and technology transfers, and integrates local companies into global value chains. Companies not able to demonstrate that they are making efforts to support local suppliers are more likely to face community conflicts and pressure from government in the near future.

In addition, building up competitive, local suppliers of goods and services will, in the long run, reduce procurement costs and increase supply chain resilience. The coronavirus pandemic has demonstrated in stark terms the major risks that come with relying on international providers of goods and services. ■

Editor: Munesu Shoko
e-mail: mining@crown.co.za
Features Writer: Mark Botha
e-mail: markb@crown.co.za
Advertising Manager: Bennie Venter
e-mail: benniev@crown.co.za
Design & Layout: Darryl James

Publisher: Karen Grant
Deputy Publisher: Wilhelm du Plessis
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Kamoa Copper's concentrator plant ahead of schedule for Phase 1

The ramp-up of Kamoa Copper's Phase 1, 3,8-million tonne per annum (Mtpa) concentrator plant continues to advance ahead of schedule, with approximately 320 000 t of ore milled in September.

More than 16 000 t of copper concentrate were produced and a total of 16 503 t floated in the reporting month ended 20 September, which is Kamoa Copper's fourth full month of production, setting a new monthly record.

Commenting on Kamoa's operational performance, CEO Mark Farren says: "The team at Kamoa has worked tirelessly to bring the Phase 1 concentrator to steady-state performance. We are very pleased with September's results, which exceeded steady-state design parameters for ore throughput and were close to achieving steady-state design copper recovery and monthly copper production."

The average floated concentrate copper grade in September improved to 55,7%, up from approximately 48% in August. Over 46 700 t of copper in concentrate have been produced year-to-date as of 20 September 2021, to supply either the Lualaba Copper Smelter near Kolwezi, or international markets.

"There are a number of additional adjustments being incorporated into the Phase 1 processing circuit, which will enable the concentrator to achieve better results in the next quarter. These adjustments, which also will be incorporated into the Phase 2 processing circuit, should position us to achieve 2021 copper production in the upper end of our previous guidance of 80 000 to 95 000 t," adds Farren.

Performance guarantee tests were successfully completed on the Phase 1 concentrator plant during the first three days of September. The performance tests involved a 72-hour continuous run at steady-state design, or above, ore throughput and grind.

Farren adds, "Mining production was steady at 384 000 t produced from the Kakula and Kansoko mines. The mining teams are now well established and able to consistently outperform our internal target. We have established a skilled and motivated local workforce, who no doubt will carry us through the ramp-up of Phase 2 and subsequent expansions of our mining footprint. It also is encouraging to note that the Phase 2 concentrator construction remains solidly ahead of schedule and on budget.

Overall construction of the second 3,8-Mtpa concentrator plant (Phase 2) is progressing well, with the project approximately 49% complete. Engineering and procurement activities are effectively complete with fabrication at 86% complete.

Study work for the Phase 3 mine and concentrator expansion is underway, which includes optimisation work to determine mining production capacity and costs at the various mining areas on the Kamoa mining complex. This would include expanded facilities at the Kansoko Mine, Kamoa North (including the Bonanza Zone) and Kakula West. ■

The ramp-up of Kamoa Copper's Phase 1, 3,8-million-Mtpa concentrator plant continues to advance ahead of schedule.

Steady demand for large rough diamonds in key diamond hubs

In September this year, ALROSA evaluated the results for three auctions of large rough diamonds, held in the world's major diamond trading centres.

Under Russian law, ALROSA sells special size diamonds (weighing 10,8 carats and more) at international auctions. Viewings take place either in Moscow or abroad for the clients' convenience.

In August and September, auctions were held in Antwerp, Dubai and Ramat Gan. As a result, 80 highest bidding companies, including companies from Belgium, Israel, India and UAE, purchased 349 lots weighing over 6 000 carats for US$37,8-million.

Evgeny Agureev, deputy CEO of ALROSA, says: "August is traditionally considered a relatively quiet period. However, this year we saw a consistent demand for rough diamonds of high quality and price. At a time when international travel remains limited, there was strong interest in all three international auctions. Together, they attracted more than 300 registered participants. In the second half of September, we also launched an online auction in response to the market's demands. It has a new expanded format, with lots' descriptions supplemented by expert evaluations and additional photos and videos. This auction, running until October 13, enables clients to analyse and select diamonds completely remotely."

ALROSA is the largest diamond miner by volume worldwide as well as the largest vertically integrated company in the industry with all stages of the value chain in-house, from mining to cutting and polishing and jewellery creation. ■

Akobo Minerals receives positive results from its metallurgical testwork

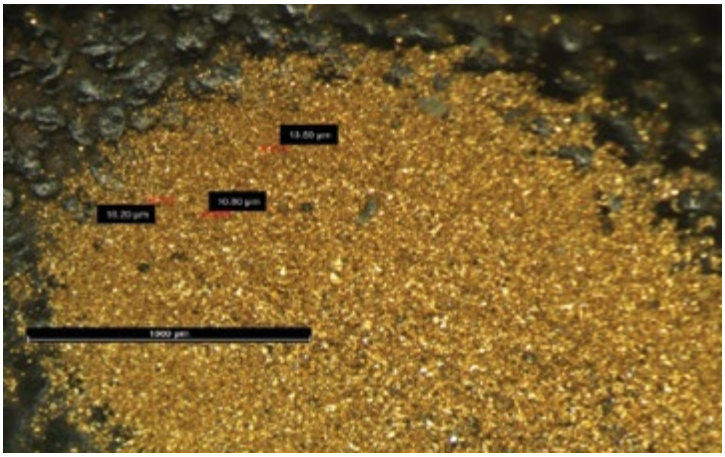
Akobo Minerals has received the testwork results from the Peacocke and Simpson Laboratory. The positive results of the gold extraction tests give potential for greater than expected revenue generation to that proposed in the scoping study, at similar operating costs.

The metallurgical testwork gives an indication of how much gold is expected to be recovered as if the cores/bulk samples had been treated with conventional gravity recovery and cyanide leaching unit operations. Samples were taken from a total of three holes drilled at Segele to generate 248 kg for testwork purposes.

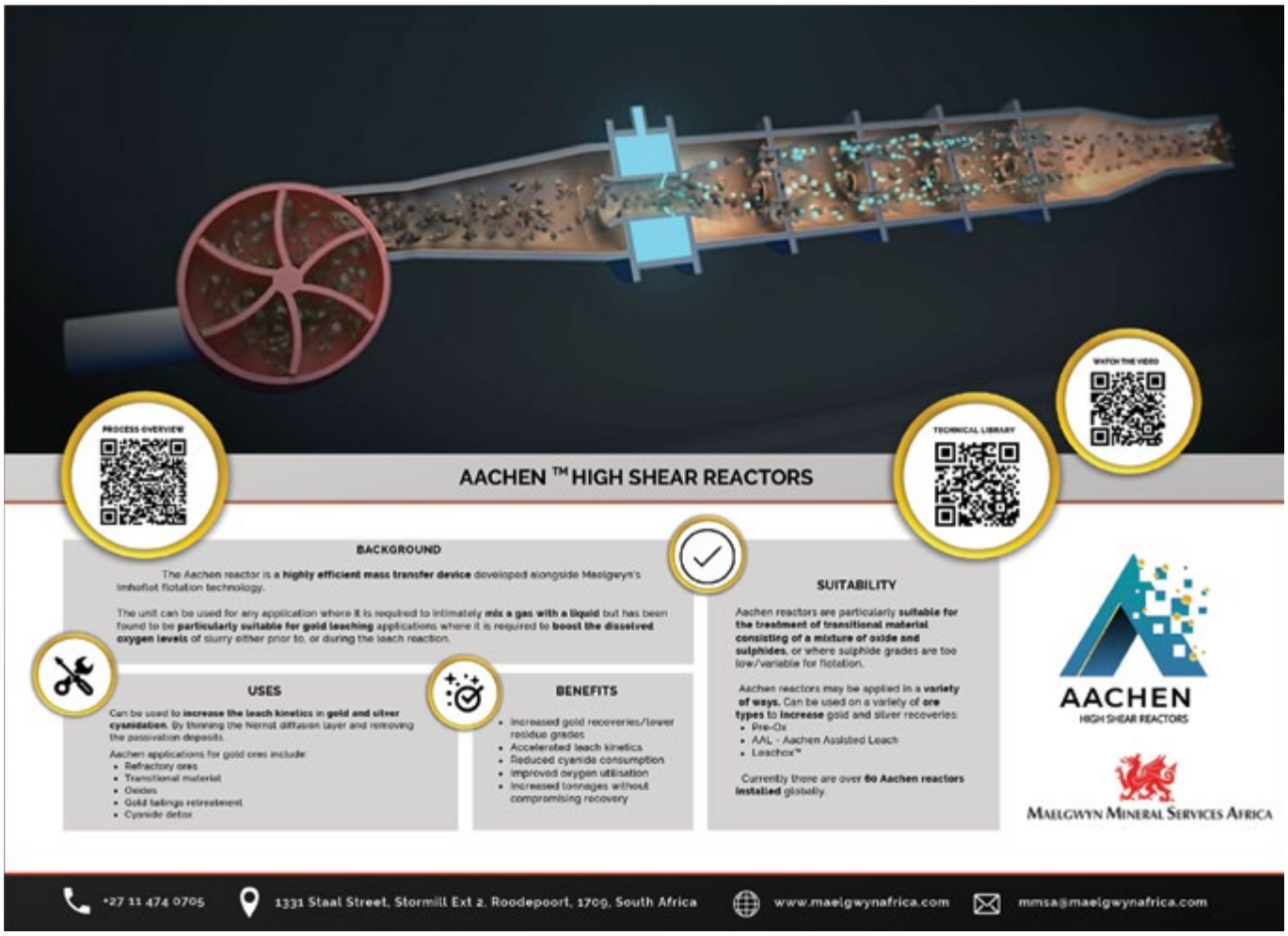
The testwork shows a good gravity gold recovery of 76% with an additional recovery of up to 21,3% with cyanide leaching of the gravity tailings. Also grindability results indicated a slightly softer ore than expected, with the possibility to install a smaller mill than assumed in the scoping study. These results can be considered to be unoptimised and hence improvements are still possible.

Now that the first stage of metallurgical testwork is complete, Akobo Minerals will advance to plant design. For that purpose Peacocke and Simpson has a strong partnership with Appropriate Process Technologies (APT) of Johannesburg, South Africa. APT has provided over 200 small and medium scale plants to over 23 countries since 2007. Recent projects delivered by APT include Scotgold, United Kingdom (7,5 t/hr crushing, grinding, gravity plant); Yaron, Zimbabwe (20 t/hr Combo gold plant); CATA, Tanzania (40 t/hr, Tritank CIL) and many more.

Akobo Minerals intends to investigate alternatives for building and operating its Segele mine – especially for underground mining activities. For example, in order to reduce the risk of delayed production start and other operational risks, it is realistic to look at using contract mining. Outsourcing such activities is possible given the excellent project economics and will allow the company to focus on processing plant operation and reaching the company objectives of defining 1,5 to 2-million ounces.



Samples were taken from a total of three holes drilled at Segele to generate 248 kg for testwork purposes.



High-tech revolution opens doors for on-site mine training

In a quantum leap for training in the underground mining sector, the Murray & Roberts Cementation Training Academy (MRTA) is strategically positioning itself to take its world class learning systems to customers on their own sites.

This innovative move, according to Murray & Roberts Cementation education, training and development (ETD) executive Tony Pretorius, incorporates the use of remote e-learning solutions coupled to Dover Assessment for psychomotor skills, VR Simulation, mass assessment tools and classroom response systems – or 'clickers'.

"It is an exciting step beyond the MRTA's industry-leading facilities at Bentley Park near Carletonville, and opens doors for companies to generate and upgrade skills even during the COVID-19 pandemic", Pretorius says.

"Making use of the latest technologies – such as interactive touchscreens – we can now offer two-dimensional and three-dimensional training interventions," he says. "This can be deployed with virtual reality (VR) training modules, including the use of VR simulators that we are developing with our strategic technology partner, Simulated Training Solutions (STS)."

Among the high-tech advances being driven by the academy is a portable VR drill rig. The portfolio of ground-breaking training tools will be easily transported in a purpose-designed trailer to sites convenient to the customer – even on mines themselves.

Applying the tools, he says, will be members of MRTA's experienced team of trainers, accredited by the Mining Qualifications Authority.

"This gives even remote mining sites the chance to enhance skill levels, productivity and safety," he says. He points to the ongoing difficulty that companies face in conducting group activities under COVID-19 protocols, and particularly in moving personnel across borders.

In addition to these regulatory restraints, this new training infrastructure could also reduce the cost of having staff attend off-site training for extended periods – where costs are raised by travel and accommodation.

"We believe that our state-of-the-art educational innovations can give remote mines unprecedented access to valuable skills transfer with real bottom-line benefits to be gained," he says.

Looking beyond mining operations themselves, Pretorius also highlights plans to reach out to communities needing skills development to combat unemployment. This socially responsible approach to training is already embraced at the MRTA facilities, but could in future be more widely available through this injection of technology.

The academy's new age of training systems will also be rolled out within the projects of Murray & Roberts Cementation itself, further enhancing the company's reputation for performance excellence and safety.

"This new technology definitely raises the level to which we can take industry skills, and we anticipate an enthusiastic response from both internal and external clients," says Pretorius. "We believe strongly that this is the future of training – where we leverage digital technologies like VR to help take mining expertise into the Fourth Industrial Revolution." ■

The academy's new age of training systems will also be rolled out within the projects of Murray & Roberts Cementation itself.

Exploration success for Perseus in Ghana

Perseus Mining Limited (ASX/TSX: PRU) has provided details of recent successful exploration activities at its Edikan Gold Mine in Ghana. Impressive drilling results have been recorded at the Nkosuo prospect (previously referred to as Breman) on the Agyakusu Prospecting Licence, just 7 km from the mill at Edikan.

Early indications suggest Nkosuo hosts near-surface, granite-hosted gold mineralisation similar in style to that mined in Edikan's Fobinso and Abnabna (AG) pits.

Resource definition drilling is in progress. Perseus expects to complete a maiden Mineral Resource estimate in the March 2022 quarter. Edikan's mine life is currently forecast to end in FY2025 however, this discovery at Nkosuo has the potential to extend the mine life well beyond that date.

Perseus's MD and CEO Jeff Quartermaine says: "With our three gold mines now in operation and Perseus moving closer by the day to achieving our goal of producing 500 000 ounces of gold per year, we have turned our sights to finding ways of sustaining this level of gold production from our operations out to the end of the decade and beyond.

"Our exploration programme at Nkosuo has so far, returned impressive results that demonstrate the potential of this prospect to add to Edikan's mine life with further drilling. We are particularly encouraged by similarities between the Nkosuo deposit and the Fobinso and Abnabna deposits which we've already successfully mined and processed at Edikan. While we are working towards completing a maiden Mineral Resource estimate for Nkosuo in early CY2022, we intend to continue exploring on the Agyakusu, Agyakusu-DML and Domenase exploration licence areas, all of which are under option to Perseus and all of which are located within trucking distance of our Edikan mill." ■

Executive changes at Anglo American

The Kumba Board has appointed Nompumelelo 'Mpumi' Zikalala as CEO. Mpumi, currently MD of De Beers Managed Operations, succeeds Themba Mkhwanazi who has been appointed CEO of Anglo American's global Bulk Commodities business following the decision of Seamus French to leave the group after 14 years. Both appointments will take effect on January 1, 2022.

Commenting on Mpumi's appointment, Terence Goodlace, chairman of Kumba, says: "I am delighted that the Kumba Board has appointed Mpumi Zikalala as the new CEO of Kumba. Mpumi will join the Kumba Board as an executive director and brings over 20 years of mining experience, having started her career as a Chemical Engineering bursar at Anglo American and having held a number of senior operational and commercial leadership roles at De Beers. Her appointment is another demonstration of our commitment as a business towards nurturing and supporting the success of women. We look forward to her leadership in advancing the strategic and operational aspirations of Kumba."

Mpumi Zikalala, says of her appointment: "It is a privilege to be appointed as CEO of Kumba. My focus will be to build on Kumba's strong safety and operational performance track record, strengthening strategic partnerships and unlocking further value from the business. I look forward to joining Kumba's world class team and contributing to the next phase of Kumba's journey to be the most valued company in the eyes of our stakeholders."

Themba Mkhwanazi has been appointed CEO of Anglo American's global Bulk Commodities business.

Paying tribute to Seamus and Themba's leadership, Goodlace says: "On behalf of the Kumba Board, we thank Seamus French for his insightful and valuable contributions and wish him all of the very best in his future. We congratulate Themba Mkhwanazi and thank him for his enormous contribution to Kumba over the last five years. Through his leadership of excellence and collaboration with stakeholders, Themba successfully led the development and implementation of the Tswelelopele strategy that has transformed the business and delivered significant value to our wide range of stakeholders, not least our host communities. Themba will remain on the Kumba Board as a non-executive director in his new role."

Nompumelelo 'Mpumi' Zikalala has been appointed CEO of Kumba.

Themba Mkhwanazi says: "I am grateful for the opportunity to contribute meaningfully to Kumba over the last five years and would like to thank each of Kumba's employees, contractors and members of the executive team for their commitment to Kumba's success. My appreciation also extends to the Kumba Board for their support and guidance. I look forward to my new role and collaborating with partners and stakeholders across Anglo American's broader Bulk Commodities businesses. My focus will continue to be on safe, responsible production and playing our role in our drive towards cleaner steelmaking using our premium quality iron ore and met coal and working with partners on new steelmaking technologies." ■

New underground mine at Loulo-Gounkoto ramps up production

The Loulo-Gounkoto gold complex is set to remain a major contributor to the Malian economy well into the future as it continues to replace the ore depleted by mining, Barrick president and chief executive Mark Bristow says.

Mines operated in Mali by Barrick and its predecessor Randgold have spent some US$8-billion in the country in the form of taxes, royalties, salaries and payments to local suppliers over the past 24 years. To date this year, it has paid US$318-million to the government in taxes, royalties and dividends and invested more than US$13-million in community wellbeing projects ranging from health and education to economic development initiatives such as its Business Accelerator programme, designed to equip budding entrepreneurs with management skills.

Loulo-Gounkoto is on track to meet its annual production guidance, with its new underground mine at Gounkoto – the complex's third underground operation – ramping production. Through successful exploration it is on track to increase mineral reserves net of depletion for the third successive year and promising results from the Yalea Ridge and Gounkoto-Faraba targets reaffirm the potential for further life-of-mine extensions.

Underground mining operations at the Loulo-Gounkoto gold complex in Mali.

"Loulo-Gounkoto is one of the world's greatest gold mining operations and it continues to confirm its status as a member of the industry's elite Tier One1 club as well as the largest private sector contributor to Mali's GDP," Bristow says.

"In addition to the enormous value it creates for its stakeholders, Loulo-Gounkoto also aspires to a high level of social responsibility. Almost 40% of employees have been vaccinated against COVID-19 and 335 people have been vaccinated in the surrounding community. Security staff and other employees who come into contact with the community have undergone rigorous training in human rights. Work is also under way to secure the new certification standardized by the International Cyanide Management Institute." ■

AngloGold Ashanti to resume mining at Obuasi

AngloGold Ashanti has announced that underground ore mining at the Obuasi Gold Mine in Ghana is expected to resume by mid-October.

For the remainder of this year, underground ore will be used only to replenish the run-of-mine stockpile. Gold production from underground ore sources is therefore expected to re-commence only in January 2022. The safe ramp up to the full mining rate of 4 000 t per day is expected to be achieved by the end of the first half of the 2022.

Underground mining activities at Obuasi were voluntarily suspended following a sill pillar failure on 18 May 2021 which resulted in the tragic loss of a single life. A detailed review of the mining and ground management plans has been conducted by a cross-functional internal team and supported by independent third-party, Australian Mining Consultants (AMC).

During the review period, underground development and work related to the Obuasi Redevelopment Project continued to progress.

Following this review, a comprehensive series of protocols has been introduced to supplement existing operating procedures. The full suite of procedures ahead of the mining front now include the existing systematic probe drilling procedure, extensive use of technology, including Cavity Monitoring Systems and Cavity Auto Laser System, augmented with visual inspections to confirm the position and status of backfill in previously mined areas. The new paste-fill plant has been commissioned and its reticulation system is expected to be completed by the end of this year.

These protocols, which have been integrated into the Mine Operating System, will be bolstered by scheduled audits to ensure the accuracy and diligence in probe drilling, and the intended implementation of the revised plan. AMC will continue its review of future mining areas.

During the review period, underground development and work related to the Obuasi Redevelopment Project continued to progress, with Phase 2 construction substantially complete at the end of June 2021.

Phase 3 of the project, which relates principally to extended capital expenditure to refurbish existing infrastructure around the KMS Shaft, as well as to service the mine in deeper production areas, has progressed during this period and will continue as planned through to the end of 2023. ■

Kibali advances automated mining

Continuing investment in technological innovation is keeping Kibali at the forefront of developments in automated mining.

The Kibali gold mine remains on track to achieve its production guidance for the year and grow its mineral reserves net of depletion, securing its future as a Tier One operation for at least another 10 years, says Barrick president and chief executive Mark Bristow.

At the same time, says Bristow, continuing investment in technological innovation is keeping Kibali at the forefront of developments in automated mining.

Machine learning has been implemented at the mine's three hydropower stations and reactive control of the enlarged battery installation will further reduce the need for back-up diesel generation, shrinking Kibali's already relatively small carbon footprint. New automation software for the underground haulage loaders has been installed and the commissioning of a system for remote stope bogging now enables operators to control loaders from surface.

"Surface control is safer and more efficient, and it also creates employment opportunities for women in an industry where these are not abundant. It's worth noting that all these operators are Congolese, as Kibali continues to employ and upskill locals in line with Barrick's global policy of giving preference to host country nationals. Congolese citizens currently make up 94% of Kibali's workforce including its leadership," Bristow says.

"Some 5 000 of our employees and contractors go home to surrounding villages at the end of their shifts and the wellbeing of these communities is consequently a prime concern. This is exemplified by the effectiveness of Kibali's anti-COVID-19 campaign which included the construction of a community treatment facility. With the support of the Congolese health authorities, we secured a supply of the AstraZeneca vaccine and to date 21% of employees and contractors have been vaccinated compared with the DRC's countrywide average of 0,15%." ■

Drill results show continuity of mineralisation at depth at Uis

AfriTin Mining Limited (AIM: ATM), an African tech-metals mining company with a portfolio of production, development, and exploration assets in Namibia in tin, lithium and tantalum, has provided a further update on its down dip extensional drilling programme designed to elucidate mineralisation of the V1/V2 pegmatite at depth.

Drill results for the final five drill holes that intersected the V1/V2 pegmatite demonstrate continuity of mineralisation at depth, with the highest combined metal content intersection from drill hole V1V2022, containing 0,17% Sn, 61 ppm Ta and 1,33% Li2O, over a 51 m intersection at a depth of 201m to 252m.

Significant pegmatite intersections include:

- 101,05 m @ 0,164% Sn, 78 ppm Ta and 0,52% Li2O in drill hole V1V2021
- 164,09 m @ 0,169% Sn, 57 ppm Ta and 1,04% Li2O in drill hole V1V2022
- 169,02 m @ 0,171% Sn, 62 ppm Ta and 0,81% Li2O in drill hole V1V2025

Drill hole intersections demonstrate the continuity of mineralisation, a potential upgrade to resources at depth and support the lithium and tantalum by-product initiatives currently underway.

"We are pleased to announce these drill results showing the extension of the V1/V2 pegmatite at depth, the consistent tin grades and the substantial lithium grades, which serve to further validate the planned expansions of the Phase 1 pilot processing plant. We look forward to the initiation of another drilling programme aimed at aligning the lithium and tantalum resource confidence intervals with the current confidence interval for tin within the current Mineral Resource Estimate, which we expect to commence in quarter 4, 2021," says CEO Anthony Viljoen.

"These high-grade drill hole intersections substantiate our belief that AfriTin is poised to become a leading supplier of technology metals targeting a more diversified portfolio of production in the future." ■

Axis House celebrates 20 years of championing

For the past 20 years, Axis House has been a staple entity in the development of cutting-edge reagent solutions in the global mining sector. Central to the company's success over the years has been a strong focus on research and development (R&D), a customer-centric approach and continued innovation. Looking ahead, the company has a specific focus on expanding its footprint into new markets and mineralogies with a range of new technical products. MD Justine Stubbs and sales manager: Africa Gareth Heynes speak to Modern Mining's *Munesu Shoko*.

Gareth Heynes, sales manager: Africa at Axis House.

Axis House, a leading supplier and distributor of chemicals to the mining industry, celebrates 20 years of being a trusted partner to the global mining sector. Speaking to *Modern Mining*, MD Justine Stubbs notes the key factors behind the company's success over the past two decades has been our continued innovation in the development of our expansive reagent range, R&D as well as an unparalleled customer-centric approach.

"Axis House has managed to remain leaner than our competitors, which has allowed us to stay agile and flexible. Because of our agility, we have been able to rival some of our largest competitors in this arena, those that provide big volume production solutions. Our competitive edge is the ability to offer quicker turnaround times and faster decision making," says Stubbs.

Research & Development

At the core of Axis House's continued innovation is R&D, with a strong focus on supplying specialised reagents for cost-effective processing of minerals in mining.

"The development work starts in the laboratory,"

Acid digested samples of different metals to be used for analyses on the AAS.

cutting-edge reagent solutions

The Atomic Absorption Spectrometry or AAS is a technique that measures the concentrations of metallic elements in solution.

says Stubbs. “We believe in using science to create workable solutions for our customers, which is why R&D underpins everything that we do. We operate a fully equipped flotation laboratory in Cape Town, South Africa and a metallurgical laboratory in Australia. Both these laboratories offer a fully complementary service to existing and prospective clients.”

Reliable data is produced from the lab, before development products are distributed to site, where their potential is demonstrated in the client’s laboratory before pilot or full-scale plant trials. “We have infield metallurgists that travel around to sites with mobile testing devices for flocculation and sedimentation, among others. We also have a small pilot plant for precipitation tests. This allows our metallurgists to carry out all the test work independent of the client’s team onsite, before proceeding to confirmatory work,” says Gareth Heynes, sales manager: Africa.

“Clients require full confidence before proceeding with additional or alternative reagents into their plants. So as a reagents supplier you want to be sure that you provide a product that gives the client the highest level of assurance in the performance of their plant. At the end of the day, everyone reports to someone, and metal recoveries are reported to shareholders, and we strive to ensure that all our clients can report increased performance to their shareholders,” says Stubbs.

Customer-centric approach

In the early days, the company was focused on bringing the product closer to the market as part of its customer-centric sales model – carrying the cost on its balance sheet rather than on that of the client. This, says Stubbs, was to alleviate the extremely long lead times that were associated with products that were supplied from Europe, North America and China, among others, and to offer a service that was more supply chain-driven to Axis House clients.

“While that service approach still remains, we have in the past 15 years adapted it. We now work closer with clients to provide tailor-made solutions that speak directly to each client’s unique needs. We have evolved to become a client-specific reagent solutions provider. This is due to our understanding that client needs are often different from site to site. Once you have a large pool of clients however, you get to experience most of the issues or main problems on site and therefore we are able to leverage the knowledge that we have acquired across these various sites to develop solutions for customers. Knowledge sharing becomes vital, as it enables us to find solutions for the client quickly,” says Stubbs.

The froth column test is used to compare frothers in terms of froth rise rate, stability and rate decay.

Sharing of knowledge, adds Heynes, has been absolutely important for Axis House's growth. Leveraging a wide global footprint and a deep understanding of the global chemicals markets, the company is able to combine the collective knowledge of its experts across milling, flotation, sedimentation, leaching and analytics, with its world class R&D capabilities to tailor solutions that fully address individual client needs.

Expanding footprint

To unlock its next growth chapter, Axis House is looking to expand its footprint into new markets. "Looking ahead, the world is now our territory, not just Africa," declares Stubbs. The global expansion commenced last year with a strong focus on North Africa, Middle East and Europe

"South America is interesting, although it's a conservative market, we are confident of growth in this region," says Stubbs, adding that Axis House has observed an increased demand for oxide collectors in South America.

"Oxide collectors are one of our strong points. It is where the company's background lies. We believe that oxide collectors are a great product to take the lead into this market, rather than other overtraded products such as flocculants and frothers, where most clients would likely prefer home grown than imported solutions," says Stubbs.

Commenting on how this territorial expansion is being rolled out, Stubbs says a new market is generally researched from South Africa. Axis House believes that a feasible way into a new market is through "people that are already on the ground". The company therefore strongly believes in working with local partners, be they agents or joint ventures.

"We look at what each territory requires. If it's technical sales driven, then the market requires a lot of technical support. If it's more supply chain sales driven, then it needs warehousing infrastructure and people on the ground. It doesn't really matter what the need is, we will find a fit for each market. I absolutely believe that having feet on the ground is the better way to do it," says Stubbs.

New minerology and technical products

Apart from new territories, Axis House has a strong focus on expanding its products into new metal processing applications. Over the last year, says Heynes, the company has been focused on developing new technical reagents, not only for its bread and butter– copper and cobalt – but also for new commodities including PGMs (platinum group metals) and gold.

Traditionally, adds Stubbs, the company was more copper and cobalt focused. Going forward, flotation in PGMs and in gold is a big growth area for Axis House. The company has in the past 18 months introduced a range of new products to cater for these commodities. Axis House has manufactured a range of products specifically for the gold and PGMs markets, and these include primary collectors, depressants, flocculants and frothers.

Axis House has brought to market its new HydroFroth™ range, which can be tailored for both gold and PGMs. Optimal froth conditions are created by effectively controlling the laminar layer development and allowing for proper gangue drainage. Combined with improved water rejection ability that promotes final concentrate grade improvements, the HydroFroth range also speeds up kinetics whilst maintaining froth mobility.

In terms of flocculants, Axis House has further developed their Brontë range, which can be tailored for both PGMs and gold. Polyacrylamides with a range of different charge strengths and molecular weight improve the settling rate at various solid and liquid separation stages in mineral processing, such as thickening of flotation concentrates, recovery of pregnant leach liquors and dewatering of tailings.

A range of collectors for the gold market include the DGQ4, MGQ2 and the TGQ4. The DGQ4 has

In case of injury or contracting a disease on duty, HOW DO I CLAIM ?

STEP 1

- Inform your employer
- Your employer informs RMA of the injury/ disease; within seven working days for workplace accidents and 14 working days for diseases

STEP 2

- Submit all the necessary documents such as:
  - Certified copy of your ID or passport.
  - Earnings
  - Proof of banking details
  - Contact details: full residential, cell number, email address (optional)

STEP 3

- Complete Section 51 document (if you are under the age of 26 years or if you are a learner or trainee)

STEP 4

- Medical reports (first medical report from your treating doctor must be submitted with your original claim; however,there are additional medical reports that will be required)

STEP 5

- Final assessment (this is the final document that will be submitted to RMA regarding your claim)

If the injury is assessed at between 1% and 30% you will receive a lump sum payment. If the injury is assessed at between 31% and 100% you will be on a disability pension for life.

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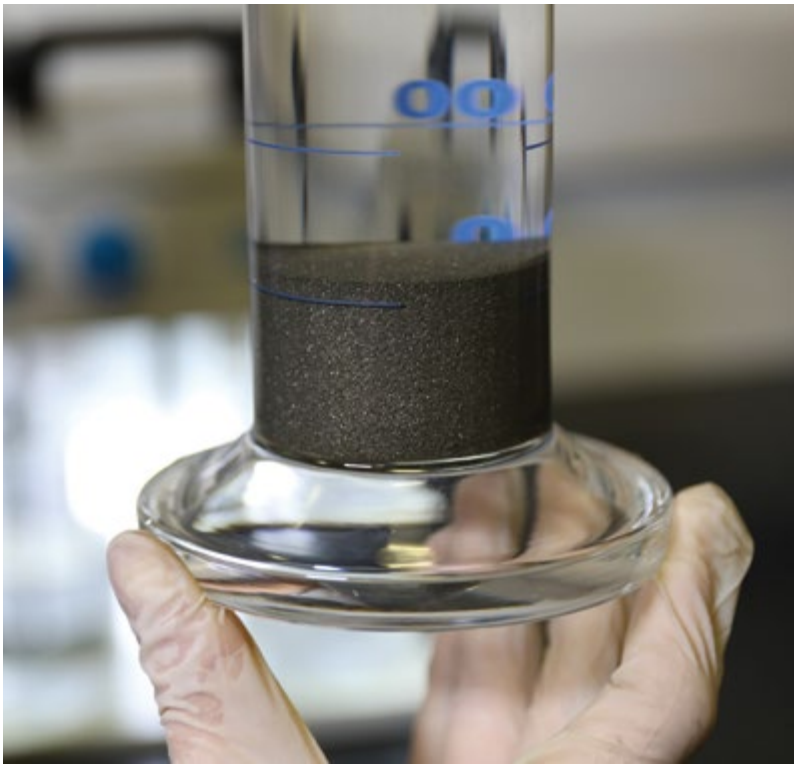

The cylinder settling test is used to measure the effectiveness of flocculants in solid-liquid separation.

shown an increase in recovery of fine particles (<25 µm) and this is attributed to its effect on the behaviour of the froth phase. When used in dual-collector reagent suites with xanthates, the recovery of free gold and gold-bearing sulphides is markedly improved. As the silver content of the gold surface increases, DGQ4 adsorption increases dramatically. Research has concluded that the addition of DGQ4 results in a more stable froth phase in addition to the synergistic interactions between the reagent and primary xanthate collector – hence the improved floatation performance.

MGQ2 adsorption occurs on pure gold surfaces as both monomeric and dimeric species. MGQ2 has a higher affinity for gold particles with low silver content, thus using the collector in low silver grade ore results in improved recoveries. It is an alternative to the conventional xanthate collectors and requires lower dosages to obtain high recoveries in sulphide-mineral flotation.

By having both a short chained and a branched alkyl group, the TGQ4 collector renders the minerals' surfaces hydrophobic at a faster rate than most collectors, resulting in improved flotation performance when blended with other collectors. The liquid nature of the oily product improves the shelf life significantly, as well as adding to the ease of dosing, as no additional make-up is required. The gold collector range is also applicable to the various gold bearing ores, be it Cu associated gold or pyrite associated gold.

A range of collectors for the PGM market include DPG4, TPG4 and DPG6. With the DPG4, a liquid sulphide collector that can be used as a complete replacement or as a secondary collector with xanthates. The PGM collector range has been developed to treat all the common PGM bearing ores like Merensky, UG2, Platreef and Great Dyke ores as the PGM and gangue mineralogy differs greatly between these ore types. The minimum interaction between the DPG4 collector and mineral surface is sufficient to impart hydrophobicity to the mineral surface.

The TPG4 is a neutral oil specialised liquid sulphide collector that can be used as a complete replacement for xanthate collectors. The collector is both a short chained and a branched alkyl group, rendering the minerals' surfaces hydrophobic at a faster rate than the xanthate collectors. This is very beneficial when dealing with non-sulphide PGMs, such as tellurides and arsenides that have slow flotation kinetics.

In an alkaline circuit, flotation reagent is more selective against iron sulphides and displays weak collective power towards pyrite. In relation to the PGM industry, a key characteristic of the DPG6 collector is its fast kinetics contribution, which is key when dealing with the slow floating minerals. The liquid nature of the product significantly improves the shelf life and adds to the ease of dosing as no additional make-up is required.

"Additionally, polymetallic ores are a big focus for us at the moment. This has been enabled by taking the knowledge we have gained in copper and cobalt, and applying it to a new commodity and understanding the changes that are required to cater for new minerology. Being able to crack the code on a new collector, for example, for a new mineral is what excites our in-house development team," says Stubbs.

Apart from flotation, the company is also looking at extraction and electrowinning, where it's currently developing new extractants. "We have acid mist suppressants that we are busy rolling out in our traditional territories of Zambia and the DRC, and these have already shown great results. We have also added acid mist suppressants and smoothing agents for capital production – which are very important to our strategy. Those are fairly new products that we have brought to market in the past three to five years," concludes Stubbs. ■

Key takeaways

- Axis House, a leading supplier and distributor of chemicals to the mining industry, celebrates 20 years of being a trusted partner to the global mining sector
- Central to the company's success over the years has been a strong focus on research and development, a customer-centric approach and continued innovation
- To unlock its next growth chapter, Axis House is looking to expand its footprint into new markets
- Apart from new territories, Axis House has a strong focus on expanding its products into new metal processing applications

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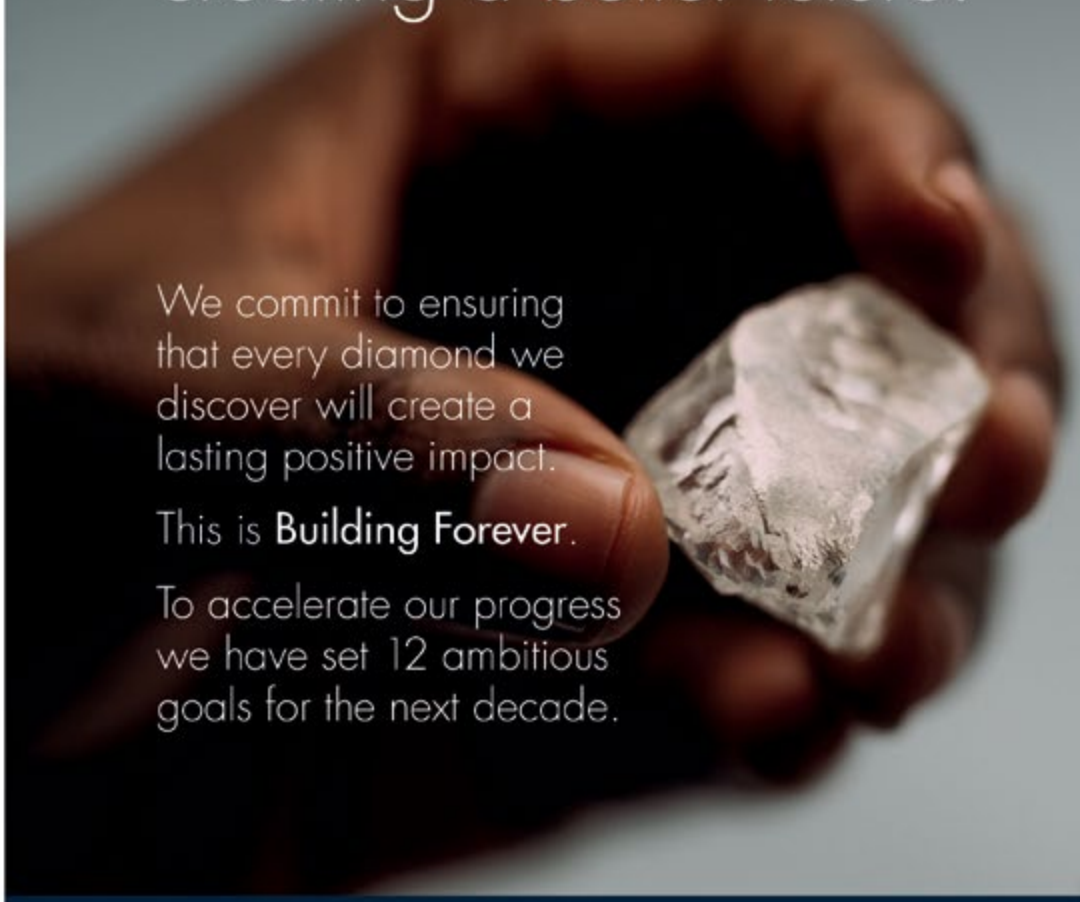

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Katie Fergusson,
Senior Vice-President of Sustainable Impact for De Beers.

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Realising the multi-mine, multi-jurisdiction

The recent securing of a group level financing package and the imminent commencement of building at the high-grade Kouroussa Gold Mine in Guinea mark the next phase of Hummingbird's strategy to become a multi-mine, multi-jurisdiction gold producer.
By *Munesu Shoko*.

Hummingbird Resources plc (AIM: HUM) has provided an update on the development of the high-grade Kouroussa Gold Mine in Guinea. The company has secured a group level financing package from Coris Bank International to fully fund the project into production, along with internal cash flows.

Additionally, the company has finalised all necessary engineering and study work to provide capex and timeline estimates together with project economics.

Kouroussa is forecast to be a high-grade, low-cost mine which will produce an average of between 120 000 and 140 000 ounces (oz) for the first three years of production and average 100 000 oz over the life of mine (LOM).

The LOM has increased to a minimum of seven years from the original five year estimate at purchase of the project based on the optimised mine plan, and is forecast to produce at an average all in sustaining cost (AISC) in the range of US$900 – US$1 000 per oz throughout the LOM, with material upside potential through further exploration drilling which is currently being planned.

Dan Betts, CEO of Hummingbird.

Extensive drilling and exploration has already been undertaken.

Next phase

Commencement of construction is to begin this quarter, Q4 2021, with first gold pour scheduled for the end of Q2 2023.

Total project capex of US$97,5-million for a 1-million tonne per annum (Mtpa) processing plant and establishment costs, with an additional budget of US$10-million for pre-production mining cost and US$7,5-million for contingencies.

The project is fully funded through internal cash flows and a group financing facility from Coris Bank of US$100-million at a fixed interest rate of 8,5% over four years.

Dan Betts, CEO of Hummingbird, says: "The completion of the financing and the imminent commencement of building Kouroussa marks the next phase of Hummingbird's strategy to become a multi-mine, multi-jurisdiction gold producer."

"Kouroussa is a low cost/high margin project which will more than double Hummingbird's gold production, substantially improve future cash flows and generate returns for all our stakeholders. With one of the highest IRRs for a gold project in West Africa, and material upside to extend LOM through further exploration within our licences area yet to be fully explored, Kouroussa provides a strong platform for our next phase of growth," adds Betts.

Kouroussa, says Betts, will be a key contributor in Guinea's journey to becoming a leading gold producer in West Africa, following ongoing gold discoveries in the Siguiri Basin, where the project is located.

gold producer strategy

"The recent political events in Conakry have not impacted the rapid progress of the development of Kouroussa, and we have taken measures to ensure that our key priority of maintaining the safety of our employees, contractors and operations remain intact," he says.

"I would like to personally thank Coris Bank and their team for the long-standing commitment they have shown to Hummingbird and again for this financing package to support the company in building our next producing gold mine."

Project overview

The Kouroussa Gold Mine, acquired by Hummingbird in September 2020, is situated near the town of Kouroussa, in the south-eastern area of the Republic of Guinea, located 570 km east of the capital of Guinea, Conakry. The project is 170 km to the east of Hummingbird's Yanfolila mine in Mali, and an approximate five hours travel time by paved roads from Mali's capital, Bamako.

In May 2021, Hummingbird was granted the mining licences for the project. The initial licences were issued for a period of 15 years, as outlined in the Guinean mining code, with the option to renew every five years with no limits on renewal terms.

Extensive drilling and exploration has already been undertaken by the previous owners with a current resource base of 1,18 Moz at >3g/t (625 600 oz indicated, and 552 700 oz inferred).

The project, which has a similar metallurgical flow sheet and process plant design to Yanfolila, allows Hummingbird to leverage the construction and operational expertise gained to date and turns it into a multi-asset gold producer with jurisdictional diversification in line with the company's growth strategy.

The project will produce an average of 120 000 – 140 000 oz in years one to three, with an average of 100 000 oz per annum over a minimum seven-year LOM.

The company believes the initial LOM can be increased significantly through exploration in this highly prospective region with exploration planning commenced.

Project financing

The project is fully funded to production from internal cash-flows and a group financing package of up to US$100-million from Coris Bank. The financing package is split into three debt tranches:

- First tranche of US$40-million to be drawn imminently ahead of construction scheduled to begin soon after
- Second tranche of US$30-million to be drawn when further into the construction phase, expected in 2022
- Third tranche of US$30-million is available for final capex requirements and internal growth initiatives

The term of the loan is four years, being interest only for the first 18 months on each debt tranche once drawn, at an 8,5% fixed interest rate. The loan is based on a binding term sheet, with final loan documentation being completed to allow the first debt tranche to be drawn imminently. A capex payback period of approximately two years is forecast once in production.

Some 16 000 m of a 24 000 m infill drill programme to upgrade confidence in the mineral resources at Kouroussa's KK deposit has been completed.

Drilling programme

Hummingbird continues to progress its Guinea exploration programme focused on growing the quality and quantity of the current resource base of 1,18 Moz at >3g/t (625 600 oz indicated, 552 700 oz inferred) to extend the project's LOM potential.

Significant exploration potential is known to exist at depth at the key Koekoe (KK) and Kinkine (KnK) deposits and the company has identified several further high priority targets for further exploration within the mining licenses area.

Some 16 000 m of a 24 000 m infill drill programme to upgrade confidence in the mineral

The focus of the infill drill programme is to convert resources to reserves.

resources at Kouroussa's KK deposit has been completed ,with the remaining metres to be completed on schedule in 2021. The focus of the infill drill programme is to convert resources to reserves.

A maiden Kouroussa reserve on the KK deposit will be included in the company's reserve statement to be released this quarter. This will be followed by a subsequent company resources and reserve update based on 2021 drilling due H1 2022.

Planning for future exploration drilling has begun to target further resource growth for both open pit and underground operations to extend on the current seven-year LOM. Further, the company has progressed with the geotechnical and geohydrology drilling programmes at KK and KnK, with confirmatory metallurgical test drilling completed earlier this year.

Key takeaways

- Kouroussa is forecast to be a high-grade, low-cost mine which will produce an average of between 120 000 and 140 000 oz for the first three years of production and average 100 000 oz over the life of mine
- The LOM has increased to a minimum of seven years from the original five year estimate at purchase of the project based on the optimised mine plan
- Commencement of construction is to begin this quarter, Q4 2021, with first gold pour scheduled for the end of Q2 2023
- Total project capex of US$97,5-million for a 1-million tonne per annum processing plant and establishment costs is planned, with an additional budget of US$10-million for pre-production mining cost and US$7,5-million for contingencies

Project development progress

The company's dedicated Kouroussa project development team has finalised key pre-development workstreams to ensure the project is construction ready.

Firstly, ESG processes, initiatives and infrastructure have been imbedded into the project design, including among others: final tendering for a +7 MW solar power plant and waste heat recovery systems to ensure a low carbon emissions project; human resources (local and regional hiring policies); community and government liaison programmes; and local and in-country contractor utilisation where possible.

Further, an updated Environmental and Social Impact Assessment (ESIA) has been completed to ensure the project complies with leading international ESG standards and is in line with the World Gold Council's Responsible Gold Mining Principles requirements.

Infrastructure designs have been finalised, including: offices; workshops; medical stations; access control, and the mine camp. Process plant design and flow sheet for a 1 Mtpa Carbon in Leach plant have been completed.

Key construction and engineering contracts are being finalised with Soutex and WACOM, who have worked together on previous projects in West Africa. Soutex, an engineering firm based in Quebec City in Canada, has designed the processing plant. The company specialises in mineral processing plants and has been involved in several recent projects in West Africa.

WACOM will perform the civil and structural design of the process plant along with the fabrication and construction. WACOM is well known to Hummingbird as it constructed the mining company's Yanfolila plant on time and on budget when formerly known as IMAGRI.

WACOM has a large fabrication and machining workshop in Bamako, Mali where most of the structural steel, plate work and tanks will be fabricated and transported by road to Kouroussa. This will ensure both low cost and timely sequenced arrival of fabricated components for plant construction.

Meanwhile, final negotiations are being completed with leading mining contractors, which are expected to complete soon now that project funding has been secured. Key project hires have been completed such as: head of project management; head of security; ESG manager; exploration team (numbering 16) and head of HR; with a Kouroussa organisation structure complete and ready to be implemented.

Overall security planning and upgrading initiatives are underway, including: additional security fencing and systems around camp; recruitment of security personnel; and a permanent onsite Guinea military presence. ■

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The quest for zero harm in SA's mining industry

The Minerals Council South Africa, in conjunction with mining companies, aims to achieve world-class safety performance by working in close collaboration with tripartite partners in government and organised labour. This feature discusses some of the initiatives, challenges and achievements on the road to zero harm in mining. By *Mark Botha*.

Dr Sizwe Phakathi, head: Safety and Sustainable Development at the Mineral Council South Africa.

Addressing the initiatives by the Minerals Council South Africa and industry to improve the safety performance of the South African mining industry, Dr Sizwe Phakathi, head: Safety and Sustainable Development at the Mineral Council, says that in the past 27 years, the industry tripartite stakeholders have cooperated to reduce the number of fatalities from 615 in 1993 to 51 in 2019, the latter being a record-low, earning the industry high praise from Mineral Resources and Energy Minister Gwede Mantashe.

"Regrettably," says Phakathi, "the mining industry recorded 60 fatalities in 2020, which was an increase of nine deaths over the 2019 safety performance." He notes that the number of injuries has also been declining over the 27 years since the dawn of democracy in South Africa (see Figs. 1 and 2).

"The Minerals Council and our member companies are committed to the industry goal of zero harm and achievement of the tripartite milestones on occupational health and safety," he says.

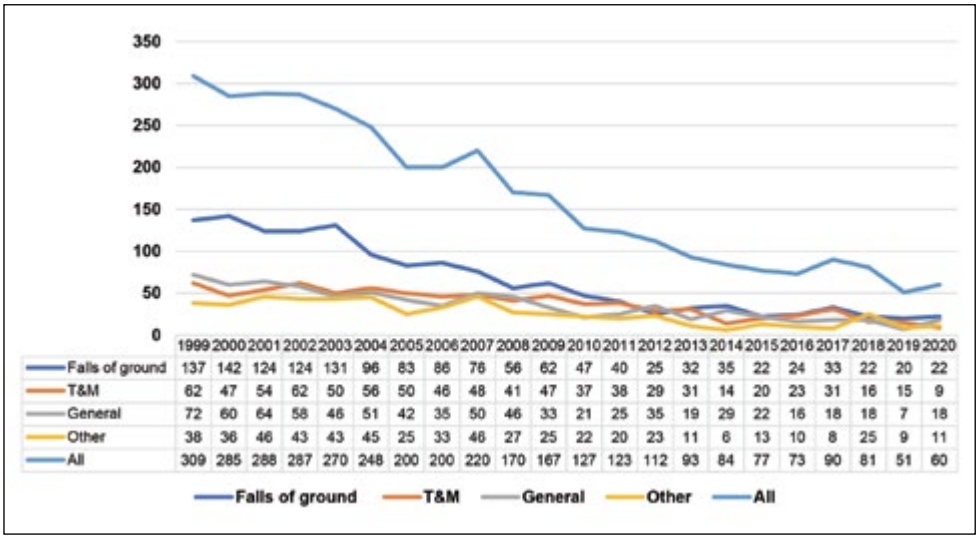
The health and safety milestones agreed on at the biennial OHS Summits by stakeholders from government, business and organised labour have contributed to the improvement of the industry's safety performance.

The health and safety milestones agreed on at the biennial OHS Summits by stakeholders from government, business and organised labour have contributed to the improvement of the industry's safety performance.

In 2009, the Minerals Council established the MOSH Learning Hub to facilitate the adoption of leading practices to prevent fall of ground and transport related fatal accidents. Three years later, the council established the CEO Zero Harm Leadership Forum which meets quarterly to lead health and safety improvements.

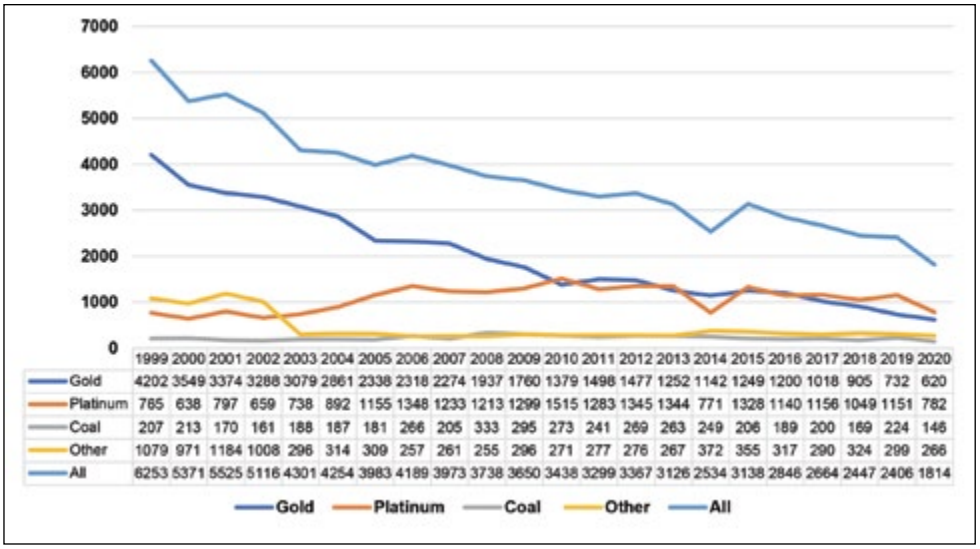
"In 2019, our member companies convened the CEO Heartfelt Conversation Workshop on Health and Safety," says Phakathi. "This in turn gave rise to the Khumbul'ekhaya Health and Safety Strategy, a holistic, CEO-led approach to eliminate fatalities in mining.

The Minerals Council has conducted an analysis of the safety performance regression in 2020 and, upon reflection on the safety performance trends, its CEOs and board approved the development and implementation of action plans to focus on the prevention of fall of ground and transport fatalities and injuries in the next three to five years.



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Falls of ground	137	142	124	124	131	96	83	86	76	56	62	47	40	25	32	35	22	24	33	22	20	22
T&M	62	47	54	62	50	56	50	46	48	41	47	37	38	29	31	14	20	23	31	16	15	9
General	72	60	64	58	46	51	42	35	50	46	33	21	25	35	19	29	22	16	18	18	7	18
Other	38	36	46	43	43	45	25	33	46	27	25	22	20	23	11	6	13	10	8	25	9	11
All	309	285	288	287	270	248	200	200	220	170	167	127	123	112	93	84	77	73	90	81	51	60

Figure 1: Number of fatalities by causes, 1999 – 2020. Credit: Department of Mineral Resources and Energy



	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Gold	4202	3549	3374	3288	3079	2861	2338	2318	2274	1937	1760	1379	1498	1477	1252	1142	1249	1200	1018	905	732	620
Platinum	765	638	797	659	738	892	1155	1348	1233	1213	1299	1515	1283	1345	1344	771	1328	1140	1156	1049	1151	782
Coal	207	213	170	161	188	187	181	266	205	333	295	273	241	269	263	249	206	189	200	169	224	146
Other	1079	971	1184	1008	296	314	309	257	261	255	296	271	277	276	267	372	355	317	290	324	299	266
All	6253	5371	5525	5116	4301	4254	3983	4189	3973	3738	3650	3438	3299	3367	3126	2534	3138	2846	2664	2447	2406	1814

Figure 2: Number of injuries by commodity, 1999 – 2020. Credit: Department of Mineral Resources and Energy

Phakathi says the national days of Health and Safety in Mining held in 2020 and 2021 focused on the improvement of health and safety during the era of COVID-19. The theme for 2021 was "Renewed Focus for Our New Normal".

"As the Minerals Council, we have been working with our committees to address behavioural safety through a set of Khumbul'ekhaya initiatives aimed at transforming the culture of health and safety in the industry." He says these initiatives include multi-disciplinary peer reviews of accident and incident systems and analysis; the Just Culture Accountability Model Framework; learning from incidents, and the digitisation of safety data.

Initiatives

"The Minerals Council is committed to tripartite collaboration towards the improvement of health and safety in the mining industry. The industry has made great strides in reducing occupational fatalities, injuries and disease over the years through tripartite collaboration," says Phakathi.

He says the Minerals Council CEO Zero Harm Leadership Forum agreed at the end of 2020 that eliminating fatalities to zero remains the target despite the challenges that still persist.

"We believe it is possible to achieve zero harm as has been demonstrated by some mining companies operating for significant periods of time without fatalities."

Fall of ground action plan

Despite the progress made in reducing fall of ground (FOG) related fatalities in mining due to initiatives such as the adoption of leading practices including mining with nets and bolts, Phakathi stresses that one fatality is still one too many.

He says FOG safety performance has plateaued in the last three years and that the Minerals Council has therefore made an investment of R46-million over the next five years into the implementation of the Elimination of Fall of Ground Fatalities Action Plan, launched during the National Day of Health and Safety in Mining on 8 July this year.

Photo by Arno van Rensburg on Unsplash

Industry initiatives aimed at addressing TMM accidents are beginning to yield results.

This action plan seeks to ensure that the industry achieves the desired step change in the improvement of FOG safety performance.

"The plan consists of six pillars focusing on the adoption of leading practices: research and development; skills development; policy; behaviour; culture and operational discipline, and monitoring and evaluation."

Phakathi says the Fall of Ground Action Plan is available on the Minerals Council website. Transport related fatalities are also a cause for concern despite the reduction in these in the last three years.

"To this end, the Minerals Council has invested over R20-million over three years, through a holistic, risk-phased action plan towards the implementation of the trackless mobile machinery (TMM) regulations.

Key challenges

He says fall of ground, transport and 'general types' of accident such as slip and fall and materials handling incidents are major causes of fatalities.

"For example, over 20 fatalities reported last year were as a result of fall of ground, particularly in the gold and platinum mining sectors."

Gravity-induced fall of ground is the main challenge while rock-burst (seismicity) related fatalities seem to have been contained in recent years.

Phakathi says there were ten transport related fatalities reported in 2020. Rail-bound equipment related fatalities are another concern whereas trackless and mobile machinery (TMM) related fatalities have been reducing in the last three years.

"This shows that industry initiatives aimed at addressing TMM accidents are beginning to yield results. There has also been a spike in 'miscellaneous' fatalities involving employees collapsing in the workplace due to factors other than the mining environment. This is a signal that there is a need to focus on wellness issues, especially in the light of the challenges brough about by the COVID-19 pandemic."

COVID-19

He says the impact of COVID-19 on the industry's regression in terms of safety performance in 2020 cannot be ruled out.

"The pandemic has altered the manner in which work was organised at the rock-face. Changes in work schedules and COVID-19 protocols such as social distancing and isolation may have increased absenteeism rates and impacted the quality of front-line supervisions and safety coaching. We are still trying to understand the nature of the impact that COVID-19 may have had on the industry's safety performance." ■

Key Takeaways

- In the past 27 years, the industry tripartite stakeholders have cooperated to reduce the number of fatalities from 615 in 1993 to 51 in 2019
- In 2009, the Minerals Council established the MOSH Learning Hub to facilitate the adoption of leading practices to prevent FOG and transport related accidents
- Fall of ground, transport and 'general types' of accident such as slip and fall and materials handling incidents are major causes of fatalities
- The impact of COVID-19 on the industry's regression in terms of safety performance in 2020 cannot be ruled out

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HYDAC seeks SADC expansion of IIoT-powered oil lubrication systems

HYDAC South Africa is scaling up its oil-based lubrication systems in the southern African mining industry. Setting the company apart in this field is the integration of sensors and IIoT in its offering to enable remote diagnostics, thus being more proactive in servicing customers, especially those operating in remote parts of Africa, writes *Munesu Shoko*.

Having set up shop in South Africa some 13 years ago, HYDAC South Africa, part of Germany headquartered HYDAC International, has over the years been on a drive to expand its footprint and offering into new markets and industry sectors.

Traditionally renowned for its hydraulic accumulators and filtration systems, the company has in the past five years broadened its offering with oil-based lubrication systems, with a specific focus on turnkey project solutions for the mining sector. Central to this approach is the integration of the Industrial Internet of Things (IIoT) in its oil-based lubrication units, ushering in a new era in this sector.

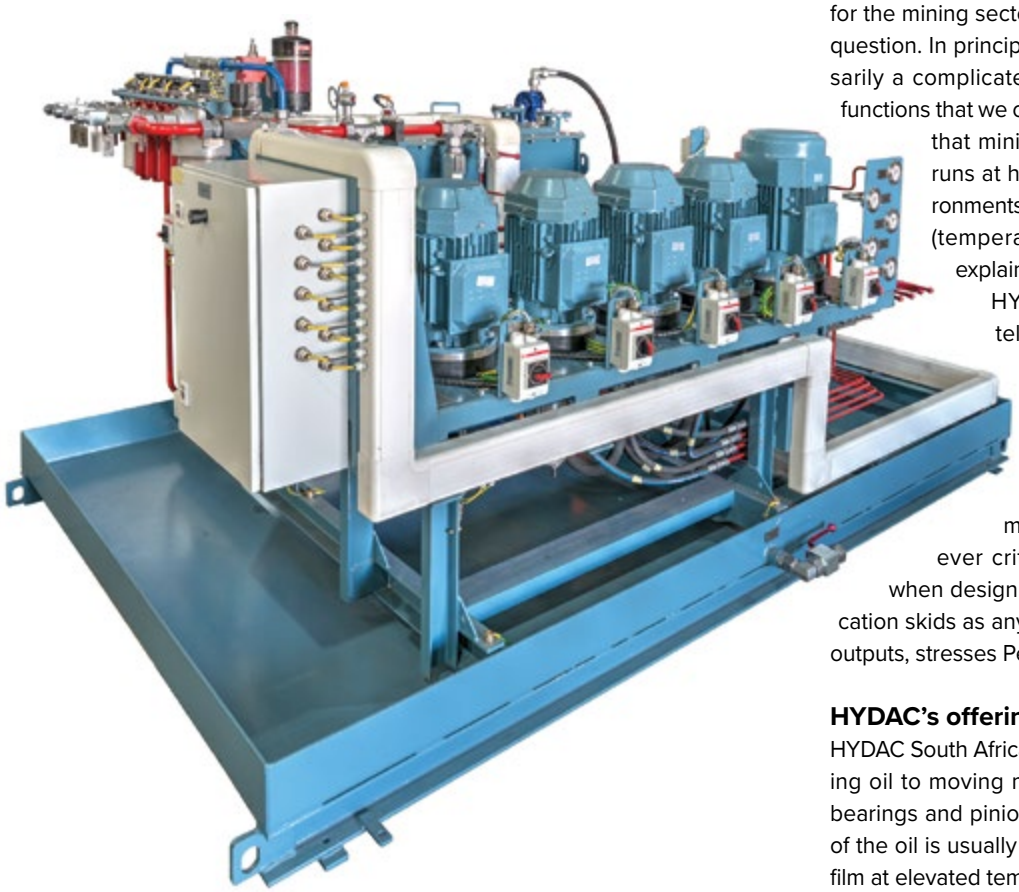
"Having initially focused on component sales, we have grown our project business significantly over the past five years, with initial focus on South Africa," says Tinus Vermeulen, national project sales manager at HYDAC South Africa.

To support this growth, the company has recently expanded its footprint in South Africa with the addition of operating branches in Durban and Cape Town, complemented by resident sales engineers situated in different parts of the country, including Bloemfontein, Richards Bay and Gqeberha (formerly Port Elizabeth). In addition, the engineering team has been increased to support customers with regards to the design, manufacture and project management of the HYDAC systems.

The focus now turns to the Southern Africa Development Community (SADC), says Vermeulen, where the company is establishing a strong footprint in big mining markets such as the DRC and Zambia. "We have recorded some notable successes in the DRC in the past year, making a breakthrough on some of the large mines in the country," he says.

"We seek to expand our oil-based lubrication systems in these mining markets. With the integration of IIoT, we believe we have a unique value proposition for the mining sector, where downtime is out of the question. In principle, a lubrication unit isn't necessarily a complicated piece of equipment, but the functions that we offer with it are critical in ensuring that mining equipment, which generally runs at high duty cycles in adverse environments, operates at optimum conditions (temperature, water content and dirt)," explains Vermeulen.

HYDAC engineer Dustin Pereira, tells *Modern Mining* that the lubrication market has traditionally been dominated by one or two strong players. The situation has, however, changed in the past 10 years with the influx of many smaller suppliers. It is however critical to select quality products when designing and manufacturing the lubrication skids as any downtime can affect the user's outputs, stresses Pereira.



HYDAC develops oil-based lubrication systems. Shown here is a hydraulic powerpack for a white metal bearing jacking and lubricating system.

HYDAC's offering

HYDAC South Africa is looking at supplying lubricating oil to moving machinery including gearboxes, bearings and pinions, among others. The viscosity of the oil is usually elevated to supply a lubricating film at elevated temperatures.

Tinus Vermeulen, national project sales manager at HYDAC South Africa.

Izak Lombaard, project engineer at HYDAC South Africa.

Dustin Pereira, engineer at HYDAC.

In order to design a successful lubrication system, says Pereira, it is imperative that oil cleanliness and contaminant levels are maintained within a tight ISO tolerance rating. The equipment requiring lubrication is kept within a strict temperature range to maximise efficiencies and prevent breakdown of the lubrication oil. Returning oil is capable of indicating the health status of the machinery and can therefore be used as an early warning mechanism for predictive maintenance, thus preventing serious damage and downtime to plant equipment.

"When it comes to the health status of machinery, there is need for early warning mechanisms to prevent serious damage to plant equipment. HYDAC has a line of products for conditioning and monitoring of lubricating systems on various ranges of plant equipment. For example, our screw pumps allow for large viscosity oils and large flow rates to be pumped without cavitation, while offering a higher dirt tolerance when compared with various other positive displacement pumps. These pumps run quietly and with low ripple and can incorporate internal pressure bypass valves to protect equipment from overpressure spikes," explains Pereira.

Where slipper pads require jacking, adds Pereira, HYDAC also has a range of high-pressure multi-outlet pumps capable of providing each pad with its own supply of oil, and not rely on problematic flow dividers. Each line can be individually monitored and settings adjusted for drive end and non-drive end jacking force requirements.

Oil conditioning

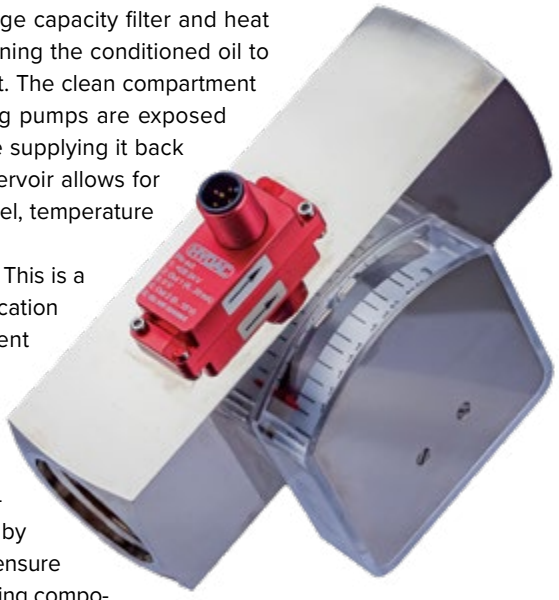
Oil conditioning is key to lubrication systems, and is therefore one of the key focus areas for HYDAC. Pereira explains that the oil in most applications is only gravity fed back to a sump/reservoir. This oil therefore does not have the effective head or pressure to allow for efficient filtration or cooling. Consequently, a reservoir must be designed to allow for oil to return under gravity and for conditioning before feedback to the plant equipment. Some key elements in the conditioning leg comprise the following:

Reservoir/sump design: High performance systems may require the oil to return to the reservoir through a basket strainer in order to remove any larger particles that may be picked up during equipment operation that can cause damage to the lubrication system. The basket strainer is made of stainless steel and is washable/serviceable.

HYDAC's CSM 1000 metallic contamination sensor, an online condition monitoring system for the continuous measurement of solid particle contamination in hydraulic and lubrication fluids.

The reservoir design, stresses Pereira, is key to allow for settling of the oil. It must have compartments to allow for the settled particles to be removed during maintenance. The settling compartment is therefore separated into an intermediate section to allow for oil to be circulated through a large capacity filter and heat exchanger, before returning the conditioned oil to the 'clean' compartment. The clean compartment ensures that the jacking pumps are exposed to the filtered oil before supplying it back to the bearing. The reservoir allows for monitoring of the oil level, temperature and cleanliness.

Conditioning of the oil: This is a key process in the lubrication process. Plant equipment operates at high duty cycles and in most instances under difficult conditions, whereby wear particulates are washed away by the conditioning oil. To ensure the longevity of the moving components, the lubricating oil must be replenished with fresh, clean and cool oil.



HYDAC's HFT 2100 flow transmitter is used for monitoring the flow rate of systems with viscous fluids.

To remove particulates from the oil, high efficiency

HYDAC Industry 4.0.

filters with a large dirt holding capacity are installed to remove the dirt from the high viscosity oil throughout the operating temperature range.

"HYDAC has a full range of low-pressure high-capacity filter housings and elements to achieve conditioning of the high viscosity oil to a pre-determined ISO cleanliness level, incorporated with the inline low and high pressure filter assemblies, both singular and duplex. In fact, we have a full filter portfolio available. Intelligent electrical clogging indicators allow for cold start-up bypass. This in turn allows for a cost-effective design for the ideal operating range of plant equipment. Smart sensors also give feedback on the filter cleanliness capacity trends for predictive maintenance applications," explains Pereira.

Temperature control: This is one of the important factors in the process. Many gearboxes and moving machinery are sized based on thermal capacity and heat dissipation properties. A gearbox may have to be oversized for an application based on the thermal capacity rather than the performance of the gears, and this may make the selection impractical or unsellable. Therefore, removing excess heat from moving machinery is a key feature of lubrication systems.

HYDAC offers a full range of well-defined heat exchangers capable of dissipating large heat loads with various media, including air, water, sea-water and other fluids. The air/oil heat exchangers are able to integrate various electric motor fan drives, allowing these units to be adapted for various voltages and frequencies based on the client's needs.

"Thermo-bypass valves can be integrated into systems whereby efficient cooling can be supplied all year round, regardless of the fluctuation in the cooling media temperature (within limits). Therefore, oil from the reservoir/sump is cooled through the conditioning leg and returns to the clean chamber of the reservoir for the supply pumps delivery to plant equipment," says Pereira.

System intelligence

Given the shortage of skills on mines in some countries, Pereira says system intelligence is the next big thing in lubrication. System intelligence, Industry 4.0 and predictive maintenance can be achieved through the strategic integration of a range of HYDAC sensors throughout a lubrication system.

Simple feedback from key features is achievable with HYDAC sensors such as flow rate transmitters and switches, pressure sensors and temperature sensors. These are all capable of giving feedback to control systems of both return oil from plant equipment and the supply of conditioned oil into the field. The feedback from these sensors can give trip commands or sequence additional equipment. With HYDAC, it can be achieved from CAN open sensors, ATEX and SIL rated sensors.

"The filter clogging sensors can trend wear and serve as an early warning when a spike of contaminants is recovered from the field with the lubrication oil. Sensors in the return line compartment can pick up the amount of metallic ferromagnetic particles that return from gearboxes and may also trend wear characteristics on the gears where setpoints may be programmed to signal maintenance requirements. Aqua-sensors may be installed to monitor the ingress of free water molecules into the gearbox or bearings – this may again point to issues with plant equipment breathers or labyrinth seals, among others," says Pereira.

Once the ingress of moisture is found, HYDAC rental equipment can be installed to remove any dissolved water particles within the system. Contamination sensors can give real-time feedback on the lubricating oil's ISO cleanliness levels. Trending this may serve as an early warning signal for ingress of foreign particles into systems from wear or damaged parts.

"All of these sensors may be integrated into cloud setups with a dashboard development, allowing remote access by specialists capable of identifying mechanical issues before they become serious breakdowns," says Pereira.

Enter IIoT

The Industrial Internet of Things (IIoT) is unleashing enormous value in plants around the world. IIoT, involving real-time sensing and predictive maintenance, is viewed as an easy win for lubrication. With data being the new currency for businesses, says Izak Lombaard, project engineer at HYDAC South

Africa, IIoT is quickly moving from being optional to a requirement and will soon become an invaluable part of business operations in order to gain a competitive edge and remain one step ahead in tough economic times.

Explaining IIoT, Lombaard says it is basically the IoT (Internet of Things) at an industrial scale. IoT is a term that refers to all things that get connected to the internet, he says. IoT was pioneered in home automation, allowing users to remotely control devices in the home like turn the lights on, turn the thermostat up and control a robot vacuum cleaner, among others – demonstrating the significant role internet-connected devices can play in the modern lifestyle.

On an industrial scale, says Lombaard, industrial 'things' such as automated controllers (PLCs and electronic controllers), individual devices and sensors, as well as other items such as cameras, vehicle fleets and telephone systems, can now be connected to the internet.

"Once connected to a local network, these components can individually communicate with each other, allowing for a large information network. This provides us with continuous information from the devices. This info is on demand, extremely detailed, live or historical, follows trends and predicts maintenance and failure. All this can be done remotely. The remote part is very important because we can now quickly assist a client who is far away from our Johannesburg office without having to send a technical person to site, for example, up in Africa," explains Lombaard.

How it works

HYDAC installs an internet gateway on a system, for example a lubrication unit. "To connect to the internet, we can use a mobile SIM card, WiFi or Ethernet connection," says Lombaard. The system can have an existing network (PLC or controller) or only a few analogue and digital sensors without any controller.

The existing network can then be accessed from anywhere in the world via a VPN connection. The VPN allows HYDAC to connect to the gateway. The data and information from the devices connected to the gateway is stored in the internal memory of the gateway. This information can also be forwarded to a local server or the cloud.

"We can also create a web server on the gateway. This web server can host several custom designed web pages. The web pages can be designed to show information such as live sensor values, historic trends and alarm & error messages, to name a few," says Lombaard. "We can also use the web pages to change values on the system – set points can be changed, systems can be started and stopped remotely."

Automated emails can be configured on the gateway, and reports at set intervals. Emails can be based on sensor values. Web pages can be accessed from any device that is capable of browsing the internet. This includes computers, mobile devices, tablets or smart TVs at home.

"Most systems are already fitted with digital and analogue sensors which can connect to the gateway which HYDAC installs. The additional hardware cost to get a system connected to the internet is very affordable when compared to the early failure of equipment," explains Lombaard.

"The real benefit can be seen if you compare the cost to implement IIoT on a system to that of a single flight and accommodation for a technician or engineer to visit a site for a few days. COVID-19 has also cast the spotlight on the importance of these systems, given the difficulties of travelling to sites during lockdowns," concludes Lombaard.

Managing health and safety in remote mining locations

Kevin Thompson, vice president: Business Development at Remote Medical International.

The biggest challenge facing mines operating in remote locations – in terms of health and safety – is their remoteness. Mastering health and safety in remote locations, reasons Kevin Thompson, vice president: Business Development at Remote Medical International, requires a tailored approach based on the specific circumstances of each mine. By *Munesu Shoko*.

The importance of good health and safety management at mining operations cannot be reiterated enough. In his experience, Kevin Thompson, vice president: Business Development at Remote Medical International (RMI), has found that employee health and safety is generally one of the top priorities for every mining company.

"Companies are strongly committed to continually evaluating their operating practices to work towards a workplace with no injuries or illnesses. Like most industrial work, mining involves a degree of risk – and getting as close as possible to eliminating that risk and protecting workers always has to be a key initiative," says Thompson.

He says the past 17 months, with the COVID-19 pandemic, have further reinforced the fact that external factors, in addition to day-to-day operations, will always be a health and safety risk requiring advanced and ongoing planning to mitigate. As he works for a medical company, Thompson tends to think more about the "health" side of health and safety, but reiterates that the two are inextricably linked.

Commenting on the challenges faced by mining companies operating in remote locations, Thompson believes the biggest challenge is their remoteness. "I live in a city where I have multiple hospitals within a 15-minute drive. These facilities have emergency departments, advanced diagnostic capabilities, surgical capabilities and access to practically every medical specialty you could need – and that's just the hospitals. There are ambulances, urgent care clinics, wellness centres, physical therapists, dentists and a whole suite of other health-related services available at my fingertips," he says.

Paramedic rescue services on site.

This access to care, he says, isn't the case for mines in remote locations. In addition, the extent of "remoteness" can vary tremendously. Healthcare needs to be built into these locations, and mining companies must make the challenging decision of what type of medical services they want on-site.

"Many factors will influence this decision, such as distance from definitive medical care, workforce size, community initiatives and more. Generally, though, it will just never be the same breadth of services found in non-remote locations that most of us take for granted. This, of course, leads to other challenges. For instance, what do you do if a health concern exceeds the capability of the medical care on site? Where do you take the patient? How do you get them there?"

Mastering health and safety in remote locations

Mastering health and safety in remote locations requires a tailored approach based on the specific

Mining dump trucks at a mine site.

circumstances of each mine, but there are several factors to keep in mind. "I will focus on the 'health' side of health and safety here. Firstly, fit-for-duty and regular medical surveillance programmes can help ensure a healthy workforce and catch and address health problems early on – before their severity grows," says Thompson.

Secondly, he says, mines can build an on-location healthcare capability commensurate with the needs of the population and the project budget. In some cases, this may be a small team of healthcare professionals – even just one may suffice in some instances. In other cases, adds Thompson, where a mine may support a large workforce and even the greater community, there may be need for a fully equipped hospital.

"Even where there is a hospital, it is essential to develop a plan to deal with medical issues requiring further treatment elsewhere. These plans – we often call them 'Medical Emergency Response Plans' – generally outline referral facilities and their respective capabilities to treat a wide variety of health emergencies. They also detail how to get a patient to these places – sometimes it may be by road, and in some instances it may be by air. Based on the mine location, trustworthy referral facilities may be nearby or in another country," says Thompson.

In addition to or built into medical emergency response plans, mining companies should also be forming strategies for dealing with geographic-specific health issues such as malaria or more widespread health issues like the COVID-19 pandemic. These should be both preventive in nature and contain plans for handling larger-scale occurrences.

Supporting health and safety initiatives

RMI regularly works with mining companies and other organisations across a wide variety of industries to support their health and safety initiatives. "We help organisations coordinate medical screening programmes, and we install and manage turnkey medical clinics on site at remote locations. We have an assistance department to coordinate all patient movements when they are needed," says Thompson.

"We understand that each company and project brings unique requirements, and therefore we work in a consultative manner to put health solutions in place. Through all of these services, clinical governance and quality assurance are critical to our success – and therefore, key to protecting the health of our client's workforce," he adds.

A major advantage of dealing with RMI is that the company works on a consultative basis with its clients. While it has been offering medical services to remote locations for nearly 20 years, "we are still learning every day".

When combining the company's internal expertise

Underground mining work.

with its clients' specific knowledge of their own projects, Thompson says it is easy to put together a medical plan that serves a wide variety of needs. Furthermore, while mining is a crucial industry that RMI serves, the company also works in many other industries facing similar challenges in terms of coordinating medical care for their workforces. This experience gives RMI a unique perspective that it can bring to all of its clients – whereby it can institute best practices across a vast industrial sector that helps benefit everyone involved.

"One essential item of this is the niche we fill as a medical company that blends best practices in healthcare with best practices for employers. RMI plays a vital role in managing illness and injuries appropriately and ethically while considering the classification of illnesses and injuries with relevant regulatory agencies. While we will never sacrifice excellent patient care, we understand and train all of our clinicians on the impacts of their clinical decisions," he says.

Another benefit of working with RMI is the responsiveness and agility it brings to its clients. "We are agile in addressing our clients' needs, especially when confronted with complex or novel situations," says Thompson. In terms of responsiveness, the company aims continually to respond nimbly in every situation, from worker health emergencies to enquiries from its current and prospective clients.

"I know it has been discussed everywhere, but the pandemic was a terrific example of these qualities. The industries we work in are essential, and RMI worked with all of our clients to initially institute measures to keep them working and safe. As the pandemic continued, that initial response has morphed into continually helping organisations protect their workforces while maintaining business continuity," he adds.

Success stories

Over the years, RMI has recorded some key successes in the field. Recently, one of its most experienced providers expertly evaluated and managed a patient with acute appendicitis. The patient had a highly atypical presentation for the diagnosis. Yet, RMI's provider followed the patient closely onsite and reached out to the company's Topside team of physicians early on to express his concerns over this possibility. Due to the progression of symptoms and frequent updates from the provider, the decision was made to medevac the patient to an emergency department for a complete evaluation. The patient was ultimately diagnosed with acute, uncomplicated appendicitis and successfully underwent an appendectomy later that day.

"We recently managed a young man who experienced severe anaphylaxis after accidentally ingesting peanuts at lunch. Anaphylaxis was

Quick take

- ❒ Employee health and safety is generally one of the top priorities for every mining company
- ❒ The biggest challenge facing mines operating in remote locations – in terms of health and safety – is their remoteness
- ❒ Mastering health and safety in remote locations requires a tailored approach based on the specific circumstances of each mine
- ❒ Remote Medical International regularly works with mining companies and other organisations across a wide variety of industries to support their health and safety initiatives

recognised immediately by the on-site provider, who initiated treatment and contacted our topside physician for direction. Between the topside physician and on-site provider, multiple rounds of epinephrine were administered to the patient to stabilise the reaction and allow for transport to definitive care. Prompt recognition and aggressive treatment of a severe peanut allergy saved this man's life that day," says Thompson.

Elsewhere, in the summer of 2021, a small community outbreak of COVID-19 affected the local workforce in two waves. In mid-July, several employees with household COVID-19 contacts became ill and later tested positive for the disease. These individuals were identified appropriately and isolated by RMI's on-site provider, and a larger outbreak was contained. At least two of these individuals worked in an administrative capacity and continued working remotely while maintaining isolation precautions.

Several weeks later, a widespread COVID-19 outbreak within the community infected multiple employees. In response, RMI's clinical team collaborated with the client and employed a strategy of widespread testing and contact tracing.

"We identified 15 additional positive cases over a two-week period, with contact tracing and quarantine provided for dozens of other individuals, including family members of affected employees. Throughout this time, there were no operational disruptions for the client, and no Remote Medical International personnel were infected. RMI's focus during this outbreak was to maintain operations for the client by keeping their workforce safe and support overall community public health efforts," concludes Thompson. ■

Companies are strongly committed to continually evaluating their operating practices to work towards a workplace with no injuries or illnesses.

Solid financial performance for South

South Africa's mining sector delivered a solid financial performance for the 2020 – 2021 financial years with value delivered to all stakeholders despite the current challenging pandemic environment. For the companies in PwC's 13th edition SA Mine analysis, revenue in rand terms grew by 63%. This was mainly driven by higher prices for PGMs and iron ore.

Andries Rossouw, PwC Africa Energy Utilities & Resources leader.

Marcia Mokone, partner in PwC's Mining Division.

The excellent financial performance resulted in mining companies being in a very strong financial position, with record distributions to shareholders and more than a tripling in taxes paid. Debt has largely been repaid and returns to shareholders reached record rand levels for many companies. These are some of the highlights from PwC's 13th edition SA Mine, a series of publications that highlights trends in the South African mining industry released today.

"The growth in SA's mining industry confirms the resilient nature of the sector and the opportunities that exist in rebuilding the South African economy. With record rand prices for gold, the platinum group metals basket, iron ore and more recently, coal, it was no surprise that the industry's financial performance exceeded expectations on most fronts," says Andries Rossouw, PwC Africa Energy Utilities & Resources leader.

"The COVID-19 pandemic has also added momentum to the already in focus importance of the environmental, social and governance (ESG) agendas across all industries in South Africa. Multiple stakeholders are increasingly challenging mining companies to make changes to their boardroom agendas on ESG. There is widespread recognition in the industry that for South Africa to achieve its net zero targets, ESG must be a core component of any mining company's strategy and policies."

Market capitalisation

Total market capitalisation increased in the current year to R1,470-billion from R1,047-billion. This total is a R423-million (408%) year-on-year (YoY) increase from 2020, mainly attributable to the increase in market capitalisation of companies within the PGMs sectors.

Financial performance

For the companies in PwC's analysis, revenue in rand terms grew by 63%. This was mainly driven by higher prices for PGMs and iron ore.

The mining sector was one of the most resilient sectors, emerging strongly despite COVID-19 restrictions to deliver record financial results. In line with the prior year, the PGM basket generated the largest portion of revenue.

As global supply and demand jostled to find their way back to pre-pandemic levels, demand and therefore prices were the outright winner. With record rand prices for gold, the platinum group

Africa's mining sector

Above: The growth in SA's mining industry confirms the resilient nature of the sector.
Photo by Albert Hyseni on Unsplash

Left: The mining sector was one of the most resilient sectors, emerging strongly despite COVID-19 restrictions to deliver record financial results.

metals basket, iron ore and more recently, coal, it was no surprise that the industry's financial performance exceeded expectations on most fronts.

High prices can only be utilised if you can deliver into them and the SA mining industry did well to recover production levels to be at or above 2019 levels.

The average EBITDA margin of the mining companies included in PwC's analysis was 46% compared to 27% in the prior year. At these margins mining companies are faced with interesting capital allocation decisions. Maintaining discipline and following through on long term strategies remain key.

The aggregate tax expense for the mining companies was R91-billion with an effective tax rate of 27%. This represents a staggering 250% increase from the previous period and was driven by the increased profitability of the mining sector. Taxes paid increased by 258%. The increase in revenue also resulted in royalty taxes of R21-billion being paid in the current year. This represents a 146% increase from the prior year.

Net profit grew to R274-billion, which represents a 285% increase, because of the increased commodity prices and improved production after mines largely returned to pre-COVID-19 production levels.

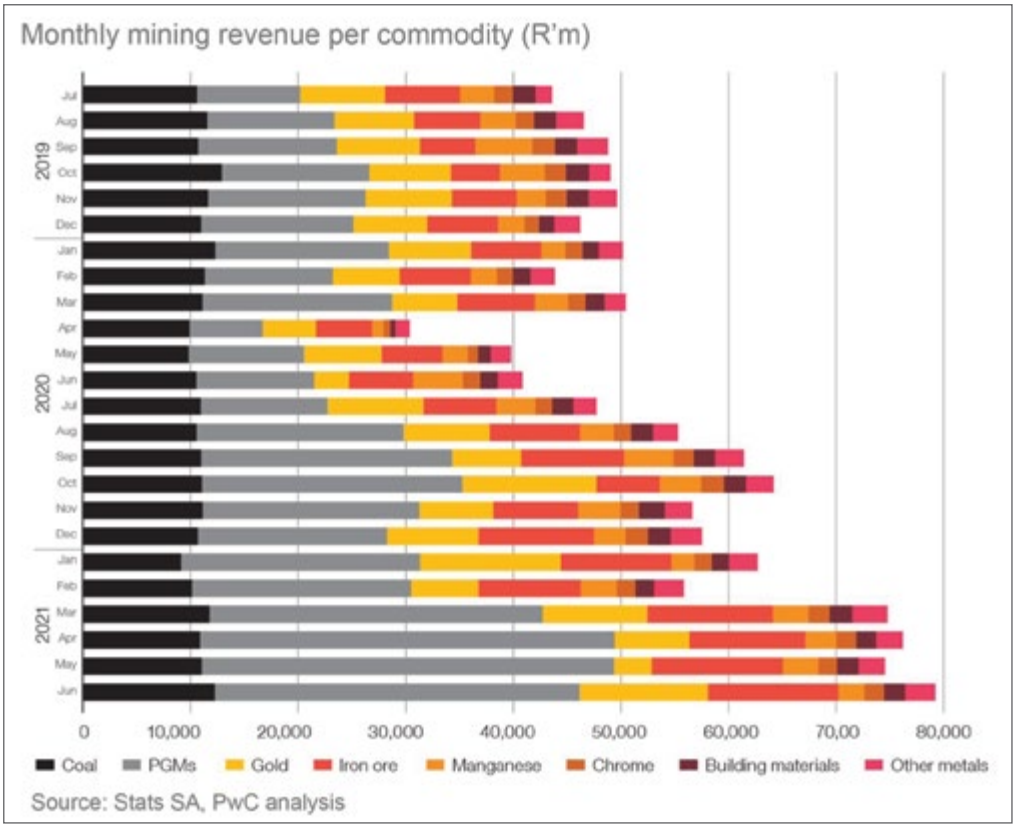
Production

The current period saw production increase by 6% YoY. Although the overall production for the year to June was still marginally below 2019, monthly production levels over the last six months were above the 2019 levels.

Manganese ore was the largest positive contributor with an average of 20% increase in output as operations recovered from an extended shutdown in response to COVID-19 restrictions and market conditions. Diamond production grew the largest by 30%. Coal has seen the biggest drop in production from the prior year at an average of 6%.

Transitioning to a cleaner economy

As South Africa navigates its way through its transition to a cleaner economy, there are several factors to consider. The transition comes with employment opportunities in cleaner energy industries, such as renewable energy and battery storage. It is key that these opportunities are maximised to the fullest



Monthly revenue show record prices and production recovery.

to generate economic growth and employment opportunities for all. There is need to skill and reskill employees for this transition.

The just transition concept has put a lot of focus on the plight of communities in the coal mining areas. In a country with record unemployment and where the socio-economic challenges probably post the biggest risk, not only for the mining sector, but for the country as a whole this focus might be too narrow. PwC believes the socio-economic challenges need to be addressed on an integrated basis.

The limitations of supply of key commodities required for the total green energy value chain are likely to limit the pace of the energy transition to the extent that a realistic transition will result in most of the existing coal mines closing on their normal life of mine planned times. In fact, in the next decade, the country stands to lose more jobs in the gold sector for planned mine closures than in the coal sector.

The mining industry is well positioned to use the global energy transition opportunity to enable growth in SA. This includes the opportunity for research and development (R&D) and industries to support the renewable energy industry in general and the green hydrogen economy.

Smart mining

The mining workforce – from a job role, digital skills and behaviour perspective – is evolving continuously. In a recent PwC survey of digital transformation in the South African mining sector, most respondents believed that there will be a change in the nature of the workforce to more skilled employees over the next five years.

As major mining organisations think about their strategy and transformation journey from a digital and mining operations automation perspective, it is critical to understand, identify and start developing skills to support and undertake this transformation. The report identifies some of these roles, skills and competencies.

"In order to prepare the workforce for future roles and to upskill employees with the skills and competencies they need to stay relevant, upskilling and learning and development within mines needs to be carefully rethought with rapid technology adoption in mind. Mining companies have a unique opportunity to manage digital transformation proactively and to minimise the potential negative impact on the workforce and operations through upskilling and reskilling," says Marcia Mokone, partner in PwC's Mining Division.

Although digitised training has a number of benefits, in the South African mining context there are some challenges that need to be considered: language barriers and literacy levels; workforce age groups, generational expectation differences, and cultural norms; physical infrastructure, and asset development and operating costs; and scalability, adaptability and accessibility of training.

"As mining organisations think about new ways of learning, they will need to put plans in place to future-proof their workforces in order to address these factors and, more importantly, the realities of diverse workforce generations, cultures and literacy levels," adds Mokone.

ESG enters the mining mainstream

PwC has observed many large mining companies protecting their investments by diverting investments away from coal towards investments that are likely to support the net zero agenda. Shareholders and other stakeholder scrutiny are turning up the heat on how mining companies operate – this is becoming a real concern for the industry.

There is widespread recognition in the industry that for South Africa to achieve its net zero ambitions, ESG must be a core component of any mining company's strategy and policies. Mining companies have often been criticised for not doing 'enough' on ESG and consequently are increasingly challenged

to make changes to their boardrooms.

"While the transition might present challenges, it also presents substantial opportunities for mining companies to create shared value and economic benefits for the communities in which they operate," Mokone says.

Infrastructure

PwC believes that there is an obvious need to invest in the right skills, infrastructure, energy, and water and, in general, creating an enabling environment for exploration, mine development and production.

Realising the full potential benefit of the country's resources and creating long-term sustainable outcomes will depend on the industry's ability to mine cost competitively and to integrate various value chains profitably.

Share of value added

The 2020 – 2021 year has been rewarding for mining industry stakeholders. There have been record distributions to shareholders. As reported in company value added statements, employees continue to take a major share of value added (20%) and government increasing its share through direct taxes (14%), employee taxes (3%) as well as royalties (5%). What was evident this year is that growing the pie is a much more successful way to share value with stakeholders than trying to increase stakeholder share from a shrinking pie.

Mining companies for the first time in a number of years were able to retain value created. This strong financial position and available cash resources leaves mining companies with interesting capital allocation decisions. Strategies will include expansions and new development, acquisitions, strengthening of local infrastructure and host communities, market development and investments up and down the value chain. Execution on these strategies will require disciplined long-term sustainable mind sets.

The current period saw production increase by 6% YoY.

Photo by Zac Edmonds on Unsplash

Key takeaways

- Total market capitalisation increased in the current year to R1,470-billion from R1,047-billion last year
- This represents a R423-million (408%) year-on-year (YoY) increase from 2020, mainly attributable to the increase in market capitalisation of companies within the PGMs sectors
- For the companies in PwC's analysis, revenue in rand terms grew by 63%. This was mainly driven by higher prices for PGMs and iron ore
- With record rand prices for gold, the platinum group metals basket, iron ore and more recently, coal, it was no surprise that the industry's financial performance exceeded expectations on most fronts

UMS delivers on Target, ahead of schedule

Takalani Randima, MD of UMS METS.

With design and contracting capabilities under the same roof, United Mining Services (UMS) is positioned to respond quickly to mining customers' needs, and has the flexibility to address challenges of any size, big or small. UMS recently delivered a fast, innovative solution for Harmony's Target 1 gold mine to optimise the shaft's cooling capability.

Located in the Free State province, the Target 1 shaft is used to transport men, material and rock from surface to 203 level, at a depth of 1 800 m. A single decline, equipped with a conveyor belt, connects 203 level to 255 level, approximately 2 050 m below surface.

Prospecting at the mine location dates back to 1890 and the shaft was constructed in the mid-1940s. Consequently, there are no designs available for the shaft, making modifications challenging. UMS was tasked by the mine to come up with a solution to remove the brattice wall, which allowed the converting of an upcast shaft compartment to downcast, to facilitate more cool air entering the shaft from a newly built refrigeration plant at the surface.

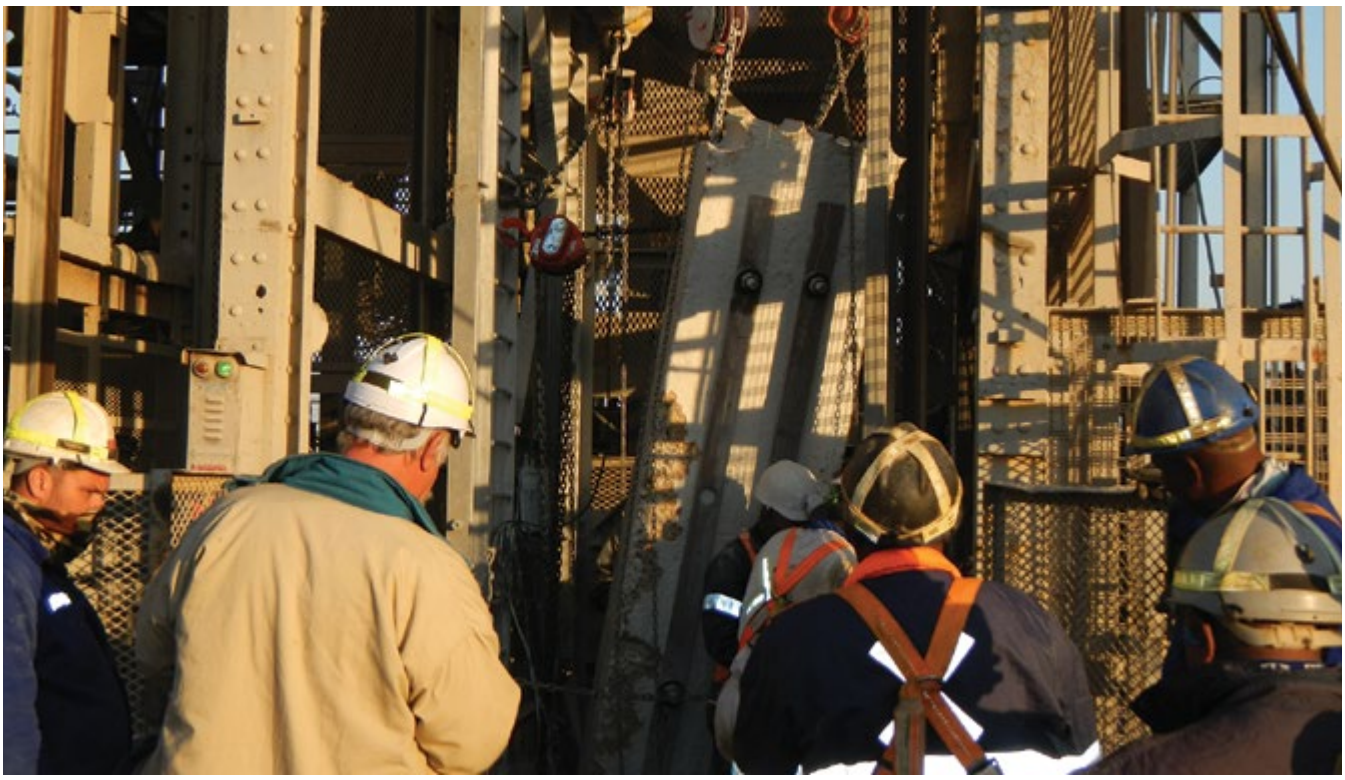
The solution

Takalani Randima, MD of UMS METS, explains that the rectangular shaft has seven compartments, six of which were used for downcast air flow. In order to convert the seventh compartment to downcast and allow cool air from the new refrigeration plant to pass down through the entire shaft, a portion of the brattice wall in the shaft had to be cut from the surface down to 9 metres below.

After assessing the shaft, UMS identified that there were water and electricity service cables in the way in the brattice wall section. "To access the shaft wall safely without causing damage to the service cables, we designed a 'skeleton' that could be attached beneath the skip compartment of the shaft, similar to a cage," says Len Phillipson, contracts manager at UMS.

Phillipson adds that UMS METS designed the skeleton to fit the width of the entire shaft, with the capacity to carry up to five people and equipment, to a maximum weight of eight tonnes. The skeleton was constructed by Harmony's skip and conveyance workshop, and UMS Shaft Sinkers executed the project. Phillipson says that the mine will be able to use the skeleton for other work that needs to be undertaken on the shaft.

Cutting the wall also proved to be a challenge as it was very old and had no reinforced steel. "During core drilling to check the capacity, we saw that the wall was already cracking. To prevent the wall from falling down, which could have caused irreparable damage to the shaft, we proposed to strap it with steel, and cut it in three sections, each measuring 3 m long by 2,8 m wide.



With no designs available for the shaft, making modifications challenging.

Cutting the wall also proved to be a challenge as it was very old and had no reinforced steel.

"As there were no drawings of the shaft, we were essentially going in blind, and relied on experience to remove the wall safely," says Phillipson. "Considering that each wall section weighed approximately 1,6 t, cutting and removing them was not without its risks, but these risk were effectively mitigated and we are pleased to have completed this complex task safely and successfully."

Ahead of schedule

"Our initial time frame to complete the project was 30 days, but with collaboration between the customer, UMS METS and UMS Shaft Sinkers to solve the challenge, we were able to fast-track it in 19 days," says Randima.

"The customer had faith in our methodology, and the job was done safely without damaging the shaft's steelwork. This project demonstrates how UMS can provide quick solutions to mining customers' challenges by having design, engineering and execution capabilities under one roof.

"This one-stop turnkey service is what makes UMS unique: we have the flexibility to work with customers on projects of all sizes, mobilise quickly, and execute the project efficiently and safely from a commercial and quality perspective, while accommodating the customers' systems," notes Randima.

Phillipson adds that owing to the collaboration between UMS and the mine team, the Target mine did not have to stop productivity while the work was carried out on the shaft. As a result, the mine has been able to greatly increase the amount of cold air entering the shaft, and make working underground much cooler and safer. ■

A portion of the brattice wall in the shaft had to be cut from the surface down to 9 m below.

Key takeaways

- Located in the Free State province, the Target 1 shaft is used to transport men, material and rock from surface to 203 level, at a depth of 1 800 m
- A single decline, equipped with a conveyor belt, connects 203 level to 255 level, approximately 2 050 m below surface
- UMS was tasked by the mine to come up with a solution to remove the brattice wall, which allowed the converting of an upcast shaft compartment to downcast, to facilitate more cool air entering the shaft from a newly built refrigeration plant at the surface
- UMS's initial time frame to complete the project was 30 days, but with collaboration between the customer, UMS METS and UMS Shaft Sinkers to solve the challenges, the company was able to fast-track it in 19 days

Orica's ambition to achieve net zero emissions by 2050

Orica (ASX: ORI) has announced its ambition to achieve net zero emissions by 2050, covering scope 1 and 2 greenhouse gas (GHG) emissions and its most material scope 3 GHG emission sources1,2.

The ambition builds on Orica's previously announced medium-term target to reduce scope 1 and 2 operational emissions by at least 40% by 20303.

To advance its net zero emissions ambition, Orica will:

- Continue to reduce its operational footprint: prioritising scope 1 and 2 operational emissions reductions by deploying tertiary catalyst abatement technology, sourcing renewable energy and optimising energy efficiency and industrial processes;
- Collaborate with its suppliers: as new and emerging technologies scale and become commercial, partner with suppliers to source lower emissions intensity ammonium nitrate (AN) and ammonia to reduce Orica's scope 3 emissions, which account for approximately 70% of Orica's total scope 3 emissions;
- Prioritise lower carbon solutions: developing lower carbon AN, as well as new products, services and technology offerings to help customers achieve their own sustainability goals; and
- Report progress: transparently disclose performance consistent with the recommendations of the Task Force on Climate-Related Financial Disclosure.

Orica's net zero emissions ambition covers its global scope 1 & scope 2 GHG emissions.

Orica MD and CEO, Sanjeev Gandhi, says: "Our ambition of net zero emissions by 2050 shows our commitment to playing a part in achieving the goals of the Paris Agreement5. This is a strong signal that the decarbonisation of Orica will, and must, continue beyond 2030 and requires a collaborative approach across all of our stakeholders.

"We are making solid progress having already achieved a 9% emissions reduction in FY2020 and further reductions this financial year. We've taken our 2030 medium-term target and extended our planning over the long term, developing a credible roadmap to support our ambition to achieve net zero emissions by 2050.

"Over the next decade, Orica is deploying tertiary catalyst abatement, prioritising renewable energy opportunities and supporting a trial of carbon capture utilisation and storage technology. Beyond 2030, how we achieve our ambition is dependent on effective global policy frameworks, supportive regulation and financial incentives, and access to new and emerging technologies operating at commercial scale."

Weba develops tool to model reliability

Based on its experience in manufacturing and maintaining transfer points, Weba Chute Systems has developed a reliability model that allows customers to improve uptime in their plants.

According to Izak Potgieter, ISO systems manager at Weba Chute Systems, the tool is able to capture, store and calculate vital information about wear rates on different components within each chute.

"The data specifies exactly which chute is being referenced, where it is physically located in the mine or plant, the components it includes and the dimensions of these components," says Potgieter. "Data is captured over time on the tonnages that pass through the chute, and the wear that occurs on components such as lips, liners and dead boxes."

Components are installed once the wear rate is near 100% with a 10% confidence level still in place.

When inspections of the chute are conducted, precise measurements are taken of wear levels so that comparisons can be made over time. The tool generates important calculations such as the wear rate per hour or per day, which allows forecasts to be made about key indicators such as mean time between failures (MTBF).

"By applying the concept of exponential distribution to the percentage reliability required by the customer, we can then calculate the number of hours that the chute should be able to operate between maintenance interventions," he says.

Average tonnages passing through the transfer point is usually gathered from the mine's SCADA system. If these tonnages – or the nature of the material – does not change, then the wear life of each chute's various components can be predicted fairly accurately.

World-renowned Weba Chute Systems are used for bulk materials transfer in the industrial and mining sectors. As the leading manufacturer of bespoke chutes, the company engineers and produces quality transfer systems - each solution tailored to the specific application requirements aimed at enhancing productivity and reducing unscheduled downtime.

With more than 5 000 chute systems operating worldwide, Weba Chute Systems has offices and representation in South Africa, Africa, Australasia, Russia, North America, South America and Europe.

Kwatani innovates to keep screens well isolated

Screens vibrate more when starting and stopping, often causing unexpected damage to buildings and reducing the lifespan of the machine. Kwatani has applied cost-effective isolation solutions that include both torsional and coil springs.

According to Kwatani's chief operating officer, Kenny Mayhew-Ridgers, the company has achieved considerable improvements in many screening applications by selectively fitting torsional springs alongside coil springs.

"It is well known that the vibrating motion of a screen impacts on the building and structural accessories around it," says Mayhew-Ridgers. "This vibration is addressed by fitting isolators between the screen and the plant floor, and by constructing the plant building to certain minimum structural specifications."

However, the focus is often on the frequencies that the screen generates in its steady-state phase – or the normal running phase – rather than during the transient phases when the screen is starting up or slowing down to a stop.

He highlights that it is during these transient phases that the screen's movement becomes amplified and potentially most destructive.

Isolators between the screen and the floor – common among which are coil springs and rubber buffers – are meant to absorb vibrations and prevent damage to surrounding infrastructure. However, the transient phases, especially when stopping, can generate considerable sideways movement of the screen, which must be avoided.

"Traditional isolators like coil springs usually perform well in controlling the up-and-down movement of the screen," he says. "Our experience is that the sideways movement, which is induced most strongly when the machine stops, can be better controlled by torsional springs."

However, he notes that coil springs retain the advantages of being cost effective and providing a good linear isolation of the screen from the building structure. In this respect, their isolation characteristics are generally better than rubber buffers which rather excel in terms of their damping qualities.

One of Kwatani's smaller screens used in diamond mining fitted with torsional springs.

"The torsional spring provides the best of both worlds, giving a good linear range for compression during operation while also becoming non-linear like the rubber buffer during stopping," he says.

Using its years of experience observing screens operating in the field, Kwatani has developed and trialled various solutions in its dedicated testing centre at its headquarters in Kempton Park. ■

Unprecedented demand for Grindex stainless steel pumps on the Copperbelt

Integrated Pump Technology reports an unprecedented demand for Grindex stainless steel pumps from customers on the Zambian and DRC Copperbelt. Grindex stainless steel pumps are engineered to operate reliably in contaminated water and handle corrosive slurries with abrasive solids.

Grindex stainless steel pumps are engineered to operate reliably in contaminated water.

Sales manager, Jordan Marsh attributes the move to stainless pump units to the poor water quality in the region which has seen acidity levels increase and pH drop. "In areas experiencing acid mine drainage, we see many instances where initial pumps selection did not properly consider the operating conditions, and excessive strain was placed on pumps that are not practical for use in such highly corrosive applications."

"This is one of the reasons why we urge our customers to do a proper assessment of the operating environment and ensure that the pump selected is capable of dealing with conditions," he continues.

Marsh stresses that a standard submersible drainage and sludge pump, even with a protective coating, is not able to withstand the levels of acidity and abrasion and will fail within a matter of weeks or even days.

"As the official sub-Saharan distributor for Grindex pumps, we are able to offer Grindex stainless steel pumps which are engineered to operate reliably in contaminated water and handle corrosive slurries with abrasive solids."

A major advantage that the Grindex Inox range of pumps offers is that that these are essentially plug and play units and easy to install and operate. The pumps are manufactured from acid-proof stainless steel and operate reliably in pH levels ranging from 2 to 10. This makes the pumps more than suitable for use in mining applications on the Copperbelt.

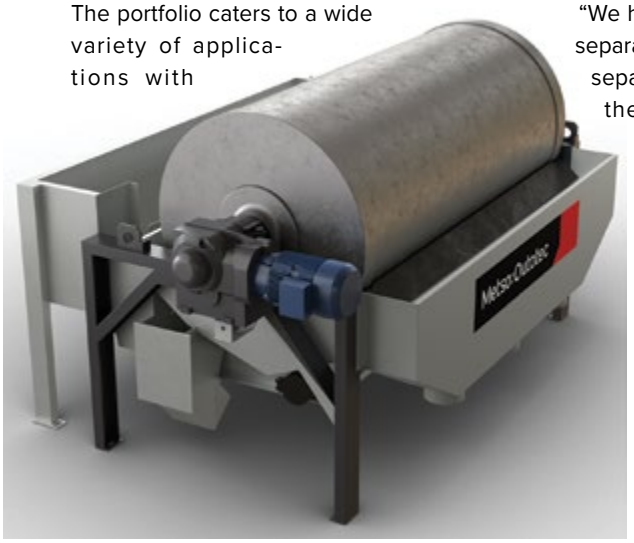
"What sets the Grindex Inox range apart from other similar stainless steel pumps is that it incorporates SMART motor protection," Marsh explains. "This facilitates pump operation without requiring an external control panel and prevents damage being caused in the event of a power outage."

The cast acid-proof stainless steel impeller ensures pumping capacities in corrosive slurries, while the diffusers in the drainage pumps are rubber-lined and adjustable to maintain optimum pumping performance. In the sludge pumps, the rubber-lined pump housing is highly abrasive resistant and oil-resistant for longer life.

Included in the Grindex pumps recently installed and operating successfully on the Zambian and DRC Copperbelt are dewatering, drainage and sludge pumps ranging from 2 kW all the way up to 8 kW units as well as 85 kW Grindex N/H stainless steel Inox pumps. ■

Metso Outotec introduces versatile portfolio of magnetic separators

Metso Outotec is introducing its versatile magnetic separators portfolio consisting of wet and dry low intensity magnetic separators and high gradient magnetic separators. The portfolio caters to a wide variety of applications with the separators' flexible modular design, enabling superior separation selectivity and improved recovery of fine and ultra-fine particles.



The low intensity magnetic separators, which are designed to recover magnetic material from non-magnetic matter, are part of Metso Outotec's Planet Positive product offering.

"We have a long history in magnetic separation, and we delivered the first separator back in the 1890s. Since then, we have developed and delivered thousands of magnetic separators worldwide. We are continuously developing our products securing our position at the forefront of the magnetic separation industry," says Jan Jirestig, product manager, Magnetic Separators, Metso Outotec.

Metso Outotec high gradient magnetic separators (HGMS) are designed to recover weakly magnetic material from non-magnetic matter and can be used for many applications including the processing of iron ores, rare earths and other weakly magnetic minerals, which are not normally treatable by ordinary magnetic separators.

The low intensity magnetic separators (LIMS), which are designed to recover magnetic material from non-magnetic matter, are part of Metso Outotec's Planet Positive product offering. The separators use physical separation and don't require chemicals in the process. The low intensity magnetic separators feature modular design with several frames and process tank designs and use a common magnetic drum for ease of selection of the best machine for each individual application.

Metso Outotec's offering also includes the SLon Vertically Pulsating High-Gradient Magnetic Separator, which effectively processes fine, weakly-magnetic minerals. The units are wet, high-intensity magnetic separators that use a combination of magnetic force, pulsating fluid, and gravity to process minerals. ■

Booyco Electronics broadens **footprint** with strategic collaborations

South Africa-based proximity detection specialist Booyco Electronics is broadening its global reach through collaboration agreements with selected technology integrators.

Solutions from Booyco Electronics, a pioneering force in proximity detection systems (PDS) and collision avoidance, have been attracting increasing international interest, says CEO Anton Lourens. The company has been applying and improving its technology mainly in the mining sector for the past 15 years.

"With South Africa's mining industry in many respects leading the way in deploying collision avoidance systems, Booyco Electronics has developed world class solutions that can add value to global markets," says Lourens. "Having explored the best ways of servicing our international customers, we have chosen a number of strategic collaborations with technology integrators across the world."

The company now has collaborations with several technology specialists worldwide including Insucam, Ramjack, RCT and Tecwise. These partners understand the safety and other benefits of Booyco Electronics' PDS solutions, and bring their insights into the local conditions in which this equipment can be applied.

"We believe that these technology partners – who understand our products and solutions – create the optimal channel to customers in regions where Booyco Electronics does not have its own infrastructure," Lourens says. "These companies understand their customers' specific needs, and can apply our solutions in the most effective manner."

He highlights that collaborative partners are expected to have high levels of expertise in related fields, a solid technical capacity to support customers, and the necessary insight and experience to implement value-adding solutions.

"Their role in applying our PDS solutions would include the full scoping of customer needs, close engagement to clarify options, training of customers' operators, installation of equipment and general project execution," said Lourens. "This gives the customer confidence that our solutions will be properly leveraged to satisfy requirements."

"We appreciate the fact that new technologies like ours are easier to introduce through an existing relationship – for instance, where a mine has already been working successfully with a trusted technology integrator," he says.

"Our approach is therefore to build on those links where confidence has already been built, based particularly on the delivery of innovative solutions."

The company's partners are therefore best placed to facilitate Booyco Electronics' access into markets not yet familiar with PDS.

The Booyco CXS allows end users to achieve Level 9 compliance.

ABB Ability eMine to fast-track transition to all-electric mines

ABB has launched ABB Ability eMine, a portfolio of solutions that will help accelerate the move towards a zero-carbon mine. ABB also unveiled the piloting of the ground-breaking ABB Ability eMine FastCharge, said to be the world's fastest and most powerful charging system, designed to interface with all makes of electric mining haul trucks.

eMine comprises a portfolio of electrification technologies which makes the all-electric mine possible from mine to port and is integrated with digital applications and services to monitor and optimise energy usage. It can electrify any mining equipment across hoisting, grinding, hauling and material handling. From 2022, it will include new ABB Ability eMine FastCharge which provides high-power electric charging for haul trucks and is currently in pilot phase. It also incorporates the ABB Ability eMine Trolley System which can reduce diesel consumption by up to 90%, significantly lowering energy costs and environmental impact.

ABB Ability eMine is integrated with digital applications and services to monitor and optimise energy usage.

"The global mining industry is undergoing one of the most significant and important transformations of our generation – and that is to become zero-carbon," says Max Luedtke, global head of Mining at ABB. "ABB Ability eMine is an exciting milestone to help convert existing mining operations from fossil fuel energy to all-electric. Mines can become ever more energy efficient with vastly reduced levels of CO_2 emissions, while at the same time staying competitive and ensuring high productivity."

"We are celebrating 130 years in the mining industry and decades in the electrification of mining equipment," adds Mehrzad Ashnagaran, global product line manager, Electrification and Composite Plant. "Today we are extending our engineering capabilities and investment to electric transport, to bring new solutions to meet the growing demand of our customers. Besides the environmental benefits, fuel price volatility, making electricity more cost competitive, and legislation are driving the move to electric-powered mines. ABB not only

BME wins good mining practice award in Indonesia

BME Indonesia, part of South African blasting leader BME and the JSE-listed Omnia Group, has received a good mining practice award as the best performer in the blasting services category by the Indonesian government.

The award was made at a special ceremony on 29 September in Jakarta, where it was accepted by BME's business manager Indonesia, Agusman Agusman. The company earned the accolade on the strength of its performance on its full-service blasting contract for a coal mining customer in East Kalimantan. BME Indonesia has been active on the contract for the past two years.

"This exciting award means a lot to us, especially since we began working as blasting contractors in this market only a couple of years ago," says Agusman. BME Indonesia has been supplying explosive products and accessories into Indonesia for over a decade. Its holding company BME is a leading player in blasting services and products in Africa, with a global presence including Australia, Canada and the United States.

"Government's recognition of our high standards of operation is an important sign for the local mining industry," he says.

"This demonstrates the quality of our processes and performance, taking us another step forward in raising our competitiveness in this market."

He notes that the award criteria considered a range of factors related to how a company managed its operation. In addition to its safety focus, it also assessed each company's staff competence, vendor management, innovation and level of local content.

"BME Indonesia's safety record on this contract, where we employ over 45 people, has been exemplary," he says. "We have managed to achieve a zero recordable case rate (RCR), with no lost-time incidents (LTIs) and no environmental incidents."

This safety performance can be attributed to the disciplined application of BME's Safety for Life policies, according to Ramesh Dhoorgapersadh, BME GM for Safety, Health, Environment, Risk and Quality (SHERQ).

"The award shows that, as a multinational company that is well recognised in Africa, BME has the capacity to implement its good blasting practice wherever it operates," says Dhoorgapersadh.

"It should also be remembered that the emulsion manufacturing plant at the mine site was commissioned at the start of the COVID-19 pandemic." ■

under-stands these requirements, but we can also equip the industry to meet them."

eMine FastCharge can serve as a cornerstone of the transition to fully electrified mines across the industry. This flexible and fully automated solution is being designed for the harshest environments, can be installed anywhere and can charge any electric truck without human intervention at up to 600 kW, the highest power available on today's market to minimize the downtime of mobile assets. Charging time will depend on the battery capacity onboard the haul truck and the operational profile, however in many instances a suitable state of charge could be reached within 15 minutes. With eMine, ABB is extending its capabilities to the electrification of mining trucks and technologies for the full hauling process.

eMine provides integral design planning and thinking to maximise the value of electrification, helping to design the hauling process in the most optimized way with electrical solutions that match mine constraints and help meet production targets. ABB helps mine operators map their journey towards an all-electric mine from phasing out diesel to embedding a new mindset and new team skills. By fully integrating electrification and digital systems from the mine to the port, eMine further reduces overall costs and improves mine performance while significantly lowering environmental impact.

ABB draws on 130 years of experience in the mining industry and is a pioneer in the integration of electrification, automation and digitalisation in mining. eMine is underpinned by ABB Ability MineOptimize, a platform that optimises engineering in the design of the plant or mine and facilitate the transition to the digital and CO_2 free mine of the future. ■

Safe, efficient mines are sustainable mines

Leading global mining-tech company IMDEX is uniquely positioned to play a leading role in achieving a more sustainable community by developing products that make mining safer and more efficient, says CEO Paul House.

Releasing the company's first Sustainability Report, House said that sustainability objectives and ESG principles should be driven by strong economic outcomes.

"To be truly sustainable, they must not be simply additional cost burdens to any organisation or industry," he said.

IMDEX is present on 70% of mineral drilling projects globally and has sales in more than 100 countries.

"The responsbility to prosecute mining activities in a safe and ethical manner has never been higher," House said. "Our community is increasing its demand for all industries to accept a greater burden of responsibility for its engagement in the environment and the community.

"Great opportunities exist for us to improve our quality of life, now and into the future, through the development of products and services that have a less negative impact.

"The levers that enable that progression are found in successfully extracting critical metals from the earth.

"As a mining-tech company, our opportunity, indeed our obligation, is to leverage the strength of our R&D capabilities, our geoscience expertise and our global teams to solve key mining industry challenges.

"Ultimately, our goal is not simply to make a better mine, it is to make all mining better."

As examples, IMDEX solids removal units reduce water consumption by up to 70% and limit environmental impact on site and its mining technologies enable significant productivity, cost and safety benefits, targeting a 15% to 20% gain in mine to mill efficiency.

House said IMDEX BLASTDOGTM – under development with the aim of providing greater orebody knowledge prior to blasting – is an example of R&D solving mining industry problems and achieving greater efficiencies.

"A great deal of inefficiency exists in mining operations — by some estimates up to 40%," he said. "This is not wilful, it is a direct result of lack of orebody knowledge. As a consequence, there is inefficient use of explosives and energy and ultimately poor fragmentation of the orebody." ■

IMDEX BLASTDOG – under development with the aim of providing greater orebody knowledge prior to blasting – is an example of R&D solving mining industry problems and achieving greater efficiencies.

Arjen de Bruin, MD at OIM Consulting.

Modernisation means more than simple mechanisation – it means people

The latest figures from Statistics South Africa have revealed that in July 2021, there was a 10,3% year on year increase in mining production, which it has attributed to higher commodity prices and the recovery in the global economy. And while the sector appears to be on an upward trajectory after a crippling hard lockdown last year, the mining industry's adoption of mechanisation and digitisation has also been attributed as having played a role in this renaissance. By *Arjen de Bruin*, MD at OIM Consulting.

There is no denying that the mining industry is a significant contributor to South Africa's economy, with local mineral reserves boasting an estimated value of around US$2,5-trillion. It also plays a crucial role in creating employment within the country's communities; according to Chamber of Mines (2014), the industry directly employs about 462 000 people, while another Chamber of Mines report estimated that for every mine worker, there were 10 other people who were financially dependent on them. Mining is big business, and a noteworthy socio-economic contributor.

Modernising the sector

Mechanisation, which is essentially the use of machinery in mining in order to 'modernise' the sector, has been applauded for creating a safer working environment and boosting output.

And certainly there is truth in this. A *South African Journal of Economic and Management Sciences* research paper, published in 2018, aimed to explore the socio-economic effects of mechanising and/or modernising hard rock mines.

The paper noted that there "is a general perception that the current conventional method of hard rock mining in RSA is unsustainable... due to rising labour costs, weak metal prices, occupational health and safety concerns and low productivity levels," stating that "modernisation of mines in the form of mechanisation has the potential to improve the competitiveness, health and safety and profitability issues within the mining industry."

The concern which has been raised is that mechanisation will displace a significant portion of the labour force – which is something the Unions have taken issue with. However, the paper ultimately concluded that overall, there was support for mechanisation in mines among the various stakeholders, stating that: "Interviewees were also unanimous in identifying the social-economic benefits of mechanisation; these were in line with those identified in the literature, namely benefits in occupational health and safety issues, efficiency, costs and improved life of mines.

"Furthermore, participants viewed mechanisation and modernisation as an opportunity to reskill themselves and to improve operations and quality of life. More importantly, stakeholders seemed to share a common vision and interest of the future; as such, they were able to see beyond their constituencies and interests."

This is no doubt a positive, and shows a willingness to embrace the fourth industrial revolution. However, I believe that mechanisation and modernisation are two very different things, and that in order to reap the full benefits of modernisation, you need to start not with the tech – but with the people.

Ongoing inefficiency

In my line of work, we engage with a large number of mines. All of them are mechanised, yet even with all this machinery and automation, our clients complain of ongoing inefficiency. Anecdotal feedback suggests that while financial targets are being achieved thanks to the commodity boom, operational targets are not met anywhere near as consistently. And in many cases, these targets are set up to reflect the current state of operations, and could be exponentially improved should the lingering inefficiencies be resolved.

Sustainable, holistic modernisation means that organisational and cultural hurdles are addressed and overcome. The research paper highlights that "the framework for mechanising mines explicitly states the importance of consulting different stakeholders. However, there seems to be a perception that companies who own internal change management programmes cover these socio-economic issues."

It also concedes that this is not a uniquely local problem: "South African mining companies are also not an exception in being slow to embrace the human-centred approach to modernisation...The mining industry around the world generally neglects the socio-economic effects..."

As specialist consultants within the mining arena, we have found that even when change management programmes are in place, the focus is on the implementation of the technology, not on breeding a healthy organisational culture.

Align the organisation

To effectively 'modernise' you need to align the organisation to the mechanisation strategy. New roles need to be defined with responsibilities. Scorecards need to be created, providing a clear understanding of deliverables and accountability. ■

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