CROWN PUBLICATIONS

MODERN MINING

August 2021 | Vol 17 No 8

For people who are serious about mining

IN THIS ISSUE...

McCloskey INTERNATIONAL

FIELD TESTED
WORLDWIDE

Kemach Equipment offers a range of McCloskey Crushers, Screens, Stackers and Washing Plants to suit your requirements.

- Robust and reliable mobile crushers for the materials processing industry. The high performance range of jaw, impact, and cone crushers combine productivity with outstanding durability to achieve the most efficient levels of product reduction across all crushing applications.
- Mobile Screeners are high capacity, heavy duty, versatile machines built based on the industry leading "High Energy" screenbox. With the largest screening areas in their class, the S-Series and R-Series screeners are designed to give customers high output and durability in the most demanding conditions, and deliver high production across industries.
- Stacking Conveyors and Feeders provide material stockpiling solutions that maximize the efficiency of mobile screening and crushing plants. Tracked or wheeled, McCloskey conveyors deliver high stockpile capacity and less downtime across every application.

Contact your nearest branch today ***www.kemach.co.za***

KEMACH EQUIPMENT

JOHANNESBURG +27 (0) 11 826 6710
MIDDELBURG +27 (0) 13 244 1839
PRETORIA +27 (0) 12 548 2956
BLOEMFONTEIN +27 (0) 51 432 3978
KWA ZULU-NATAL +27 (0) 31 700 8278
RICHARDS BAY +27 (0) 87 357 8985
CAPE TOWN +27 (0) 21 949 7442
GEORGE +27 (0) 44 878 0366
PORT ELIZABETH +27 (0) 41 453 1819
EAST LONDON +27 (0) 43 732 190

CONTENTS

ARTICLES

COVER

GRAPHITE

RARE EARTHS

WATER TREATMENT

WOMEN IN MINING

MINING NEWS

SUPPLY CHAIN NEWS

EXPERT VIEW

ON THE COVER

Astron Energy identifies several global trends in mining and examines how they are playing out on the local stage.
See story on page 10.

COMMENT

It's time to get the demographics right

Munesu Shoko

A particular challenge for the mining sector is the low level of female participation at all levels of the industry. Estimates suggest that women comprise only 10% of the global mining workforce. Figures from the Minerals Council South Africa show that women represented 12% of the total mining workforce in the country in 2020.

Historical concerns around work conditions and the competitiveness of the mining sector have been complemented by a growing number of other issues. Today, an overarching goal is to find ways in which the mining sector can promote better women representation. Efforts by mining companies to employ more women have stalled, leaving the industry as one of the world's most male-dominated professions.

Mining companies are becoming increasingly aware of both the business and moral imperative of enhancing the representation of women across all levels and are attempting to increase the numbers of women through various initiatives. While there has been improvement in business in general, the mining industry still struggles to attract and retain women at all levels of employment. Research has shown that once employed, on-the-job challenges at mining operations lead to women leaving mining roles.

As you will see in this issue of *Modern Mining*, we cast the spotlight on the plight of women in the industry. Despite the challenges, it is encouraging to see that efforts are being made to address these issues. On August 19, 2021, the Minerals Council South Africa marked the second National Day of Women in Mining, reporting back on progress made in the year since the initiative was first launched, on August 21 last year.

The Minerals Council understands the dire need for the industry to get the demographics right as far as women representation is concerned. Minerals Council CEO, Roger Baxter, believes that the future of mining in South Africa and the world at large is under threat if industry stakeholders don't get this right. While there is commitment at executive level to increase women representation in the industry, this commitment must be translated into action.

Creating meaningful and measurable metrics for social change is notoriously difficult and tracking progress on gender issues is no different. However, even the most basic metrics on the representation of women at various levels within a company have the potential to create the necessary conversations and highlight the need for change. Setting targets related to gender diversity is something that most companies have shied away from, although this is starting to change.

Companies that have succeeded in their quest to create inclusive workplaces have started by putting in place strong company-wide gender equity policies, and reviewing other existing policies to identify any risk of creating bias against women. They have also made a firm commitment to gender equity in relation to wages and benefits.

In my recent conversation with a female executive from a platinum producer, she noted that diversity and inclusivity in the mining industry need to start with seemingly little things that make a huge difference. For example, female mining workers have for a long time called for the provision of gender-appropriate personal protective equipment (PPE). They have also called on mining companies to provide appropriate health and sanitation facilities at mine sites. It is also important that mining companies enhance awareness of forms of harassment, discrimination and violence through codes of conduct and training.

Despite the long road ahead, it is encouraging to see that efforts are being made to promote the employment and retention of women in the mining industry. With more women entering the sector, companies are starting to realise the benefits of having more women in their workforce.

Women have successfully proven that they are as competent as their male peers in delivering the work. The participation of women in business has been shown to influence the bottom line of companies positively and to contribute to enhanced sustainability. There have been many studies demonstrating why it makes good business sense to have a diverse board, and in some countries, legislation has ensured this takes place.

As the pace of change in the mining industry accelerates, a paradigm shift is emerging. As noted by research and consultancy company Wood Mackenzie, the adoption of technology could serve as a positive catalyst for diversity. The mining industry has a long history built on hard labour, grit and perseverance, reinforcing a system that disproportionately reveres masculine identity. This identity is waning in today's rapidly changing world where technology is fast altering the landscape. The new focus on digital transformation and automation could at last help the industry to move the dial on its gender diversity targets. ■

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
Circulation: Brenda Grossmann
Published monthly by: Crown Publications (Pty) Ltd
P O Box 140, Bedfordview, 2008
Tel: (+27 11) 622-4770 Fax: (+27 11) 615-6108
e-mail: mining@crown.co.za www.modernminingmagazine.co.za

Printed by:
Tandym Print

Average circulation
April-June 9 665

Publisher of the Year 2018
(Trade Publications)

HIGH PERFORMANCE, LOW EMISSIONS* WITH SHELL HELIX ULTRA

INTRODUCING OUR FIRST CARBON NEUTRAL OIL – OFFERING THE SAME, HIGH PERFORMANCE TECHNOLOGY BUT WITH LOWER EMISSIONS AND BETTER FUEL ECONOMY IN ANY CAR.

CARBON NEUTRAL**

WHY SHOULD YOU CHOOSE SHELL HELIX ULTRA CARBON NEUTRAL?

- Made from a 99.5% pure base oil by Shell Pureplus Technology
- 60% lower engine surface friction compared to other fully synthetic oils******
- Stronger for longer lasting engine performance***
- Anti-wear shield designed for ultimate engine protection
- Up to 3% fuel savings****
- 'Carbon Neutral impact' across its entire lifecycle from production to disposal of used oil and packaging
- Protects in extreme temperatures from -40°C to 1000°C*****
- Helps save up to 2L fuel for every full tank

DESIGNED FOR ULTIMATE ENGINE PERFORMANCE

NOW CARBON NEUTRAL THROUGH ENERGY EFFICIENT MANUFACTURING, SUSTAINABLE PACKAGING AND NATURE-BASED CARBON CREDITS.

AVAILABLE IN THE FOLLOWING VISCOSITY GRADES: HELIX ULTRA 10W-60, HELIX ULTRA 5W-30, HELIX ULTRA 5W-40 AND HELIX ULTRA 0W40.

DRIVE ON

* Based on CO_2 equivalent avoided per lt fuel saved, not combusted in the engine. Higher fuel economy based on ACEA M111 fuel economy results compared with the industry reference oil.
** The CO_2e emissions of the lifecycle of this product have been offset with verified Nature Based Carbon Credits. To find out more please go to https://www.shell.com/motorist/oils-lubricants/helix-for-cars/our-carbon-neutral-aspiration.html

AngloGold Ashanti advances reinvestment projects

AngloGold Ashanti delivered first-half headline earnings of US$363-million amid a challenging first half of the year, with performance affected by the ongoing COVID-19 pandemic, increased costs, lower realised grades across certain operations and the voluntary suspension of underground mining activities at the Obuasi Mine following a fatal accident on May 18, 2021.

Headline earnings of US$363-million, or 87 US cents per share, in the first six months of 2021, compared to US$404-million, or 97 US cents per share, in the first half of 2020. Adjusted net debt declined by 41% year-on-year to US$850-million at June 30, 2021, from US$1,431-billion at June 30, 2020. The company has declared a dividend of 87 ZAR cents per share (approximately 6 US cents per share) for the six months ended June 30, 2021.

Production for the first six months of 2021 was 1 200 Moz at a total cash cost of US$1 003/oz, compared to 1 323 Moz at US$770/ oz from continuing operations for the first six months of 2020. All-in sustaining costs (AISC) were US$1 333/oz for the first six months of 2021, compared to US$1 002/oz from continuing operations for the corresponding period last year, mainly reflecting higher cash costs, higher sustaining capital expenditure in line with the tailings compliance programme and the planned reinvestment objectives in the portfolio, COVID-19 impacts, stockpile movements and lower gold sold. Production for the half year was impacted by an estimated 42 000 oz due to COVID-19.

Mining activities at Obuasi will remain suspended pending the conclusion of a third-party review of the mining and ground management plans.

"AngloGold Ashanti remains focused on its strategy to create long-term value, while maintaining a strong balance sheet and mitigating any financial or operating risks to the business," says interim CEO Christine Ramon. "Our reinvestment projects remain on track to improve operating flexibility and access to higher grades. We are also pursuing operating and capital efficiencies over the remainder of the year."

AngloGold Ashanti's strategy of improving operating flexibility through investment in ore reserve development and ore reserve expansion at sites with high geological potential remains a key priority and is reflected by the 33% year-on-year increase in total capital expenditure to US$461-million (including equity accounted joint ventures) in the first half of 2021, compared to US$346-million from continuing operations in the first half of 2020.

This year and next remain transitional ones for the company, with the higher volumes of waste stripping and underground development accompanied by lower grades and the movements of stockpiles. The company expects the mining of lower grades and stockpile utilisation to be transitory in nature as the reinvestment programme provides improved flexibility and access to higher-grades, and as vaccination drives progress across our jurisdictions most affected by COVID-19. Notwithstanding significant pressure on costs related to the tailing storage facilities (TSF) transition in Brazil, this investment is also transitory given the upcoming legal deadline.

Mining activities at Obuasi will remain suspended pending the conclusion of a third-party review of the mining and ground management plans. On September 1, 2021, Alberto Calderon will assume the role of CEO of the company and Christine Ramon will return to her role as the company's chief financial officer. ■

Lucara recovers 393 carat top white gem diamond

Lucara Diamond Corp has announced the recovery of a 393,5-carat top white Type IIa gem quality diamond from its wholly-owned Karowe Diamond Mine located in Botswana. The diamond was recovered from direct milling of ore sourced from the M/PK(S) unit of the South Lobe.

During the same production month a 156,2 carat top white gem quality diamond was also recovered from processing of M/PK(S) material. The 393-carat diamond is the seventh diamond greater than 300 carats to be recovered at Karowe year to date and the third gem quality +300 carat produced from the M/PK(S) unit in 2021, along with the 341-carat (January 14, 2021) and 378-carat (January 26, 2021) top white gems recovered in January this year.

CEO Eira Thomas comments: "Lucara is pleased to announce the recovery of the 393-carat Type IIa white from the M/PK(S) unit of the South Lobe, the third +300 carat white gem from the M/PK(S) in 2021. The recent recovery continues to demonstrate the strong and consistent resource performance of the South Lobe. The 393-carat and 156-carat diamonds add to the collection of significant diamond recoveries in 2021, as Lucara looks to ramp up construction activities for the proposed underground expansion at Karowe." ■

Neal Froneman awarded SAIMM's most prestigious prize

Known for his skills as an ace dealmaker, mining giant Neal Froneman has been honoured with the 2021 Brigadier Stokes award by the Southern African Institute of Mining and Metallurgy (SAIMM), considered the highest distinction to be bestowed by the South African mining and metallurgical sector.

Having taken over duties as executive director and CEO on January 1, 2013, Froneman has spent the past eight years transforming Sibanye-Stillwater from a 1,5 Moz South Africa-based gold producer into a leading precious metals miner with an international operating footprint, ranking among the world's top three PGM producers.

Approaching his 38th year in the South African mining sector, Froneman said he felt incredibly humbled to be receiving this award. "When I look at the list of past recipients comprising eminent individuals who have left an indelible mark on the South African mining industry, I feel deeply humbled to be joining such august company."

The Brigadier Stokes Memorial Award was instituted in 1980 in commemoration of the outstanding contribution that Brigadier R.S.G. Stokes made to the South African mining and metallurgical industries over many years.

"'The Brig', as he was commonly known, was a remarkable and resilient man with a superior intellect, inexhaustible energy and an insatiable curiosity, who travelled widely and had many friends," said SAIMM member Professor Alex du Plessis, who read the citation at the annual general meeting. "It is indeed, therefore, fitting that the award is made this year to Neal

Neal Froneman, CEO of Sibanye-Stillwater.

John Froneman as he, in addition to displaying these attributes, has brought a notably entrepreneurial and technically innovative approach to mining in South Africa."

Froneman received the award during an online annual general meeting of the institute on August 12, joining the likes of mining veterans and influencers such as Harry Oppenheimer, African Rainbow Minerals founder and chairperson Patrice Motsepe, former AngloGold Ashanti CEO Bobby Godsell, former Exxaro Resources CEO Sipho Nkosi and Minerals Council South Africa CEO Roger Baxter, among others.

"I was reminded of Brigadier Stokes' simple and succinct ABCs of enduring relevance for respectful engagement: and, that is to be articulate, brief and courteous," added Froneman. "I trust that I have conformed with Brigadier Stokes' mantra in accepting the award instituted to honour his legacy in shaping the South African mining industry." ■

Sale of Bibiani Gold Mine completed

Resolute Mining Limited (ASX/LSE:RSG) has confirmed the completion of the sale of the Bibiani Gold Mine (Bibiani) in Ghana to Asante Gold Corporation (Asante) for total cash consideration of US$90-million.

Resolute has received the initial US$30-million cash payment from Asante with the balance of consideration payable in two equal instalments of US$30-million on or before six and 12 months following completion.

The sale of Bibiani was undertaken as part of Resolute's strategic focus on its core operating assets and to strengthen the balance sheet. The initial cash receipt of US$30-million will be applied to the voluntary early repayment of debt. No material tax implications are expected following the completion of the transaction. ■

Kamoa Copper's Phase 1 concentrator plant reaches commercial production

Kamoa Copper's Phase 1, 3,8-million tonnes per annum (Mtpa) concentrator plant reached commercial production on July 1, 2021 after achieving a milling rate in excess of 80% of design capacity and recoveries close to 70% for a continuous, seven-day period. Copper production has steadily increased since first production began at the end of May. Towards the end of July, copper production exceeded 500 tonnes per day, nearing the Phase 1 steady-state design capacity of an estimated 550 t per day, equivalent to 200 000 t per year.

Importantly, copper recoveries have increased from an average of 70% in June to 81% in July. Approaching the end of July, the concentrator averaged copper recoveries close to 82%, with operations progressively increasing towards Phase 1 steady-state design copper recoveries of approximately 86%.

Additionally, the underground mining crews at Kamoa have achieved a new record for metres of advancement in July, with 3 876 m, breaking the previous record of 3,625 m achieved in April. The progress made in July brings the total underground development to almost 52,8 km, which is more than 18,1 km ahead of schedule.

A convoy of trucks loaded with Kamoa Copper's concentrate departing the Kamoa-Kakula Mine on its way to the port of Durban in South Africa.

Kamoa Copper's CEO, Mark Farren is pleased with the performance at the mining complex and says: "Our mining and concentrator teams have delivered yet another strong performance, and we continue to add to the surface stockpiles even as Phase 1 copper production ramps up. We intend to maintain these ore production levels over the next months as we prepare for the commissioning of the Phase 2 concentrator plant, and possible strategic stockpiling for Phase 3 expansion."

To date, approximately 32 700 t of copper concentrate have been loaded at the mine site for delivery to either the Lualaba Copper Smelter near Kolwezi, or to international markets.

In July, a total of 414 000 t grading 5,16% copper was extracted from the Kakula Mine, including 85 000 t grading 7,7% copper from the mine's high-grade centre, and 47 000 t grading 4,13% copper from the Kansoko Mine. Kamoa's pre-production surface stockpiles currently contain approximately 3,54-million t of medium-grade and high-grade ore with an average of 4,77% copper.

Looking forward, Kamoa is pleased to report that the Phase 2 concentrator of the expansion to 7,6 Mtpa is more than 35% complete and well on track to begin operations in Q3 2022. ■

Chillerton advances Zambian copper-cobalt projects

Karan Rathi, CEO of Chillerton.

Chillerton Ltd, an emerging copper and cobalt development company, has become one of the largest licence holders in the Zambian Copperbelt following the award of a further three large scale mining (LSM) licences in July 2021. The company's licences now cover in excess of 20 000 ha and are located adjacent to existing producing copper mines. The location benefits from good access to existing infrastructure.

Chillerton has also signed an ore offtake and royalty agreement with Rudra Copper, a local plant operator in the Copperbelt which will allow the company to sell up to 3,5-million tonnes of tailings ore across five years, commencing in Q2 2022.

The transactions will enable significant growth for Chillerton, allowing it to focus on the development of the feasibility study on the Kakosa North and South ore bodies as well as commencing regional exploration programmes on its new and prospective licences.

Karan Rathi, CEO of Chillerton, says: "I am pleased with the tremendous progress the group has made. These deals are not just a recognition of our history and experience in Zambia, but underline our track record of making a difference.

"With copper set to drive a future of electric vehicles, the consumption of the mineral is expected to jump tenfold by 2050.

"Chillerton's goal is to create a critical metal powerhouse that not only generates growth and job opportunities in Zambia, but makes a real social impact through forging strong local partnerships and investment in the communities in which it operates."

Chillerton's ore offtake and royalty agreement with Rudra Copper will see the development of a new purpose built copper leach and SX-EW plant at the Kakosa site. The plant will initially focus on processing tailings and oxide ores producing copper cathode. The plant is expected to be operational during Q2 2022 with an initial capacity of about 35 000 t of ore per month. ■

Coal still a lifeline for SA as transition begins

While the global focus on environmental, social and governance (ESG) issues looks to phase out coal as an energy resource, the prospects for South African coal production remain strong for coming decades.

Following the 3rd Coal Industry Day, held online in July, SRK Consulting principal coal geologist Lesley Jeffrey says coal remains a key contributor to the country's economy – both in terms of energy production and mineral export revenues. Coal is only recently overtaken by platinum group metals as the country's leading commodity by sales, but it remains the most significant component of the country's mining in terms of value added – accounting for 25%.

"Strong international coal prices of around US$130 per tonne have raised the attractiveness of exports, with most of South Africa's export coal going to Pakistan," says Jeffrey. "China is also opening up opportunities for imports from SA following its trade wrangling with Australia, previously an important coal source for them."

Although there has been less coal demand from India due to a surge in local production there, South African coal still remains better suited to India's production of sponge iron, she notes. This suggests that the recent dip in exports to that country may only be temporary; the added advantage is that this market takes relatively low-grade product from South Africa. Coal Industry Day presenter Xavier Prévost confirmed that coal remained the largest single source of power generation globally. Prévost also said the coal sector expected a strong recovery in 2021 – a reminder of coal's central role in fuelling some of the world's largest economies.

Jeffrey highlighted that coal-fired power stations are still being built on a large scale in developing regions like south-east Asia – as this provides an affordable route to powering broader economic development. While South Africa has mined out much of its traditional export quality coal, there remained a long horizon of demand abroad for our lower grade coal.

"Unreliable rail services to the Richards Bay Coal Terminal continue to constrain SA's coal exports, and this has been exacerbated by a recent hacking event and the spate of looting in parts of the country," she says. The export market is vital to sustain, she emphasises, as it creates the economic balance that keeps coal producers profitable while they continue to supply Eskom at low margins. Without the higher-value exports, local electricity prices would likely have to rise even faster to meet the full cost of mining.

Lesley Jeffrey, principal geologist (coal) at SRK Consulting South Africa.

Global bauxite production to grow by 3,8% in 2021

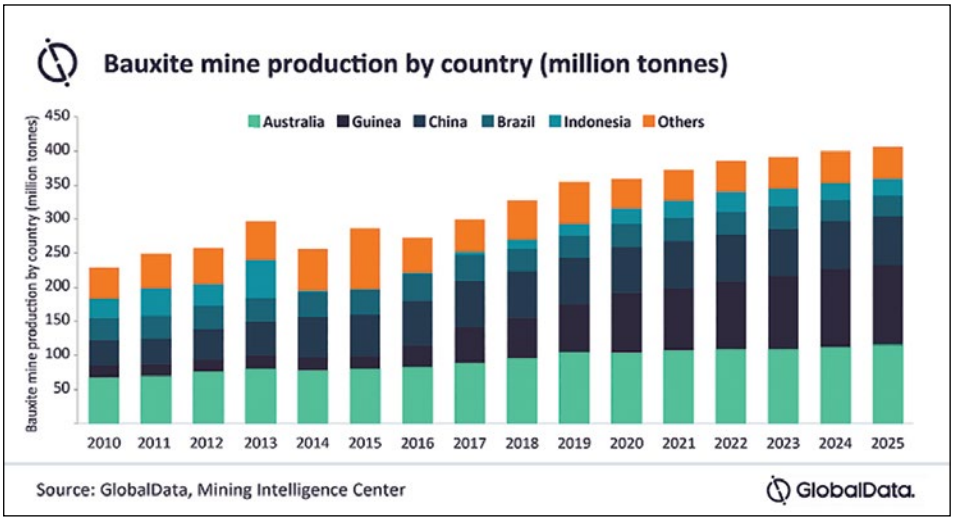
After rising by an estimated 1,2% in 2020 to 359,2 Mt, global bauxite production is forecast by GlobalData to increase by 3,8% in 2021 to reach 372,8 Mt. The leading data and analytics company notes that increased output from mines in Australia (+4,1%) and Guinea (+3,6%), as well as production from mines elsewhere returning to their pre-COVID levels, will be the key contributors.

Vinneth Bajaj, associate project manager at GlobalData, comments: "Over the forecast period (2021 – 2025), global bauxite production is expected to grow at a compound annual growth rate (CAGR) of 2,2% to reach 406,7 kt by 2025. Australia (+1,6%) and Guinea (+6,5%) will maintain a steady supply growth, supported by a series of upcoming projects. Together, they account for eight of the 17 planned bauxite projects, tracked by GlobalData, which have the potential to commence production by 2025."

In Australia, bauxite production growth will be supported by the recommencement of Metro Mining's Bauxite Hills Mine, where operations were halted due to the wet season. The mine is expected to produce around 4 Mt of bauxite in 2021. Further, the formal commitment of the stage 2 expansion of the mine to a capacity of 6 Mt, which is part of the company's long-term development plan, will be dependent on the global market conditions.

Bajaj continues: "In Guinea, the Boffa mine, which began operations in January 2020, is expected to gradually reach its full capacity during the second half of 2021. The mine is expected to produce up to 9 Mt of bauxite in 2021, compared with 7 Mt in 2020. Earlier in 2021, operations began at the Garafiri project which has over 300 Mt of bauxite reserves. The project has an initial production capacity of 3 Mt, which will be expanded up to 8 Mt."

In late July 2021, China Railway Construction Corporation (CRCC) announced completion of the construction of a railway line from Boffa to Boke, which will now increase the single trip freight volume to 10 kt, up from 5 kt earlier, as part of the first phase of the Boke development project. Phases 2 and 3 include exploitation of bauxite resources in the new mining areas of Santou II and Houda and development of an alumina refinery in the Boke special economic zone. Overall, this will play a crucial role in establishing Guinea as an export nation. ■



Global bauxite production is expected to grow at a compound annual growth rate of 2,2% to reach 406,7 kt by 2025.

DRDGOLD appoints new chairman of the board

Timothy Cumming has been appointed as chairman of DRDGOLD's board of directors.

DRDGOLD Limited (DRDGOLD, JSE, NYSE: DRD) has appointed Timothy Cumming, a non-executive director of the company, as chairman of the board of directors and the nominations committee with effect from December 1, 2021. He is also an independent non-executive director of Sibanye-Stillwater.

Current chairman Geoff Campbell resigned as director and chair of the board on January 26, 2021 with effect from December 1, 2021.

In line with good corporate governance in accordance with the recommendations of the King IV Report on Corporate Governance for South Africa 2016, Edmund Jeneker will remain as the lead independent director of the company.

Timothy (Tim) Cumming was appointed to the DRDGOLD board in July 2020. He is also an independent non-executive director of Sibanye-Stillwater Limited and Nedgroup Investments Limited and serves as non-executive Chairman of Riscura Holdings Limited.

His career spans mining, financial services and consulting. He is the founder of Scatterlinks Proprietary Limited, a South African-based company providing leadership development and advisory services to senior business executives.

Cumming started out as an engineer at the Anglo American Corporation of South Africa Limited working on a number of gold and diamond mines including involvement in the geo-technical design of the Ergo tailings dam. Thereafter he held senior roles in financial services including General Manager at Allan Gray Limited, Head of Investment Research at HSBC Securities (SA), CEO of Old Mutual Asset Managers and MD of various divisions within the Old Mutual Group.

Other involvements include chairmanship of the Mandela Rhodes Foundation's Investment Committee and the Woodside Endowment Trust and membership of the Greenpop advisory board (a social enterprise committed to restoring ecosystems and sustainable development). ■

Thungela reports solid performance in first interim results since listing

Thungela Resources Limited has reported a strong set of interim results for the six months ended 30 June 2021. This follows the successful listing on the Johannesburg Stock Exchange and the London Stock Exchange on June 7, 2021.

July Ndlovu, CEO of Thungela, comments: "I am pleased to report that after one month of operating as an independent business, we are well-positioned to deliver on our targets. Although we are in the early days of independence, we continue to remain focused on running a fatality-free business, delivering productivity and cost improvements. With our strong balance sheet, we believe that we are in a good place.

"Our financial performance is buoyed by the recent recovery of global thermal coal prices and the active steps we have taken to upgrade our portfolio. We experienced firm demand from South Asia including India, Pakistan, Sri Lanka and Vietnam. Thungela's high quality coal is well placed to continue capitalising on significant market demand in this region. Coal prices were supported by supply constraints from South Africa, Colombia and Australia, with the latter still facing an ongoing ban on imports into China."

Regrettably, the company reports that it had a loss of life at its Goedehoop Colliery. "Our condolences go to the family, friends and colleagues of Moeketsi Mabatla. Thungela reaffirms its commitment to achieving a fatality-free business."

Benefitting from higher global thermal coal prices driven by the continued demand from South Asian markets for high quality thermal coal and global supply constraints, Thungela generated operating profit of R990-million and adjusted EBITDA for the six months ended June 30, 2021 close to R1,9-billion, while the statement of financial position showed a strong net cash position of R3-billion.

Thungela delivered earnings per share of 313 cents and headline earnings per share of 305 cents for the reporting period. This includes the impact of two significant once-off adjustments; the restructuring costs and termination benefits of R386-million, as well as the fair value adjustment of R584-million on the derivative relating to the Capital Support Agreement with Anglo American.

July Ndlovu, CEO of Thungela Resources.

The majority of Thungela's coal is exported and its revenue was positively impacted by the benchmark thermal coal price which strengthened by 47% compared to H1 2020, however, the strengthening of the Rand offset some of the gains.

Thungela implemented actions prior to the Demerger which has improved the quality of its portfolio by taking higher cost production out of the business. In particular, the Bokgoni pit of the Khwezela operation was placed on care and maintenance during Q1 of this year.

Fluor achieves first concentrate at Khoemacau

Fluor Corporation (NYSE: FLR) has announced that Khoemacau Copper Mining (Pty) Limited (Khoemacau) recently achieved first copper and silver concentrate production for its Starter Project near Toteng in Botswana.

The project is in the Kalahari Copper Belt and is expected to produce an annual average of 62 000 tonnes of payable copper and 1,9-million ounces of payable silver in concentrate for more than 20 years.

Under the project scope, Fluor provided engineering, procurement and construction management for upgrading the Boseto Processing Plant, a transport corridor and a 40-km water pipeline from the Haka water pump station to Zone 5.

"The transition from construction to operations marks a major historical achievement for Khoemacau and Botswana," says Tony Morgan, president of Fluor's Mining & Metals business. "This modern mining and processing operation is expected to deliver substantial economic benefits to the country."

"We would like to thank the entire Fluor team for their important contribution over the past four years working with us to deliver the project and the production of first concentrate," says Johan Ferreira, CEO of Khoemacau.

The project recently celebrated 6-million continuous hours worked without a lost time injury.

Construction began in October 2018 with more than 1 800 workers on site during peak construction and achieved first concentrate on time and substantially within the original budget.

Boseto processing facility.

Astron Energy unpacks key trends shaping

According to the latest data from the Minerals Council of South Africa, mining contributed R376-billion to GDP, and remains the mainstay of the country's economy. However, the world of mining is changing – in terms of technology, our understanding of its social and environmental impacts, as well as demand for battery metals. Astron Energy identifies several global trends in mining and examines how they are playing out on the local stage.

Safety has always been a key focus area for mining companies, and COVID-19 has only magnified the scope of the issue. Miners are investing in advanced technologies such as augmented and virtual reality, drones, remote vehicles, advanced telematics and wearables, as well as learning to apply advanced analytics to the vast quantities of safety data their operations generate.

A 2017 report by Accenture found that by implementing four digital initiatives – autonomous operations, smart sensors, connected workers and remote operation centres – South African mining companies could improve frontline performance and safety, and unlock R99-billion in cumulative value creation opportunities.

Of course, technological innovations need to be implemented in the context of a company-wide culture of safety. In 2016, following a fatal accident at its Sishen mine, Kumba Iron Ore CEO Themba Mkhwanazi declared that the company would see no more on-the-job fatalities, adopting a six-point approach that shifted focus from accident prevention to eliminating fatalities. Since then, the company has seen a 67% reduction in serious incidents – and not one death.

Right: Safety has always been a key focus area for mining companies.

Below: Mining contributed R376-billion to South Africa's GDP, and remains the mainstay of the country's economy.

Supply chain visibility using technology

The COVID-19 pandemic has exposed the vulnerability of global supply chains to disruption. This has obliged mining companies to increase visibility along their supply chains, looking beyond tier 1 suppliers to trace materials back to their source. Even prior to the pandemic, however, miners – particularly those in the gold and diamond sectors – were facing scrutiny of their supply chains around human rights issues.

In collaboration with other diamond miners, De Beers is developing Tracr, an end-to-end diamond industry traceability platform built around blockchain technology, with the goal of creating a guaranteed record of sustainability and authenticity for its diamonds.

Social impact

Research by Ernst & Young found that a trust deficit with communities is one of the most significant risks faced by mining companies worldwide. Investor activism has risen around 70% since 2014 to more than R450-trillion in value – and is putting pressure on

the local and international mining sector

companies to operate along sound environmental and social governance principles. It's not just about investors, though; McKinsey found that companies operating on these principles registered top-line growth, lower costs, reduced regulatory and legal issues, greater productivity and improved utilisation of investments and assets.

The pandemic has presented an opportunity for major corporations such as mining houses, to step up to the plate and contribute meaningfully to the societies in which they operate. In July 2020, Glencore Alloys South Africa handed over the Bethanie Clinic healthcare facility near Brits to the National Department of Health. Built at a total cost of R30-million, the state-of-the-art clinic now serves a broader community of more than 27 000 people.

Environmental sustainability

The spotlight on mining companies doesn't just shine on social issues; they are increasingly expected to adopt sustainable operating practices. South Africa remains a water-scarce country, and mining is a water-intensive industry. Impala Platinum recently received an A rating in the 2020 CDP Water Disclosure Project, which encourages companies to benchmark their sustainability practices against those of other companies. Impala was recognised for its disclosure, awareness of and management of water-related risk.

Demand for battery metals

Sustainability is also at the heart of surging demand for the minerals required to produce lithium-ion batteries, which are used in electric vehicles (EVs) and photovoltaic (PV) power arrays. The battery metals market was worth around R193-billion in 2020, with a projected compound aggregate growth rate of 2,4% to 2027.

Aside from being world's largest producer of manganese – a critical component of batteries used in EVs – South Africa is the third-largest producer of vanadium. Bushveld Minerals has developed a 1 MW mini-grid at its Vametco mining and processing facility that combines PV power generation with vanadium redox flow battery (VRFB) technology. Bushveld is aiming to use the project to demonstrate the feasibility of such hybrid mini-grids, with a view to creating a lucrative market for locally mined and beneficiated vanadium.

It's a world fraught with change, but some things are constant. As a leading provider of fuels and lubricants to local mining companies, Astron Energy remains committed to supporting this sector of the economy as it navigates the complexities of the swiftly evolving global market.

As a leading supplier of petroleum products to the mining industry, Astron Energy's understanding of how strong, mutually beneficial relations between mines and the communities they operate in positively impacting productivity is reflected in the work done through the group's ESD initiatives. The initiatives not only focus on developing and growing local suppliers that feed the needs of surrounding mines, but also drive a transformative social agenda in a meaningful and sustainable manner.

Astron Energy is the licensee of the Caltex brand. ■

Speak to Astron Energy to see how they can contribute to your business growth: zacommercial@astronenergy.co.za

Key takeaways

- ❒ Safety has always been a key focus area for mining companies, and COVID-19 has only magnified the scope of the issue
- ❒ The COVID-19 pandemic has exposed the vulnerability of global supply chains to disruption. This has obliged mining companies to increase visibility along their supply chains, looking beyond tier 1 suppliers to trace materials back to their source
- ❒ Investor activism has risen around 70% since 2014 to more than R450-trillion in value – and is putting pressure on companies to operate along sound environmental and social governance principles
- ❒ Sustainability is at the heart of surging demand for the minerals required to produce lithium-ion batteries, which are used in electric vehicles and photovoltaic power arrays

Shisir Poddar, CEO of Tirupati.

Game-changing Mozambique

With the electrification of mobility taking off and the world starting to scramble for supplies of critical raw materials, of which graphite is one, Tirupati is acquiring two world-class graphite deposits in Mozambique. The game-changing acquisition, CEO Shisir Poddar tells *Modern Mining*, allows the company to build its arsenal and seize every opportunity to become a global leader in flake graphite. By *Munesu Shoko*.

Demand for graphite has historically been driven by steel and industrial applications. In recent years, demand for natural graphite – the single largest component in lithium-ion batteries – has been accelerated by the fast-tracked expansion of the electric vehicle and renewable energy sectors.

The global graphite market is predicted to witness a 7,4% CAGR between 2020 and 2030 to reach US$36,8-billion in 2030 from US$19-billion in 2019, according to P&S Intelligence. This would be a result of the increasing demand for lithium-ion (Li-ion) batteries, which is itself a result of the rising sales of electric vehicles (EVs). Due to the increasing awareness regarding carbon emissions and the depleting fossil fuel reserves, governments around the world are offering their support for EVs.

The increasing demand for Li-ion batteries is propelling the graphite market because the anode (negative terminal) of such energy storage devices is made of graphite. Compared to lithium, such batteries need up to 20 times more graphite, as more graphite means availability of more current to flow between the two terminals. Li-ion batteries for hybrid electric vehicles require 10 kg, while for a battery electric vehicle (BEV), 70 kg of graphite is required.

To position itself as a serious player in the graphite market, Tirupati Graphite plc, the fully integrated, revenue generating, specialist graphite producer and graphene and advanced materials developer, has entered into a binding acquisition agreement for the purchase of the entire issued share capital of Suni Resources SA.

Suni Resources holds the Mozambique portfolio of graphite assets of ASX-listed Battery Minerals Limited, which includes the construction initiated Montepuez Graphite Project and the advanced feasibility study stage, Balama Central Graphite Project. The acquisition includes all associated assets, infrastructure, permits, licences and intellectual property on both projects for a total consideration of AU$12,5-million (about £6,6-million) in a cash and shares deal.

The acquisition is subject, among other things, to the mandatory shareholder approval of Battery Minerals and approval of the transaction by the Ministry of Mineral Resources and Energy in Mozambique.

Montepuez Project mine plan.

Advancing operations

The acquisition comes at a time when Tirupati continues to advance its operations across its portfolio, including primary mining and processing projects in Madagascar, Sahamamy and Vatomina, and specialty graphite and graphene processing businesses in India.

"Given the fast evolving opportunities as the electrification of mobility takes off, and the world is starting its scramble for supplies of critical raw materials, this is nothing short of a game-changing acquisition for us to build our arsenal and seize every opportunity coming our way in our quest to become a global leader in flake graphite," says Shishir Poddar, CEO of Tirupati Graphite.

"Strategically, the Montepuez and Balama Central deposits are world class and will add 152-million tonnes at 8,5% TGC of resources to our existing

graphite projects for Tirupati

Above: Construction initiated Montepuez Graphite Project.

Left: Drilling at Montepuez Graphite Project in Mozambique.

25-million tonnes of resources in Madagascar, a c.6X addition on in-ground resource tonnage with a c.12X addition on the contained graphite," he adds.

"Every forecast of flake graphite market we have come across rates the market size exceeding 5-million tonnes per annum of new demand by 2030, which dwarfs our current buildout to 84 000 tpa capacity planned at our Madagascan projects. With this acquisition, we take a significant leap forward in our mission to become a leader to meet the global needs for this critical material and contributing to the green aspirations of the world," says Poddar.

"A recent UN report," he adds, "depicts the threat we all face with climate risks and every effort towards its mitigation is an opportunity. We will continue to be pragmatic in our approach to developing additional capacities which are well planned and aligned with the graphite markets."

Utilising the strengths and advantages of these projects, which are highly complementary to Tirupati's resource requirements, will help the company to mitigate the country risks through diversification, while further bolstering the foundations which will enable the company to capitalise on every opportunity to grow beyond its medium-term development plans.

"With much of the consideration being satisfied in equity, we will welcome our new shareholders from Battery Minerals. Continuing with the construction of the Montepuez Project will be a key focus and with our expertise and history in working similar deposits over decades, we are confident it will result in even better economics for Montepuez and Balama Central, which we have already started working on and will keep the markets updated as we progress," says Poddar.

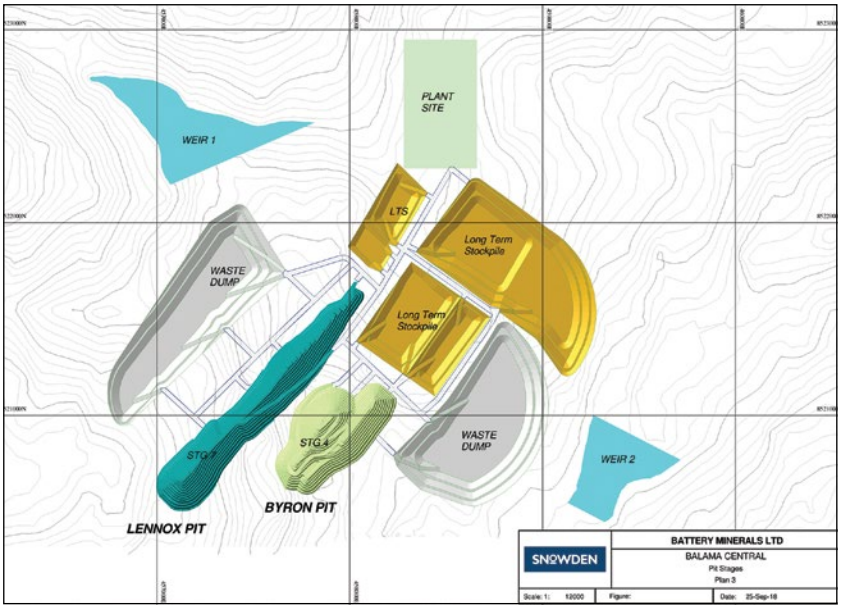
David Flanagan, executive chairman of Battery Minerals, says: "Shishir and his team at Tirupati have developed and demonstrated world leading graphite industry capability over the last 40 years. They are uniquely positioned with existing operations and downstream processing facilities that are globally competitive making them an excellent partner to commence these projects in the shortest possible time for the greatest benefit of the respective companies, shareholders and the people of Mozambique."

Projects in detail

According to Poddar, the acquisition is in line with the Tirupati's stated strategy of diversifying its resource base and mitigating country risk. The two complementary world-class graphite deposits, spread over a combined 18 500 hectares permit area , add mineral resources of over 152-million tonnes at 8,5% TGC, significantly increasing the company's JORC Code (2012) mineral resource base.

Extensive pre-development work and a Definitive Feasibility Study (DFS) have been conducted by Battery Minerals on the Montepuez project, resulting in a development plan for a 100 000 tonnes annual graphite concentrate capacity in two equal stages. Construction was initiated at the Montepuez project for a first stage 50 000 tpa flake graphite project with a 100 person base camp, plant area grading and tailing dam construction substantially completed and certain long lead equipment including crusher unit ordered for the development of the project.

The projects graphite product basket is a mix of jumbo, large and small flake, complementing Tirupati's existing mix of predominantly jumbo and large flake graphite products from Madagascar. Upon completion, the company intends to further optimise the project development plans, leveraging application of its extensive and proven expertise in developing graphite projects to minimise investment and optimise operating costs while looking to retain



Mine plan for the Balama Central Graphite Project.

the plans to implement 2 x 50,000 tpa modules plan owing to visible market opportunities in the green economy

The acquisition solidifies the company's divisional structure of primary mining and processing projects in Madagascar, Sahamamy and Vatomina, and speciality graphite and graphene processing businesses in India.

World-class projects

Currently, the global production of graphite and spherical graphite is dominated by China, which uses hydrofluoric acid purification techniques to produce purified spherical graphite. Given the transition of the world to a clean, green energy platform, many lithium-ion battery manufacturers are actively seeking alternative supply options. With this background, interest in Tirupati's products has escalated.

As recently announced, the company is now working with Hanwa, a world-leading Japanese trading company, which has already built significant interest for Tirupati's suite of graphite products in markets across Asia. Accordingly, as a fully integrated business, the company is focused on ramping up activities at its primary graphite mining and processing operations as it looks to build its position as a key supplier of high-value flake graphite.

Commissioning at the first 9 000 tpa module of its second project, Vatomina, is almost complete, which will lift primary flake graphite capacity in Madagascar to 12 000 tpa output ahead of increasing total capacity to 84 000 tpa by 2024 under the company's medium-term development plans.

Flake graphite is a critical resource, which is

used in over 150 applications. As well as purity, flake size is one of the main variables determining the product type and end application of flake graphite. For example, jumbo flakes are most suited for use in expandable graphite products, while small flakes are preferred for spherical graphite used in the anode of lithium-ion batteries.

At Sahamamy and Vatomina, the company produces high-quality flake graphite concentrate with up to 96% purity with a predominance of jumbo and large sized flakes; the flake-size distribution mix is circa 80% jumbo and large flake, and 20% small flakes. Notably, the flake sizes at Montepuez and Balama Central are predominantly small flake with the mix being circa 60 – 70% small flake and 30 – 40% coarser flake. This is key as test works to date has confirmed that the size and quality of the natural flake graphite from these projects is ideally suitable for lithium-ion batteries.

Tirupati's demonstrated low operating costs in Madagascar is primarily due to the large flake particle size distribution, which means that liberation of the graphite is easier, translating to leaner processing circuit. While more crushing facilities will be needed at the new projects in Mozambique, these projects have the advantage of being higher grade deposits and therefore, it is anticipated that low operating costs will also be maintained as they will be able to produce larger quantities of graphite from lesser material through the processing circuit.

Looking ahead, it is anticipated that the company will modify the existing mine plans at both projects, utilising its own clean processing techniques.

The projects graphite product basket is a mix of jumbo, large and small flake.

Phalaborwa Rare Earths Project: PEA to

George Bennett, CEO of Rainbow Rare Earths.

Rainbow Rare Earths Ltd has announced the commencement of work on the Preliminary Economic Assessment (PEA) for the Phalaborwa Rare Earths Project in South Africa. The PEA will compare a conventional route to produce a cerium-depleted mixed rare earths carbonate with an alternative flow sheet that bypasses the carbonate stage and delivers three higher value products – neodymium-praseodymium (NdPr) oxide, terbium (Tb) oxide and dysprosium (Dy) oxide. By *Mark Botha*.

The project comprises 38,3-million tonnes (t) of gypsum resulting from historic phosphate hard rock mining and containing rare earth elements with an estimated average in situ grade of 0,43 – 0,45% total rare earths oxide (TREO), based on previous sampling campaigns and supported by assay results, of which some 29,1% comprises high-value NdPr.

Rainbow Rare Earths CEO George Bennett says the rare earths are contained in chemical form in the gypsum stacks, which he expects will deliver a higher-value rare earth carbonate, with lower operating costs than a typical rare earth mineral project.

The results of the PEA, says Bennett, are expected by end-October 2021: "We are a bit behind schedule due to test work delays at the Australian Nuclear Science and Technology Organisation (ANSTO) in Sydney, Australia, having shut down for between two and six weeks due to COVID-19 lockdowns. Failing more delays due to Covid, we should make end October 2021."

Project background

He says the project is an earn-in agreement with Rainbow Rare Earths earning 70% on completion of a successful prefeasibility study. The company will enter inro a joint venture with Bosveld Phosphates (Pty) Ltd.

The 38,3-million t of gypsum residue resulted from around 60 years of hard rock mining of a phosphate deposit by South African government-owned mining company Foskor (Pty) Ltd. There are trace elements of RE's in the hard rock deposit but not in economic quantities.

The phosphate rock was concentrated via a flotation process to produce a phosphate concentrate slurry (also concentrating the rare earths) which was pumped to a nearby phosphoric acid production plant run by energy and chemical company Sasol Ltd.

"In the production of phosphoric acid, which is used in the fertiliser industry, a lot of heat and sulphuric acid were added, thereby effectively 'cracking' the rare earths in their mineral form to now be found in the gypsum residue (the waste stream of the phosphoric acid production process) as 'cracked' rare earths in chemical form," says Bennett

He says the gypsum residue went through three stages in the phosphoric acid production process to

The gypsum stacks at the Phalaborwa Rare Earths project.

consider bypassing the carbonate stage

concentrate the rare earths further, before final deposition as gypsum waste on the two stacks at Phalaborwa, now in economic rare earth grades.

"These elements of the asset lead us to believe that we will have a unique low capital intensity project at Phalaborwa compared to other rare earths development projects. We also benefit from very good infrastructure – situated in a large mining town with airport access five minutes away, hard-top freeways to Phalaborwa from Johannesburg, skilled labour force on our doorstep with three operating mines within a 5 km radius; grid power available at the base of one gypsum stack, machine shops and OEM suppliers on our doorstep, and two operating rail sidings at the site."

He says Bosveld Phosphates has made available to the project the existing mothballed phosphoric acid plant.

"We have use of their admin offices, workshops, machine shop, storerooms, laboratory buildings, acid storage tanks and more, all of which represents about 20% of the capital for a new process plant infrastructure."

He says independent test work carried out to date at ANSTO has confirmed that the phosphogypsum at Phalaborwa is amenable to direct leaching with sulphuric acid for extraction of the contained rare earths. The resultant pregnant leach solution after acid recovery will be a suitable feedstock for purification and separation of the rare earths.

The PEA will compare a conventional route to produce a cerium-depleted mixed rare earths carbonate with an alternative flow sheet that bypasses the carbonate stage and delivers three higher value products, comprising neodymium-praseodymium (NdPr) oxide, terbium (Tb) oxide and dysprosium (Dy) oxide. The results will then dictate the direction for development of a prefeasibility study.

The scope of the PEA was enlarged from the original plan to include a downstream processing step, as an alternative to the original flowsheet, which will produce a mixed rare earth carbonate.

"This is possible at Phalaborwa as the rare earths contained in the phosphogypsum are in a cracked chemical form. We expect further downstream processing to separate and purify individual oxides to deliver substantial benefits compared to the traditional flowsheet developed by Sasol and piloted in their pilot plant."

He says the enhanced flowsheet is expected to deliver a higher-value product as it delivers the full value of the separated rare earth metal oxides. By

Sasol's carbonate pilot plant at the Phalaborwa Rare Earths Project.

The Sasol Carbonate pilot plant produced 3 t of a cerium-depleted, mixed rare earth carbonate and a cerium oxide.

comparison, Rainbow's Gakara project in Western Burundi produces a high-grade mineral concentrate, which has been sold to China for further downstream beneficiation and processing, so realising approximately 30% of the contained rare earths metal oxide value.

"The traditional flowsheet developed by Sasol, on the other hand, would produce a mixed rare earth carbonate, realising between 60 and 65% of the contained metal oxide value, compared to the 100% of the metal oxide value we would achieve by going further downstream to produce separated, individual oxides as a per the enlarged PEA scope of work."

Bennett expects Capex and Opex savings compared to the initial traditional flow sheet to produce a mixed rare earth carbonate for further processing in a dedicated separation facility.

Only the high value rare earths (dysprosium, terbium, neodymium and praseodymium), which represent 95% of the Phalaborwa rare earths basket value, will be separated and recovered. This will enable the company to capture the full benefit of additional value from downstream processing without superfluous capital and operating expenditure which would be needed to separate all the individual rare earth elements present in the stacks.

The outcome of a successful trade-off study will enable Phalaborwa to deliver the increased value of the separated rare earth oxides through a single, low capital-intensity processing plant at the project site.

"Owing to the unique nature of Phalaborwa, we are already able to progress to the downstream beneficiation process by

producing a mixed rare earth carbonate, rather than a mineral concentrate," says Bennett

Progress

To date, Rainbow Rare Earths has drilled out the two gypsum residue stacks at Phalaborwa and conducted full assays on the grade and rare earth basket, among others and Bennett notes an inferred Joint Ore Reserves Committee (JORC) resource of some 38-million t.

"Secondly," he says, "we have been doing metallurgical test work at ANSTO to optimise the process flow sheet which Sasol used successfully to build a pilot plant at Phalaborwa. That plant produced around 3 t of a cerium-depleted, mixed rare earth carbonate and a cerium oxide.

This ongoing test-work was reported in the company's Regulatory News Service (RNS) announcement, indicating recoveries of approximately 70% at ambient temperature through a sulphuric acid leach possibly improving further with increased temperature.

"Due to the cracked nature of the gypsum, we can go straight downstream without first producing a mixed rare earth concentrate, then cracking, and then going downstream to produce a mixed rare earths carbonate. This will save a huge amount of Capex and Opex.

"Due to the ANSTO test work results, we have been investigating separation technology in parallel and are doing a study to go all the way downstream producing separated rare earth oxides. In other words, we are not stopping at a mixed rare earths carbonate, as this would save further Capex and Opex and we will realise the full value of the price for separated rare earth oxides."

He says only three oxides, NdPr, Dy and Tb, need to be separated as these constitute 95% of the value of the rare earths basket at Phalaborwa. This further reduces capital and operating expenditure.

"The PEA will definitely show a project that produces a mixed rare earth carbonate, but also could possibly go all the way to separated rare earth oxides, depending on the outcome of this parallel study."

Future outlook

Bennett describes the outlook for rare earths as "very positive", with prices once again rising strongly over the last few weeks in terms of NdPr, the two key rare earths needed in permanent magnets for electric vehicles, wind-turbines and consumer electronics, among others.

"The price for NdPr oxide was about US$38 000 per tonne around April 2020 and is now at about US$95 000 per tonne. Forecast demand for permanent magnets is set to continue to grow strongly, driven by electric vehicles and wind turbines which, in turn, are driven by legislation and world-wide emission reduction drives.

"So, whether we like it or not, this is a structural change which is not going away." ■

Key takeaways

- ❒ The results of the PEA are expected by end-October 2021
- ❒ The project comprises 38,3-million t of gypsum resulting from historic phosphate hard rock mining
- ❒ Bosveld Phosphates has made available to the project the existing mothballed phosphoric acid plant infrastructure
- ❒ The PEA will compare a conventional route to produce a cerium-depleted mixed rare earths carbonate versus an alternative flow sheet that bypasses the carbonate stage
- ❒ Only the high value rare earths, representing 95% of the Phalaborwa rare earths basket value, will be separated and recovered

Dealing with multiple streams of effluent in antimony roastery plant

Anke Botha, process manager at Multotec.

Having initially provided a water treatment plant to deal with various waste streams for a client producing antinomy metal, antimony trioxide and antimony-gold concentrates in the Arabian Peninsula, Multotec will this September commission an upgraded plant to deal with the change in feed and the increase in contaminants, process manager Anke Botha tells *Modern Mining's* Munesu Shoko.

Leveraging its experience in water treatment solutions for the mining industry, Multotec in 2017 designed and supplied a complete system to a mining operation that is extremely sensitive to water usage and waste production in the Arabian Peninsula. For this plant, Multotec needed to consider various waste streams.

When the plant was first constructed in 2017, explains Botha, it had various waste streams to deal with, including limestone scrubber blowdown with high levels of calcium; caustic scrubber blowdown with high levels of sodium sulphite; cooling water blowdown; acid quench blowdown with high levels of arsenic and antimony, as well as some spillages.

Multotec did extensive test work to ensure that various streams could be treated.

During the first order, Multotec did extensive test work to ensure that these various streams could be treated. Additionally, the company also did test work on its filter presses to ensure that it removed as much moisture as possible.

"The initial plant worked well, but had to be upgraded due to the change in feed and increased contaminants. As a result, the client had to resort to trucking some of the waste water to an off-site waste treatment facility that would treat the water for them. The exercise was cumbersome and costly," she says.

There were several changes to the client's waste streams between 2017 and 2020, explains Botha, which necessitated for the upgrade. Firstly, it was the increase in flow from the acid quench blowdown. Secondly, there was a total increase in plant feed from 5,44 m^3/hour to 10,5 m^3/hour. There was also a significant increase in contaminant levels in the acid quench blowdown, with total arsenic, antimony and selenium.

The client approached Multotec for an upgrade of the plant to deal with increased contaminants in its effluent. From the onset, the upgrade project was under a lot of pressure. "Our biggest challenges were to provide the client with a new water treatment plant using old infrastructure and taking the scope without having sufficient design details due to some logistical challenges. We, however, walked the road with the client to get to a feasible solution," explains Botha.

Initial solution

The original solution included two separate precipitators, followed by the DeSALx Ion exchange, a unique continuous counter current ion exchange technology from Australian-based Clean TeQ Water, offered locally by Multotec. This was used to remove calcium and sulphates.

"The benefit is that the moving bed ion exchange technology overcomes a number of limitations faced by conventional fixed bed ion exchange systems. It can act as a sand filter if required, simultaneously removing suspended solids while targeting

contaminant removal via ion exchange," explains Botha.

Tolerating precipitation in the desorption column is a key feature of moving bed technology, allowing for cheaper reagents to be used and preventing blocking up. This is unique to Clean TeQ Water's ion exchange technology and allows low-cost zero liquid discharge solutions and innovative flowsheets.

"After the calcium and sulphates were removed, the final treatment step was reverse osmosis (RO) to deliver drinkable water. RO was initially designed for sea water desalination to remove monovalent salt molecules (NaCl). Due to its success in this application, it has since been introduced to other sectors such as industrial and mining. In this plant, the system was a Zero Liquid Effluent discharge. We also supplied the filter press, producing low moisture content sludge," she adds.

New solution

The new solution entailed finding the best possible solution by using existing equipment. This proved to be a challenge as the contaminant levels had increased significantly and Multotec had to assist the client to get the most cost-effective solution.

In the new plant, the limestone scrubber blow down with high calcium content, the acid quench blowdown, as well as the liquor and alkali blowdown are combined and enter a lime precipitator reactor, followed by a lime thickener and a settling tank. Here, the magnesium and calcium sulphate (from the Continuous Ionic Filtration (CIF) effluent stream) rich sludge is removed by a Multotec filter press.

"The product water is sent to a feed buffering tank where oxidation occurs by means of hydrogen peroxide before sending it to the three-stage arsenic/antimony precipitation. The three-stage precipitation approach was selected due to the reduction of coagulant usage. The precipitation is then removed with a high-rate clarifier, sending the arsenic/antimony rich sludge to the second filter press in the plant," explains Botha.

Due to the high sodium content in the new effluent steams, she adds, the original DeSALx could not be used in this instance and was repurposed as a CIF. The technology uses a moving bed of charged resin beads to attract and remove ionic species from water while filtering the water of suspended solids, ensuring optimum efficiency and continual high performance. A portion of the resin is cycled between columns (usually hourly) using an air lift pump, allowing continuous operation and regeneration of the system.

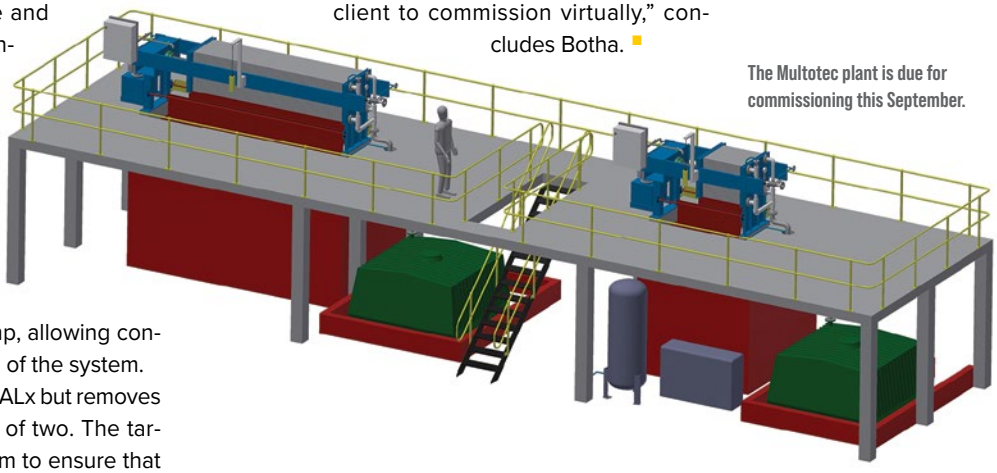
"The CIF works similar to the DeSALx but removes only one targeted species instead of two. The target species removed here is calcium to ensure that the upcoming RO can sufficiently treat the water," explains Botha.

The only waste produced is sludge that is further dewatered by Multotec filter presses.

The stream is then combined with the cooling water blowdown, sent through a multimedia filter and finally cleaned with RO, allowing the plant to deliver drinking quality water. The only waste produced is sludge that is further dewatered by Multotec filter presses. The water enters the system again to be cleaned.

"The new plant includes an additional precipitation stage. Originally there was only an antimony/arsenic precipitation stage, but with the change in feed and the increase in contaminants, an additional metal precipitation step was added, which called for the CIF solution," explains Botha.

True to its operating philosophy, Multotec has given the client continued support from 2017, and will continue doing so. "We provided support to the client from the beginning, offering solutions even when design parameters were still unclear. We have been there through the whole process, meeting daily to resolve all engineering issues to get this project done as quickly as possible. We are due for commissioning this September. One of the challenges is that we might not be able to physically commission the plant. We have, however, set up an alternative remote assistance plan that will allow us to help the client to commission virtually," concludes Botha. ■



The Multotec plant is due for commissioning this September.

Sandvik's diversity and inclusion strategies bear fruit

Diversity and inclusion remain issues of concern for the mining sector. As a service provider to the industry, Sandvik Mining & Rock Solutions Southern Africa believes it is well placed to influence the narrative and has therefore made a conscious decision to be the agent of change that the industry needs. Several key initiatives implemented over the past five years, Centre of Expertise manager Megan Rogers tells *Munesu Shoko*, have yielded solid results, with more set to be achieved in the next two years.

Megan Rogers, Sandvik Centre of Expertise manager.

In her role as the Centre of Expertise manager at Sandvik Mining & Rock Solutions Southern Africa, Megan Rogers is responsible for all the functions of human resources (HR) that are not operational. These include recruitment, talent management, planning and development, transformation, employee relations and remuneration, among others.

A labour lawyer by profession, Rogers left the practice of law a few years ago to venture into HR. Because of her labour law background, she has always found herself in employee relations, employment equity and transformation. Other than employee engagement and all the elements that come with her HR function, diversity management is a subject close to her heart.

Sandvik put strategies in place to achieve diversity at the workplace.

While reports have over the years found that the business case for diversity and inclusion is stronger than ever, mining still very much lags behind other industries in terms of women representation. The challenges for the industry, says Rogers, are well documented. Firstly, she says, if one thinks of the particular work that gets done in an underground mining environment, for example, it generally tends to be male dominated.

"From a South African perspective," she says, "the situation is compounded by the patriarchal nature of the society. Because of its history, the mining sector still has a patriarchal view embedded in a lot of practices and processes. Neither do hard labour and spending many hours underground lend themselves to female inclusion."

As a result, Rogers reasons that women have traditionally been relegated to support functions such as human resources, finance and marketing. She, however, believes that things are changing for the better. "We are starting to see women show up on core processes of the mining business. We have also started to see women coming into leadership positions, who are calling out the industry policies, processes and practices that are not inclusive by

nature. We as suppliers are also able to contribute to that narrative," says Rogers.

Other key challenges for women in mining have always been the issues of networking, mentorship and sponsorship to get ahead in their careers because the industry is male dominated, says Rogers. "It's really hard to make connections as a female when most of your counterparts, people who are supposed to mentor you, are male. As we see more females growing into senior positons, I am sure it is going to change with time," she says.

Change agent

As a service provider to the mining industry, Rogers says Sandvik has taken a conscious decision to be different. To influence the mainstream mining industry's perception on women representation, the company believes that, as a supplier to the industry and functioning outside the actual mining industry, it is best placed to affect real change. Sandvik has put strategies in place to achieve diversity at inclusion at the workplace.

The starting point was getting women representation in leadership positions right, she explains, because leadership influences culture. "Over the past few years, we have significantly changed the demographic representation of females at the top level. For example, the board had a 33% women representation in 2017, and I am glad to report that the number has risen to 50% in 2021," she says.

Over the past five years, Sandvik Mining & Rock Solutions Southern Africa has also increased its women representation at senior management level from 16,7% in 2017 to 19,4% in 2021. "The transformation doesn't happen overnight. It has been a continuous journey driven by our MD Simon Andrews, who happens to be a man but truly believes in diversity in his team," she says.

Over the years, adds Rogers, Sandvik has moved its focus from just the numbers to understanding what these initiatives really mean for inclusion. For example, the traditional management team building activities such as hunting and fishing had a male bias to them.

"We started thinking about what these activities meant for females, especially being away from their families for two to three nights without any contact. Would hunting be an appropriate activity? We have also started to think about our celebrations with customers. Could we do other events besides golf days? Those things are starting to change because of the level of consciousness within the team," she says.

"We also have Women's Day celebrations every year as an organisation, again driven by our MD, Simon Andrews. Those activities are designed for our female staff to interact with each other from every level of the organisation. The activities are also meant to provide coaching and mentorship opportunities for our female staff," adds Rogers.

Sandvik has recruited more females into the organisation in the past year.

The company has also placed a strong focus on grassroots development, with a focus on bursaries. This is meant to grow the company's own internal pipeline. In the past five years, the selection of bursary beneficiaries has had a strong focus on women and 52% of the bursaries awarded this year were awarded to female candidates. "We are adopting the same approach with our internship programme because we realise that interns offer a pipeline for the future. Over the past few years, our interns have been predominantly female," she says.

Sandvik is also using its CSI programmes to influence women advancement in society at large. While the company has a specific focus on education and health, "we also look at opportunities to support organisations that look after gender-based violence victims. This year for instance, some of our CSI spend has gone to a charity organisation, Compass, based in Edenvale, which rehabilitates women and children who have been affected by violence. We believe that we also need to contribute to society's agenda and impact the communities in which we operate," adds Rogers.

Key successes

Sandvik's programmes have yielded some key successes. At senior management level, says Rogers, the company has not only managed to bring females into leadership positions, but has also managed to retain them, which is crucial. "It's a challenge to retain senior female managers in our industry because they are always in demand and are often poached. Fortunately, we have managed to retain our senior female managers. That's a true testimony that diversity is about getting the numbers right; inclusion is about making someone feel they belong," she says.

Retention challenges, however, are more prevalent at middle management level. This, she says, is not a challenge unique to Sandvik. "Females in our industry are generally in high demand. If we don't have the next opportunity available for them, they have to leave in order to grow. However, in all our interactions with those who happen to leave, they have largely indicated that they would return to Sandvik if the opportunity arises. As part of our talent management strategy, we have mapped external talent of both female and male individuals to keep on our talent management database. We consider them as potential successors for positions when they become available," says Rogers.

Over the past three years, Sandvik's promotion stats for females have increased from 24% in 2018 to 36% in 2020. The company has also recruited many more females into the organisation.

Key takeaways

- Sandvik has put strategies in place to achieve diversity and inclusion at the workplace
- Over the past few years, the company has significantly changed the demographic representation of females at the top level
- Female representation at board level increased from 33% in 2017 to 50% in 2021
- Sandvik Mining & Rock Solutions Southern Africa has increased its women representation at senior management level from 16,7% in 2017 to 19,4% in 2021

The future

Sandvik Mining & Rock Solutions Southern Africa has a current total workforce of 1 386 people, of which 295 are females, representing 21,3% of the workforce. As part of Sandvik's global strategy to increase women representation, Sandvik Mining & Rock Solutions Southern Africa aims to continue improving its demographics over the next two years.

At a global level, the company is aiming to have 19,5% females in management positions. Sandvik Mining & Rock Solutions Southern Africa is currently on 19,4%. "We have done quite well, but given our situation in South Africa, it would be remiss of us to just look at female representation. We also have transformation targets, so we look holistically at what the environment requires us to do. We have, therefore, set ourselves black female targets in conjunction with our general female representation targets."

The company has set itself a 23,1% black female representation target at senior management level in the next two years, from the current 15,4%. At board level, Sandvik has already achieved its target of 50% black female representation. At mid-level management, says Rogers, the target is 19%, from the current 18,1%. The junior management target for black female representation is 19%; the current figure is 18,1%. Semi-skilled black women representation is 19,3%, of which the company has already reached 20,4%.

"We are in the process of drafting a new EE Plan. Given the shifts in our environment," she reiterates, "our targets are going to increase."

The targets, says Rogers, were drafted with special consideration of the demographic make-up of Sandvik's talent pipeline. "We take into account that when we grow people in our organisation, we are not only growing black people. Sometimes it appears as if we are not achieving the transformation targets, but the reality of the matter is that we are in fact growing people from our talent pool, which includes talented individuals from diverse backgrounds. However, we pay special attention to females coming through the pipeline. So many of these targets and how we intend achieving them is based on our internal talent development strategies," concludes Rogers. ■

Staying the course in a 'man's world'

That women still face constant challenges in the mining sector is no overstatement. For Mammutle Uoane, engineer at Concor, hard work, determination and focus have helped her stay the course in what is largely still deemed a 'man's world'.

Like many other women in the mining industry, the greatest challenge for Mammutle Uoane "was working to overcome the stereotype that women are physically incapable" in order to find her place in what is still regarded a male-dominated industry.

"Women are often only assigned to administrative tasks, and in order to be taken seriously, I had to work twice as hard, especially when handling the toughest and most demanding parts of my occupation," says Uoane.

Speaking to *Modern Mining*, Uoane says hard work, determination and focus have been key to sidestepping these challenges. "These qualities," she says, "have stood me in good stead, while respect, dedication and focusing on the bigger picture have helped cement these qualities."

A personal reflection that has helped her to stay the course is to remain teachable. "Bob Riley once said, 'Hard times don't create heroes. It is during hard times when the hero within us is revealed'. This is a true reflection of my approach to the challenges that women face in the industry," she says.

Support is key

Apart from the role that the company played in affording her learnership opportunities, Uoane commends Concor for its efforts in advancing women at the workplace. For example, the company observes special events, including Women's Month, and also highlights women who are making great moves in the industry.

"This gives all women out there hope and courage to also take strides and follow the dreams that may once have seemed farfetched. Concor also provides support through personal mastery and development with its Women in Leadership Programme," she says.

The company's two-year Graduate Mentorship Programme – combined with its bursary scheme – continues to generate top-class women professionals for the business and the broader mining sector.

The Graduate Mentorship Programme, which has overseen the entry of almost 100 young professionals into Concor's ranks over the past 12 years, also introduces them into the company's Women in Leadership Programme and its Future Leaders Forum.

This focused skills development and mentoring process has become a backbone of Concor's technical and management expertise, while allowing the company to offer more opportunities to South African youth.

The programme begins with an intensive three-week induction in project management, leadership and health and safety, before the interns are allocated project sites where they can apply their training with the assistance of coaches and mentors. Regular formal training during the two year period includes a course with the Gordon Institute of Business Science (GIBS), while graduates are also assisted in preparing for professional registration.

Mammutle Uoane, engineer at Concor.

Background

Uoane's journey in the mining industry started when she joined an in-service training programme at the Lonmin Deepening Project, which ran from January to December 2014. After that, she was accepted as a Concor bursar and over the following two years she completed her National Diploma and BTech in Mining Engineering.

From January 2017 to March 2019, she was part of the Concor Graduate Development Programme and within this mentorship programme she was appointed as a blasting assistant, then a site engineer and later as the acting site manager at Concor's drill and blast contract at Vlakfontein Mine. Concurrent to being the site engineer and acting site manager, she was also the project's quality management representative. From here she took up her current role as engineer – estimating department, within Concor's Mining Platform.

"Being an engineer within the estimating department allows me to leverage the experience gained in the field to do cost estimations for potential project work. It certainly assists that I have experienced the operational aspects on an opencast mining project and can draw from this skill set," she says. ■

Women at Weir Minerals Africa making their mark in mining

There has been a marked increase in women representation in the mining sector over the past decade. Industry players such as Weir Minerals Africa are continuously working hard to increase their female representation in the workplace through various initiatives, thus creating an all-round, more attractive reputation for the industry as a field in which women can thrive. *Modern Mining's* Munesu Shoko spoke to four women from Weir Minerals Africa about their journey in mining and how they have made their mark in such a male-dominated industry.

Mining companies and their supply chain counterparts are becoming increasingly aware of both the business and moral imperative of enhancing the representation of women across all levels and are pushing hard to increase the numbers of women through various initiatives.

Modern Mining recently spoke to Weir Minerals Africa's Nthabeleng Hatlane (hydraulics engineer), Jagruthi Naran (planning and logistics manager), Tiisetso Masekwameng (GM for Comminution Products) and Vilencia Parsaraman (junior process engineer), to unpack some of the issues women face in the industry and the role businesses can play in advancing women in an industry where men largely remain the 'gatekeepers'.

Key challenges

While women still face a lot of challenges to make their mark in the mining sector, Masekwameng believes that the industry has seen a huge reform in the past decade, with more women occupying senior roles of influence in the past five years.

"One of the challenges that continues to be part of this environment is that women have to work harder to be heard and gain respect from their peers because the perception is sometimes that women are in certain roles due to transformation and affirmative action more than for their capabilities," says Masekwameng.

"Women, therefore, have to prove themselves in order to gain any respect from their peers, superiors and juniors. This isn't a challenge men face as they are generally expected to be able to perform, unlike their women counterparts," she adds.

For Parsaraman, despite the documented challenges women face in the industry, she believes she has been blessed to work in a business that embraces diversity and always makes her feel respected.

"The industry in general still has its fair share of challenges. I think the main challenge has been finding my voice in an industry that is still transforming. Attending meetings or site visits where I am the only female present is still something I experience. Being a junior and a female means that I have to work a little harder than some of my colleagues so that when I do provide my input, it comes from a technically strong place and oozes confidence in my abilities," she says.

Although Naran is the only female in the operations management team and is often the only female or one of a few females sitting at the table, she has been treated as an equal and is respected for her knowledge, experience and contribution.

"My personal self-belief and perseverance, while remaining focused on my career aspirations and ambitions, have enabled me to remain steadfast in my approach to achieve success in such a male-dominated industry," says Naran.

Sidestepping the challenges

Commenting on how she has managed to sidestep the challenges, Hatlane says that she has had to face

Nthabeleng Hatlane

For Nthabeleng Hatlane, the journey in the mining industry began with a deep curiosity to understand how everything in the world works, which influenced her choice to take science subjects in high school and the decision to study engineering.

Hatlane graduated with a BTech in mechanical engineering from the University of Johannesburg, and her introduction to the industry was through Saint Gobain, where she did a year's internship in the engineering office. She then joined Weir Minerals Africa as a graduate, working in engineering support, mostly in pump assembly, at the company's Alrode facility. She eventually joined the process team at Weir Minerals Africa in Isando as a hydraulics engineer in the pump team.

"In my current role as a hydraulics engineer, I prepare and deliver technical information on original equipment (OE) products and services to both existing and prospective customers. This involves ongoing liaison with design engineers and customers to assess equipment needs and determine system requirements," explains Hatlane.

Jagruthi Naran

Jagruthi Naran began her career at Weir Minerals in 2011 after being awarded a company bursary to complete her tertiary education. During this time, she completed her practical training and honours research at the company. Upon completing her honours in industrial engineering at Wits University, she was employed by Weir Minerals as a graduate engineer where she was exposed to supply chain, operations and lean manufacturing.

"After completing the graduate programme, I was offered a permanent position as a continuous improvement engineer, where I was responsible for improving production efficiency in the machine shop as well as driving the implementation of the shop-floor management system," she explains.

Thereafter, she got an opportunity as a process engineer where she assisted in managing initiatives related to the global best practice forum across Weir Minerals. In this role, she also gained exposure to supply chain and planning, which became the stepping stone for her current role as planning and logistics manager. On the academic front, Naran recently submitted her Masters dissertation in machine learning through Wits University. She is also certified as a six sigma quality professional and has a certification from APICS in production and inventory management.

"As the planning and logistics manager at Weir Minerals Africa's Isando manufacturing facility, I am responsible for planning, purchasing, logistics and inventory management. This includes all processes from order intake to level loading the facility, through to final product distribution. The strategic component of my role involves analysing statistical data to support the business and recommend solutions in line with supply chain decision making. I manage a dynamic team of individuals who support the plant in all aspects of planning and logistics," explains Naran.

her fears and make the time to learn as much as she could. "I have always been persistent in asking for help and mentorship and I also volunteered for roles within the organisation that were not directly work related. This allowed me to find a space where I could boost my self-esteem and socialise with colleagues in other departments other than my own," says Hatlane.

For Masekwameng, having a strong personality and the ability to "manoeuvre the political arena of work" helps. However, she adds, the key is to show results that support why you are in the position that you are in. "I should also mention the importance of having senior leaders who support your growth in the business."

Parsaraman says that only when she finally understood that she was the narrator of her own destiny and "took back the pen I had given to society" was she able to overcome these challenges. "It wasn't about trying to conform; it was about embracing the fact that I stand out and understanding the unique value that I can add to our industry," she says.

Support is key

Commenting on the role businesses can play in changing the demographics in the mining industry, Masekwameng says policies are key. "Businesses should continuously review policies and implement those that drive change. Training on transformation and cultural differences also assists," says Masekwameng.

Parsaraman says Weir Minerals Africa plays a huge role in supporting the growth of women in the business. "We have several initiatives and training programmes that encourage us to embrace diversity. I was personally featured in an internal article during Women's Month where our company embarked on a #ChooseToChallenge campaign that featured the stories of a diverse group of women throughout our business, shining the spotlight on the challenges faced by women and how we can overcome these," says Parsaraman.

Weir Minerals, adds Parsaraman, also continues to provide opportunities for young professionals to embark on its graduate, internship and learnership programmes, where young women are given the stepping stones needed to join the mining industry.

According to Hatlane, Weir Minerals continuously does an incredible job of ensuring women feel equal to men in the workplace. "The Wellness helpline grants employees the opportunity to open up to a trained therapist, ensuring mental and psychological wellbeing. The Weir Group also has a global Women's Network where monthly networking

Tiisetso Masekwameng

Tiisetso Masekwameng has been in mining for the past decade and has worked in various parts of the industry. Her mining career started as part of a capital development team that was tasked to equip a platinum mine and to create access to the ore for the end client.

"My journey at Weir Minerals started as product manager for comminution products where I drove sales and applications for the Africa Middle East region. This role was challenging and demanding but also fulfilling. I was promoted to my current role in 2019," she explains.

As the GM for comminution products across the Africa Middle East region, Masekwameng manages the sales, applications, process and service support functions. The role is target driven and centres on customer centricity and support.

Vilencia Parsaraman

Vilencia Parsaraman's professional journey was set in motion after being selected as one of the GradStar Top 100 students in 2016. At the time, she was completing the final year of her National Diploma in chemical engineering at the Durban University of Technology. While attending a careers exhibition at an event hosted by GradStar, she was introduced to her current employer, Weir Minerals Africa, and this was where her chapter in the mining and minerals industry began.

In 2017, she joined the sales team at Weir Minerals Africa as a process intern in the comminution department. This was part of a two-year programme in which she completed her Bachelor of Technology in chemical engineering at the University of Johannesburg, thanks to a bursary provided by Weir Minerals.

Once her internship was over, she joined the Graduate Programme at Weir Minerals, which was for another two years. During this time, she was afforded the opportunity to further develop her skills and gain on-site experience as well as migrate to the hydrocyclone team. In November 2020, she officially completed her training programme, and was appointed to a permanent position as a junior process engineer for the cyclone team.

sessions assist in addressing challenges faced by women in the industry," says Hatlane.

Naran commends the company for participating in the "Take a Girl Child to Work Day" initiative, which gives schoolgirls a chance to experience the world of engineering and manufacturing. "For many girls, the initiative opens their eyes to the world of opportunities in the STEM industries. In addition, since I began my career at Weir Minerals Africa, there has been an increasing number of female employees in the production areas, from the pattern shop in the foundry to foundry engineers, as well as artisans in the machine shop and apprentices on the shop floor," she says.

"It is important that we continue to promote and advocate for the entry of women into previously considered male-dominant professions. There will always be challenges but the key is to remain dedicated and committed to your goals and aspirations," concludes Naran.

AECI Mining's Dinah Tsebe breaks gender barriers

In an environment where change is the only constant, the key to success is transformational leadership – a style that empowers and helps teams to build a sense of community and trust. One company that is putting emphasis on this leadership style to accelerate the strategic imperative to bring inclusivity, defeminisation of the workplace and having more women in leadership positions, is AECI Mining.

Dinah Tsebe, plant manager at AECI Mining Chemicals.

A perfect example is Dinah Tsebe, plant manager at AECI Mining Chemicals. Responsible for the company's Pretoria branch, her core function is to manage operations, including production, technical, maintenance as well as occupational health and safety of personnel and equipment on site.

Tsebe is equipped with a BTech in Chemical Engineering from Vaal University of Technology, and a post graduate diploma in management from Northwest University. She is currently pursuing her MBA with the Northwest University, and has been in the chemical manufacturing industry for over two decades.

Background

Having started her career as an engineering technician at the Council of Scientific and Industrial Research (CSIR), her passion for the manufacturing industry started when she took up a role as a plant operator at Dow Agrosciences. After qualifying for her BTech, she was afforded an opportunity to manage a newly-built plant at Senmin, now known as AECI Mining Chemicals. She later joined Sasol, where she managed the company's water and effluent sites, working closely with the Department of Water and Sanitation.

Driven by her passion for manufacturing, she returned to AECI Mining Chemicals and took up her current role as plant manager, in an industry that she believes is still very much male-dominated. She owes her success to resilience and determination to prevail against the odds. She believes that her growth in the chemical manufacturing industry is proof that women can break down barriers to flourish in any career field of their choice, "provided they are passionate and love what they do".

"I am passionate about manufacturing and seeing my ideas turning into something tangible. It has traditionally been difficult for women to progress in this industry. There are still many barriers that women face, mainly the general belief that they don't possess the necessary skills and passion to thrive in such a male-dominated industry. Some still believe that women belong in the kitchen, or are meant to take care of families. It is, however, encouraging to see that there has been a mind-set shift in the industry, with the number of women increasing, although at a gradual pace," says Tsebe.

Correcting the demographics

The push for more women in the industry isn't just an equality argument; it's a necessity. While the ratio of women in the sector is nowhere near where it should be, Tsebe believes that organisations such as AECI Mining are striving to make a bigger impact. Women empowerment is a full-force movement with a loud voice within the AECI Group.

The company has always taken a multi-faceted approach that considers the different ways women create value within the organisation and communities in which it operates. The group approaches its women empowerment programmes as an opportunity to infuse its values throughout its business operations.

"AECI was voted Employer of the Year in 2020 for its efforts in, among others, advancing inclusivity at the workplace. The company continues to offer great opportunities for development of women in different functions of the business," she says.

Tsebe commends AECI Group's partnership with the Gordon Institute of Business Science (GIBS), a highly-recommended business school, to offer employees the opportunity to sharpen their business leadership skills.

She is thankful for the opportunities of growth afforded to women and young people in general within the company.

"For example, I am currently part of AECI's Millennial Council of 2021, an initiative that seeks to give the company's young professionals an opportunity to shadow and experience aspects of leadership. The council's mandate is to ensure that the business strategy is not an executives' document, but something that's understood by all employees," says Tsebe, adding that such leadership is critical to providing staff with a frame of reference for what a company stands for. ■

Conducive environment for women to thrive at Multotec

Although the mining industry is still grappling with gender disparity, Multotec's Refentse Molehe, Este du Toit and Jeantelle Rust believe that things are rapidly changing across the industry at large, and there is a big drive to give women the platform to exhibit their capabilities and the voice to be heard in the workplace.
By *Munesu Shoko.*

Multotec has over the years created an environment in which women can flourish.

While the mining industry remains male-dominated, women are beginning to find their place in the sector. Over the past decade, South Africa has seen more women enter the mining industry. Speaking to *Modern Mining*, Multotec's Refentse Molehe, Este du Toit and Jeantelle Rust detail their journey in the industry and how they continue to find their place in a male-dominated environment.

Commenting on some of the common challenges women still face in the industry, Jeantelle Rust, manager: test work at Multotec's technology division, says trying to break into a male-dominated industry has not been an easy task. "It was a challenge to get my colleagues to gain trust in my knowledge and abilities, especially at the beginning of my career. Over the years this has subsided, and today I am very fortunate to work in an environment in which I am taken seriously as an engineer, and where I am supported, mentored, coached and encouraged to grow," says Rust.

"Starting out, it was necessary to prove myself. This meant that I had to get dirty. I was open to learning from absolutely everyone, and I was taught to respect experience, not qualifications. I am fortunate to have great mentors in my career, both male and female. The guidance helped tremendously. The most important thing that I have learnt along the way is to raise your hand for opportunities and make yourself heard. Communication is key, and nothing should be assumed," adds Rust.

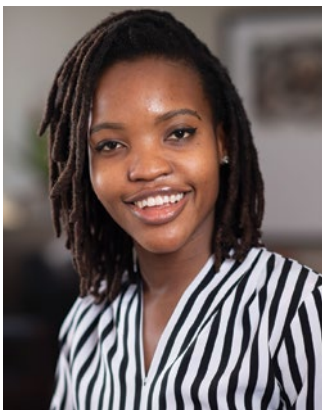
Refentse Molehe, process engineer at Multotec, says her appearance and personality, "which is girlish, bubbly and sweet" is sometimes mistaken for not being willing to get dirty. "There is a perception that a woman should change her appearance to fit into the mould of a 'typical engineer'," she says.

"A woman doesn't necessarily need to change how she looks to get the work done, and to do it well. It's important to be authentic to oneself and focus on achieving the set team goal, with your hair and nails done. I am a no-nonsense person and if I feel mistreated, I will address it immediately. I will not take lightly being unfairly treated because I am a young female in what is a male-dominated industry. We all deserve to be in the mining industry despite how we look and sound. It is all about adding value to the team and doing it while respecting each other," asserts Molehe.

The same view is shared by Este du Toit, GM of the Cyclones Division, who says that the biggest challenge for women is to prove themselves and show that they are willing and able. Key to sidestepping these challenges for Du Toit was building relationships and trust within the company.

For Molehe, gender has never been a barrier for her because of the learning environment fostered by

Refentse Molehe, process engineer at Multotec



Molehe graduated with a BEng in Metallurgical Engineering from the University of Pretoria in 2015, before completing her honours in Engineering and Technology Management from the same university in 2018. She is currently about to complete her Masters in Technology and Innovation Management this year from the same institution.

Molehe joined Multotec as a graduate engineer in research & development in 2016. She currently works as a process engineer, specifically dealing with gravity separation technology and equipment.

"My role as a process engineer entails the correct selection and sizing of equipment for customers' applications and providing solutions to customers based on my minerals processing expertise, as well as plant optimisation and improvement of current technology offerings through product development."

her tertiary institution, University of Pretoria. “Everyone in the class was seen as a student engineer and there were no limitations based on background or gender. Perhaps the lecturers were intentional about it, so I didn’t think I would have to ‘break’ into the male-dominated environment,” she says.

Conducive environment

Multotec has over the years created an environment in which women can flourish. Molehe has in recent years witnessed more women being given opportunities in senior positions, which they duly deserved. “I have also seen how active the company is in protecting women against any form of discrimination in the workplace,” she says.

“I have been fortunate to have male colleagues who believe in equality. I have one who, in every situation where I felt unfairly addressed, has always reminded me to stay true to my values. He has always encouraged me to work independently and not to allow my gender to be a limiting factor in the work environment. He really believes that women and men are equal. This was pivotal when I started working as an engineer at Multotec,” says Molehe.

Du Toit says there are many fantastic mentors within Multotec, and all one has to do is to ask for the help they need. “It is also important to listen to the more experienced colleagues and not to act like one knows everything. Management at Multotec will always help you if you approach them with the right attitude,” she says.

Multotec, adds Rust, regularly recognises and celebrates women in the company. For example, women are always prominently featured in the company’s internal newsletter, The Grapevine. The company also makes a conscious effort to celebrate Women’s Month.

“There is also a shift in the number of women featuring in top management. Things are rapidly changing in the industry as a whole, and there is a big drive to make women seen and heard. I would like to reiterate that this does not take anything away from the men in the industry, it just gives women a platform to also contribute to the discussions and developments,” says Rust.

“We are living in exciting times. As women, we have a lot to offer in terms of the way we think and act. The abilities of men and women differ, as do the abilities of each individual. We all have something unique to offer to this diverse industry, and the industry needs to capitalise on that. Eventually, we need to recognise individuals and not their gender. At the end of the day, we need to respect each other and build each other up. There is a place for everyone in this world, and we should make room for one another. Teamwork makes the dream work,” concludes Rust. ■

Este du Toit, GM Cyclones Division at Multotec

Du Toit joined Multotec in 2010 as financial manager, before being appointed commercial manager at Multotec Process Equipment to gain more knowledge of the business and the products. In 2018, she was appointed to the role of general manager of the cyclones division. She holds a B.Com Accounting and is a qualified chartered accountant. During her time at Multotec, she has graduated with a Master of Business Leadership from Unisa.

“My role at Multotec is to lead the cyclones division and to mentor and develop our young talent and ensure the business grows. My scope is to manage our sales division, drawing office, planning and production. The ultimate goal is to keep our customers satisfied as all other objectives will flow from that.”

Jeantelle Rust, manager: test work at Multotec

Rust graduated from the North-West University with a Bachelor of Engineering – Chemical Engineering with specialisation in mineral processing. Subsequently, she started her career as a graduate metallurgist at Anglo American Thermal Coal. After completing her graduate programme, she was offered employment at TWP, a prominent design house in Johannesburg.

She currently fulfils the role of research and development engineer in Multotec’s technology division. During the course of her career, she has also completed her graduate Diploma in Engineering at the University of the Witwatersrand, a Master’s Degree in Chemical Engineering from the North-West University, and she is currently enrolled for an Advanced Project Management programme at the North-West University Business School.

“For me, it is vital to keep learning. Whether we realise it or not, we all learn something new every day, and learning should be a continuous journey throughout one’s time on this earth. I am very fortunate to work for a company that encourages and supports personal and professional growth and development.”

“Those who know me are well aware that I am proud of my role. There are many aspects to my work, such as being the safety supervisor and GMR 2(7)a for my department, mentoring, coaching, networking and training. I really enjoy being involved in the careers of young engineers, and frankly, anybody who is willing to learn and grow. In my current role, I mainly oversee minerals processing test work done for customers in the mining industry. I interact with customers on a daily basis, and it is quite exciting as no two projects are the same. Each project is unique and adds to the wealth of experience and knowledge that I have gained since joining Multotec.”

Fostering a working environment that

Given the documented challenges that women working in the mining sector face, SRK Consulting – which has over the years played a leading role within the mining sector in creating a supportive culture for women – believes that the transformation required in the industry is about fostering a working environment that attracts and retains women professionals across the various disciplines of the industry. By *Munesu Shoko.*

Vis Reddy, MD of SRK Consulting (South Africa).

Sarah Skinner, principal hydrogeologist at SRK Consulting.

Historical concerns around work conditions and the competitiveness of the mining sector have been complemented by a growing number of other issues. Today, an overarching goal is to find ways by which the mining sector can promote better women representation in the industry.

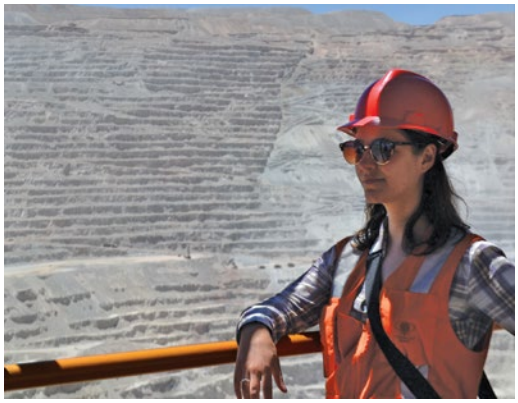
The challenges that women face in the mining sector, comments Sarah Skinner, principal hydrogeologist at SRK Consulting, depend very much on the work they do and where they are based. The experience of a consultant, for example, will usually be different to that of an underground mine employee, she says.

"In some situations, women still experience anxiety about their personal safety when working, while in others they may feel that they are 'tolerated under sufferance' and not given the respect they deserve in the workplace," says Skinner. "The transformation that is required is really about fostering a work environment that is attractive to women and one that recognises their contribution. Women also often place a heavy burden of expectation upon themselves, trying to meet an onerous range of responsibilities from family and motherhood, to their careers."

Vis Reddy, MD of SRK Consulting, believes that sexist attitudes still endure in some workplaces, undermining the progress of women in certain professions. "Employers need to recognise that cultural issues may also affect the professional environment, and must deal with this proactively. This bias can lead to women's input not being taken seriously, as they are not recognised and accepted as equal partners in the workplace. This status quo needs to be challenged so that glass ceilings can be broken," says Reddy.

Women advancement

As a leading group of engineers and scientists, SRK Consulting (South Africa) has worked hard for many years to create a supportive environment where women can grow their professional careers and advance within the business, says Reddy. This is increasingly reflected in the presence of women in various disciplines and management roles across the organisation – even in engineering fields that have traditionally been dominated by men. These include the disciplines of civil engineering, engineering geology, hydrogeology, hydrology and geochemistry.



Picture by Bruna Fiscuk on Unsplash

Mining should foster a working environment that attracts and retains women professionals across the various disciplines of the industry.

"This has been a proactive process over the years, with management taking on board the concerns and initiatives of our female colleagues. This has included internal forums and committees aimed at fostering a progressive and respectful culture among both women and men," explains Reddy.

"Our in-house leadership development initiative has been successful in empowering young women in their careers and supporting them in building leadership capacity. A strong element of this process is mentoring by our more experienced staff," he adds.

More recently, SRK has been an active participant in the International Women in Resources Mentoring Programme (IWRMP); this has allowed the mentoring of five women from across SRK's global practices, as well as the involvement of senior SRK professionals as mentors for women outside the organisation on an annual basis.

"People can learn a great deal from appropriate role models, and can work with them to build capacity; this can be done through one-to-one engagements with role models – even in other sectors or countries – or with 'distant' role models like public figures. Women should be able to talk to their managers about facilitating these links," reasons Reddy.

Having joined SRK over 20 years ago, Skinner says there has been significant changes achieved within the business, and to an extent within the broader industry. "In my experience," she says "SRK has played a leading role within the mining sector in creating a supportive culture for women. This meant at times making special efforts to change the prevailing perceptions of professionals in the workplace, as traditional views would often under-appreciate the views and contributions of women in a male-dominated environment."

is attractive to women

This has been important in a sector such as mining, adds Skinner, where issues of safety and even amenities such as bathrooms could not be taken for granted just a couple of decades ago. SRK's gender position today is to a large extent the result of the supportive environment it has created for women, and the unqualified response from management to address gender issues and ensure professional respect across the board.

Reddy believes that SRK's efforts have been successful, judging by the calibre of women that the company attracts to the business, and its ability to retain them as they progress their careers within SRK.

"In addition to providing a rewarding climate, we have also evolved our management practices to allow the necessary flexibility for women to balance their work and family priorities. Our approach to maternity leave, for instance, is based on improved benefits – as well as employment terms that encourage women to retain strong links with their profession and to sustain their careers during motherhood," says Reddy.

Helping women sidestep challenges

One of the ways SRK has helped women within its organisation sidestep challenges is through mentorship programmes. Mentoring within SRK – by women and men – has always been a valuable support for people like Skinner coming up through the ranks.

"It was also useful to participate in women-focused forums that were created from time to time within the organisation, where women could provide feedback or voice concerns. Most of the senior professionals who have supported and mentored me have been men, and their gender has not been an issue," she says.

In addition to the mentoring that takes place within SRK, says Reddy, SRK's senior staff also participate as mentors within the IWRMP. "This year, I have been mentoring a young environmental scientist on a mine in Zambia – guiding her in developing her leadership skills, confidence and technical expertise while generally planning her career goals. This kind of support is valuable in helping provide vision and also overcoming the range of obstacles that women in Africa often face in the workplace and industry," says Reddy.

Currently being a mentee in the IWRMP has been an eye-opener and a highly constructive opportunity for Skinner. Her mentor is based in the UK and performs a similar professional role to her own. "My mentorship journey has allowed me to learn a great deal about myself and provided the space to reflect on my career and progress. This can otherwise be overlooked among the busy daily demands of your work," she says.

In some situations, women still experience anxiety about their personal safety when working.

SRK, adds Reddy, has prioritised the creation of good guidelines and protocols within the company, so that employees understand what the company stands for in terms of gender equality. It has developed rules around fairness and respect, and apply these consistently to reinforce this message.

"Discipline is important for everyone to understand that discriminatory behaviour is not tolerated. Over time this has helped create a constructive environment that welcomes women, and this is shown in the way that our traditional gender-based division of labour has changed significantly," says Reddy.

Growing numbers

According to Reddy, the transformation focus within SRK has led to growing numbers of women in its ranks of both engineers and scientists, where they have increasingly filled leadership roles, especially over the past five years or so. "Our progress towards gender equality is measured mainly by our success in creating a working and learning environment that attracts and retains the best women professionals in fields relevant to our work," he says.

The success of the company's journey to date, adds Reddy, is reflected at board level – where two out of seven members are women – and among the partners, where the proportion of women is 20% and constantly rising. Of the five promotions to partner level in the past year, three have been women, and this ratio is likely to rise as SRK's senior staff , mainly male, retire. There is also a strong pipeline in the ranks of its associate partners, where four of the nine are women, which bodes well for the gender representation of the company's leadership structures going forward.

"It has been encouraging to see the number of women grow steadily in our strategic business units, a couple of which today have a majority of women incumbents. Two of our strategic business units are currently led by women," concludes Reddy. ■

UMS leads the way forward for women in mining

While it is clear that women in mining are a minority, and that long-term thinking is needed to increase accessibility and development of women in the mining sector, companies such as United Mining Services (UMS) are leading the drive towards inclusivity.

Takalani Randima, MD of UMS Shaft Sinkers.

Digby Glover, CEO of the UMS Group.

Digby Glover, CEO of the UMS Group, says that diversity has been one of the group's long-standing values. The company's two main arms, UMS Shaft Sinkers and UMS METS, have both been headed up by highly qualified, competent and experienced women for a number of years.

"This is unusual in the industry, but it shouldn't be," says Glover. "We use the right people in the right roles, who are appointed completely on merit. We source our employees from a diverse population of people, and as a result, our workforce is representative of that population."

He acknowledges that the shaft sinking business has been viewed as stuck in an industry that's seen very little evolution for decades in terms of how a business should operate, but the company's language has been shifting. UMS as a whole has been embracing new ideas to do things differently for some time. "We have been at the forefront of change in the underground mining industry, and this puts us in a unique position in this sector," says Glover.

"A large part of my role as the CEO of the UMS Group is to bring in the skills that will drive this change. I have brought in top-class people and they in turn have brought top-class people with them. We have started to assemble a team that punches far above our weight in terms of skills, know-how and experience required to do the work that we do, in order to accelerate our ability to do things better.

"It's all about people, and I'm making sure that UMS has the best, both in terms of bringing the right people in, but also in terms of looking after them once they are there."

Takalani Randima

Takalani Randima joined UMS in 2018 and is the MD of UMS Shaft Sinkers. Randima began her career in 2008 as a trainee engineer on a mine, only a few years after women were legally granted the right to work underground in South African mines, before moving through the ranks to her current position.

Randima holds a Bachelor of Mining Engineering and a Master of Engineering in Project Management and is well equipped to manage the highly skilled UMS shaft sinking and underground mining team. Her mining engineering qualifications are matched by real knowledge and hands-on industry experience while confronting on-the-job challenges. She has already led three major, highly successful shaft sinks, as well as numerous shaft and underground infrastructure projects.

"At school I excelled in science, and while all my classmates wanted to study medicine, I wanted to do something different. I won a science prize sponsored by a mining house and this got me interested in engineering which led me to being awarded a bursary from that mining house," says Randima. "Although my family were surprised at my career choice to do mining engineering, I have never looked back. What I really love about the mining industry is working with all the people; the adrenalin rush of facing different challenges every day and the need to think out of the box during problem solving. I love what I do!"

Snapshot of other women in mining at UMS

In her role as Group HR & Payroll manager at UMS, Esbé Miller focuses on establishing and managing strategic human relations/employee relations initiatives and has a direct operational responsibility regarding HR/ER.

"I grew up in Swartklip (Anglo Platinum Union Mine at the time), so I think mining was always in my DNA: approximately 80% miner and 20% Blue Bull," says Miller. "I have been very fortunate regarding the career exposure I have had thus far. After I graduated from university, I applied for the graduate programme through the Anglo Development Centre. I was placed at Union Mine as an HR graduate, where I was subsequently permanently appointed.

"I have been with the UMS Group for 15 years this July and it's never a dull moment. Working at UMS has provided me with learning experiences across various disciplines, not just within the HR fraternity. It's a fast-paced environment, where one gains experience in the local and international arena. One of the highlights of working at UMS is being part

of a team that was able to implement new strategies to overcome some of the industry challenges and ultimately positioning the UMS group where it is today," says Miller.

"Companies have all had trying times, some more than others, and we were no exception to experiencing turmoil. But sometimes, amid chaos, there is also opportunity. It takes continuous hard work and commitment from everyone, no illusions there, but it's worth it in the end. Maybe mining is not for everyone, and that is okay, but I think I am exactly where I am supposed to be."

Siphiwe Antonette Malepe recently joined UMS METS, having travelled a studious path to her current role as junior process engineer. After completing a National Diploma in Engineering that included a year of in-service training at Modikwa Concentrator Plant, she decided to further her studies and completed a Bachelor of Technology in Chemical Engineering where she was given an opportunity to mentor 10 first-year Chemical Engineering students.

At the time, she also published two academic articles and presented at the Planetary and Scientific Research centre. Further studies followed to obtain a Post Graduate Diploma in Project Management. Not quite done, Malepe expanded her career to pyrometallurgy and logistics at Samancor Ferrochrome during which time she completed her Engineer in Training Programme, before joining UMS METS where she is looking forward to learning plant commissioning.

"I chose to be an engineer because engineering gives me an opportunity to challenge myself and it gives me the space to think out of the box in the most creative and technical way," says Siphiwe. "Engineering is the centrepiece between the world we live in and innovation. The need for engineers expands with the ever-increasing demand for innovative solutions to better the conditions of the world, as we are like the wizards of society.

"I wanted a career that will allow me the opportunity to work with people who are as driven and skilled as myself, and that's ultimately why I wanted to become an engineer."

Nonjabulo Zikhali is a commercial contracts specialist at UMS, responsible for a wide variety of procurement and contracting duties such as drafting contracts, recommending the most suitable contract for a project, contract negotiations, and ensuring contractual, insurance and bonding requirements are met prior to contract execution.

Zikhali explains that while she was doing vocational work during her studies in quantity surveying, she was presented the opportunity to join a division that specialised in the construction of mineral processing plants. "My first-hand experience was when I was part of the site team helping to achieve a project of constructing a gold processing plant project in Ghana. I have not looked back since then."

UMS women in mining: Esbé Miller (front), Nonjabulo Zikhali (back left), Siphiwe Antonette Malepe (middle back) and Genevieve van Wyk (back right).

She adds that she hasn't encountered challenges in her career as a woman. "I wanted to be a professional in the engineering field and I went and did it. It was after I had started working that I realised that there were not enough women in the industry. My mentors were male so there were instances where I had to alter myself to fit in but that is a thing of the past."

She says the best part of her job is the feeling of accomplishment at the end of a project, and being part of a team that developed something valuable out in the world that creates employment for others.

As a junior mechanical engineer, Genevieve van Wyk assists with the preparation of annual budgets, designs, layouts, inspections and project installation, as well as helps plan, organise and control projects, and makes recommendations on alternative solutions to engineering problems. She got into mining when an opportunity to join UMS METS became available after she graduated.

"Two years ago, I was a graduate just starting to work and decided to join a company that was going through changes as business. Transitioning from a student to a working woman and navigating through a company that was changing was extremely challenging. Lucky for me, I enjoy a challenge," says Van Wyk.

"Since UMS has different divisions within the company, I have learnt about the different stages of mining from developing a mine, to mining, to processing ore. Having knowledge in the different stages of mining allows me to understand what happens downstream and upstream of a particular stage which allows for good engineering design.

"Over the past year, I have been involved in the design and procurement of various equipment for a shaft sinking project in Botswana. The highlight for me on this job is seeing an engineering design come to life through manufacturing. It is difficult to explain how exciting and eye opening that is." ■

Minerals Council marks second National Day of Women in Mining

On August 19, 2021, the Minerals Council South Africa marked the second National Day of Women in Mining, reporting back on progress achieved in the year since the initiative was first launched.

Nolitha Fakude, Minerals Council president and chair of the Women in Mining Leadership Forum.

Roger Baxter, Minerals Council CEO.

The first National Day of Women in Mining (August 21, 2020) aimed to spur the process forward within the Minerals Council leadership, in mining company boardrooms and within mining companies themselves and to put the advancement of women firmly on the agenda. Now, a year later, the leadership of the Minerals Council and of the Women in Mining Leadership Forum initiative report back on progress made thus far.

"A commitment to furthering the involvement of women in all aspects of the South African mining industry is something that should be front and centre for the leadership of all our member companies on a daily basis. And this commitment has to go far beyond the lip service of positive words and Women's Month campaigns. We expect to see the commitment bearing real fruit," says Nolitha Fakude, Minerals Council president and chair of the Women in Mining Leadership Forum.

It is encouraging to present this year's feedback under the theme of Women's Month, Generation Equality: Realising Women's Rights for an Equal Future. "So much of what we as an industry need to do to advance Women in Mining has to focus on young people – making the industry attractive to young women, giving them educational opportunities that open mining careers to them, transforming our workplaces to meet the expectations of a younger generation," says Fakude.

"We have much work to do, and we dare not fail. We are confident that the commitment which

Progress on foundational measures

Foundational Measure	Work done
FM1: Gender-based violence and feminicide	A survey was undertaken across member companies to determine the status quo as part of the goal of Zero Tolerance against GBVF. The insights from this survey will inform a proposed strategy on GBVF for the industry to implement.
FM2: Gender inclusive policies	A framework on development of gender diversity and inclusion policies was adopted by the Women in Mining Leadership Forum (WiMLF) and circulated to companies in May for adoption and a review of its adoption will be undertaken in January 2022.
FM3: Monitoring company performance on FMs	A dashboard which will track the progress of Minerals Council member companies' progress on achieving the Foundational Measures' KPIs has been finalised. The dashboard will be introduced to companies for the start of reporting this month.
FM4: Initiate unconscious bias training to transform culture	A strategy for use by the industry in tackling unconscious bias is being developed, with a provisional adoption date for the overall framework being in October this year.
FM5: Pulse check surveys	A pulse check survey has been developed and approved by the WiMLF and will be circulated to companies in September 2021. The results of the pulse check will feed into the overall Women in Mining strategy and be used to develop actions and focus areas for 2022.
FM 6 & 7: Personal Protective Equipment (PPE)	A survey of PPE and existing built physical environments was conducted in April and May 2021, as a gap analysis to determine the adherence of Minerals Council Member Companies to the MHSC code of practice guidelines on the provision of PPE specifically for women. Although the sample was not large, the findings of the survey illustrated that women still experience challenges with access to appropriate PPE and ablution facilities.

our members have shown so far will be translated into clear action. The future of mining depends on us committing ourselves to build an industry that is truly inclusive, internationally competitive and draws on the talents of women – now, and in the future."

Paul Dunne, vice president of the Minerals Council and Women in Mining Champion, adds that, "We are no longer at the point where a company can choose whether or not they want to be a part of this initiative. It is a business imperative at every level. And it is also a moral imperative. I am really pleased with the response we have seen from so many Minerals Council member companies over the last year – not just getting involved in the discussions but doing the hard yards of assessing the reality on the ground and working to implement change."

Despite the focus on diversity and inclusion in the past two decades, women continue to be vastly under-represented at all levels in the mining sector.

Stakeholder engagement

Considerable effort is also being put into developing wider stakeholder relationships, with institutions including the Department of Mineral Resources and Energy; the Mine Health and Safety Council; the Mines Professional Associations' Secretariat; Women in Mining South Africa; and the Southern African Institute of Mining and Metallurgy. A first Women in Mining Stakeholder Forum was held in April 2021, with a focus on establishing working relationships, agreeing areas of commonality, and developing collaboration possibilities – as well as ensuring that duplication of effort is minimised. A second forum is planned for later in the year.

"The Minerals Council calls on all member companies to fully engage with and commit to supporting the Women in Mining initiative, given its importance for the future and viability of our industry. Quite simply put – if we do not get this right, then the future of the industry is under threat. So many of our members do see this, especially at an executive level, but there is a gap between the theory and the practice, which we need to see closing. I am convinced that this gap is being closed as we speak, and that visible, tangible change across the industry is within reach," says Minerals Council CEO, Roger Baxter. ■

thyssenkrupp sells mining business to FLSmidth

thyssenkrupp has announced the sale of its Mining Technologies business unit to Danish company, FLSmidth, thus reaching a further important milestone in the initiated realignment of the group. The enterprise value is €325-million. The transaction is subject to competition authority approval. The closing of the transaction is expected within the next 12 months.

The Mining business was allocated to the Multi Tracks segment in October 2020 in order to find a new owner. With the sale, thyssenkrupp is successfully divesting the first major portfolio company in this segment. The business unit currently employs some 3 400 people and generated sales of around €0,8-billion in fiscal year 2019/2020.

The sale is an important step in the initiated transformation of the group and the associated focusing of the portfolio. The aim is to transform thyssenkrupp into a high-performing "group of companies" with independent businesses, a lean holding company and a focus on systematic performance improvement across all businesses.

"The successful sale of the Mining business shows that we are pressing ahead at full speed with the transformation of thyssenkrupp and achieving important results step by step. But we have not yet reached our goal. The principle 'performance first' continues to apply. We need to return to positive cash flow as quickly as possible. The sale of Mining Technologies makes an important contribution to this," says Martina Merz, CEO of thyssenkrupp AG.

"At the same time I am pleased that we have found a very good new owner in FLSmidth. FLSmidth presented a convincing business strategy and a clear vision for the Mining business. It will give our employees attractive prospects. That was extremely important to us when negotiating the sale," says Merz.

The successful sale of the Mining business shows is an important step in the transformation of thyssenkrupp.

The tie-up with FLSmidth, a listed company from Denmark and one of the world's leading suppliers of technologies for the mining and cement industries, will create a strong player with a global presence and leading solutions along the entire mining business value chain. A particular focus is on green technologies that can significantly reduce resource consumption and emissions in the mining industry. FLSmidth also has great expertise in taking over companies and has proven highly successful in integrating these companies.

Thomas Schulz, CEO of FLSmidth, says: "thyssenkrupp's Mining business is an ideal addition for FLSmidth. We are particularly impressed by the capabilities, expertise and reputation of the thyssenkrupp employees, especially in projects and products. The large global installed base offers great potential for the service and aftermarket business. We have similar business models, share a strong focus on sustainability and digitalization and our corporate cultures are a good match. As a result, I am very much looking forward to combining our strengths; I am convinced that together we will play a leading role in shaping a zero emission future for the mining industry and in creating sustainable growth for our customers, employees and shareholders." ■

Bentley Systems announces Seequent's acquisition of Imago

Bentley Systems, Incorporated (Nasdaq: BSY), the infrastructure engineering software company, has announced that its Seequent business unit has acquired Imago Inc, a developer of cloud-based software for the capture and management of geoscientific imagery. The acquisition will expand Seequent's technology solutions portfolio while boosting cloud capabilities to help geoscientists and engineers solve earth, environment, and energy challenges.

Imago's cloud-based platform enables the capture, cataloguing, and review of drilling core and chip images from any source, to support every aspect of the geological process from exploration to grade control. Continued development of Imago's machine learning will lead to a step function in the interpretation of geological data.

Mining companies around the world apply Imago's solution in conjunction with geology data management and modeling tools to enable teams to make more confident, profitable decisions using instantly available, high-quality images. Seequent already integrates its Leapfrog, Oasis montaj, Target, and Minalytix MX Deposit with Imago's solution, making it easy for geologists, engineers, and other stakeholders to extract knowledge and learn from geoscientific imagery. The goal is to unlock significant potential for mining and other industries, transforming image data into meaningful insights for geological activities.

Graham Grant, chief executive officer of Seequent, says, "It's an exciting step to welcome the Imago team on board to help advance Seequent's progression into the cloud. We're continually exploring ways to provide new technologies and solutions to solve workflow challenges, improve operational efficiency, and deliver greater value for our users who are working to solve some of the world's major civil, environmental, and energy challenges. This acquisition demonstrates Seequent's continued growth and our commitment to make a positive contribution to the industries we serve globally." ■

BME well-aligned with mining's safety, sustainability vision

As the mining sector looks ahead to a brighter and more sustainable future, Omnia Group company BME has built a strategic foundation to support its mining customers' ambitious vision for the future.

While southern Africa's mining sector was still not where it was seven or eight years ago, there has recently been improved industry performance in minerals such as gold, iron ore, platinum group metals, manganese, copper and cobalt. According to Ralf Hennecke, BME SADC MD, this is having a particularly positive impact in areas such as South Africa's Northern Cape province and on the Zambian copper belt. There are even prospects of mines reopening in Namibia if the uranium price continues to strengthen, he notes.

BME's used oil truck collects used oil from customers.

"Countries like Botswana have also seen better conditions in their mining industry, with increased copper and coal mining activity and the likelihood of diamond prices recovering," says Hennecke. "The mineral potential of Zimbabwe remains significant, and there is certainly an expectation that mining will play a stronger role in its economy in the medium to long term."

To fully support this growth, he notes that it is no longer enough for supply partners in mining to just deliver their offerings. In addition, they need to actively participate in supporting mines' safety and sustainability priorities through their own actions.

Aligned with the broader Omnia Group vision of "protecting life, sustaining livelihoods and leaving a better world" "BME strives to promote a sustainable environment, for instance, as integral to our core offerings," says Hennecke. "This includes our safety record, our innovative disposal of used oil and our commitment to renewable energy."

The company's safety performance was recognised last year by the Chemical and Allied Industries Association (CAIA) with an award for sustained safety performance. BME's world-class recordable case rate of 0,11 compares well with peers in its market segment.

"We have continued to incorporate used oil as a fuel agent in our emulsion explosives, which has direct benefits for customers and the planet," he says. "We collect this oil from mining customers, providing a valuable disposal service while reducing their environmental risk related to any potential soil or water contamination."

BME has also been taking steps to reduce its own carbon footprint with initiatives that include the progressive installation of renewable energy across its manufacturing and assembly plants. Hennecke also highlights the company's recent launch of its Blast Alliance brand – representing leading digital technologies that improve on-mine efficiencies. This in turn supports mines' efforts to reduce energy consumption and lower their carbon emissions. ■

Another Lokotrack for SPH Kundalila platinum crushing contract

Leading crushing and materials handling contractor SPH Kundalila has reaffirmed its faith in Metso Outotec crushers by putting to work another Lokotrack LT120 from local distributor Pilot Crushtec.

The Lokotrack LT120 mobile jaw crushing plant, acquired early in 2021, has been added to SPH Kundalila's crushing fleet at an opencast platinum mine near Rustenburg in South Africa's North West province. The company has been conducting crushing operations for the customer on that site since 2013, although it was contracted for other activities there since 2010

"The new machine is part of our ongoing plant renewal process, ensuring that our fleet performs optimally with high uptime levels," says Graeme Campbell, group commercial manager at SPH Kundalila. "We already have four of these models on other operations, and they have all been strong and reliable production units."

The crushing fleet on this project processes 350 000 to 400 000 tonnes of platinum ore per month for the mine's mineral processing plant. Material entering the crusher can be sized up to 800 mm in size, which is reduced to a product of 250 mm or less for transportation to the plant.

The mobility of the track-mounted LT120 provides the necessary flexibility that the mine requires to maintain a consistent grade for the plant, moving crushers when necessary to treat ore from different locations on site.

According to SPH Kundalila operations manager Dean Zeelie, the experienced team is able to relocate the crusher in as little as half an hour, while providing significant savings by avoiding additional load and haul costs.

Zeelie says that the Metso mobile crushers have proved themselves as reliable performers in front-line, hard-rock applications in SPH Kundalila's contracts, with one unit notching up almost 25 000 hours to date.

"The Metso technology allows us to closely monitor machine running time and operating time, so that we can schedule regular service interventions," he says. "Our on-site maintenance team ensures that all delivery targets are met, as our role in maintaining mine throughput is vital."

This disciplined approach allows these mobile crushers to be completely refurbished at SPH Kundalila's rebuild workshop in Potchefstroom at long-term intervals. This enhances reliability and lowers the total cost of ownership.

The close relationship between SPH Kundalila and Pilot Crushtec goes back over 23 years, says Campbell, with the company investing in Metso crushers since 2007. He notes that they collaborate at early stages of potential contract opportunities when Pilot Crushtec will assist with testing and will then provide recommendations on the most suitable equipment for a job. He says Metso's Bruno simulation software is also a valuable tool that the company utilises for finding optimal solutions for its projects. ■

The Lokotrack LT120 mobile jaw crushing plant has been added to SPH Kundalila's crushing fleet at an opencast platinum mine near Rustenburg in South Africa's North West province.

Metso Outotec launches thickening and clarifying solutions

The solutions feature a sustainable design and capabilities to provide safe and reliable operations.

Metso Outotec is introducing a comprehensive portfolio of thickening and clarifying solutions to achieve new levels of operational reliability and performance in minerals and metals processing. The solutions continue to set the industry standard with state-of-the-art high-rate thickeners, high-compression thickeners, paste thickeners, inclined plate settlers and clarifiers.

"We are excited to launch our combined thickeners and clarifiers portfolio to the market. This portfolio is designed to help our customers unlock the full potential of their dewatering process. Our solutions provide high process performance, facilitate efficient operation, and feature a robust design, enabling increased uptime," says Brian Berger, vice president, Thickening and Clarifying solutions at Metso Outotec. "With the combination of these features in the portfolio, our customers can align their profitability and sustainability targets."

The thickeners and clarifiers offering is supported by a global network of service experts to ensure that maximum efficiency is continuously delivered by the equipment and plants. Metso Outotec's services offering includes everything from comprehensive onsite tailings management audits, engineering, spare and wear parts, maintenance services, and remote operation capabilities. ■

BELAZ presents prototype all-electric dump truck

BELAZ is one of the first OEMs in the world to present a prototype of an all-electric mining dump truck, the BELAZ-7558E. This is a completely new type of mining haul truck, featuring batteries instead of a diesel engine.

The operation of such type of truck is economically profitable – the cost per ton is much lower compared to the traditional diesel-powered trucks of the same capacity. But, most importantly, this technology allows to completely avoid harmful emissions into the atmosphere and improve the carbon footprint on sites where these trucks will be utilised.

BELAZ has been working on this battery-powered dump truck concept for several years already, and an experimental prototype of this innovative machine was released at the end of last year. It was branded the 7558E BELAZ truck.

The electric mining dump truck is based on the BELAZ-7558 family, with a payload capacity of 90 t and a nett weight of 76 t. It can reach a maximum speed of 64 km/h. This is the most compact model of all mining dump trucks of the world's leading brands that are equipped with an AC/AC electromechanical transmission. With the drive train already electric, the challenge was basically to have enough energy storage capacity and controlling the energy.

The chosen battery type is lithium-nickel-manganese-cobalt-oxide batteries. They will be installed (on present production models) in the engine, alternator, fuel tank and cooling pack bay. In total there are 15 batteries with a combined energy capacity of 675 kWh. The rated power of the power plant is 640 kW.

This is a completely new type of mining haul truck, featuring batteries instead of a diesel engine.

The power reserve on a single charge will be at least two hours with a full load of 90 t and on uphill hauling on slope of no more than 10%. After several cycles "loading – transporting – unloading", it will be necessary to recharge. The operating time of a dump truck between recharges depends on the operating conditions. With downhill hauling, a charge will last for 8 hours, if uphill hauling, a charge will last for two hours. Charging is quick, about 20 – 30 minutes is required for a full charge from a special recharging station. The manufacturer of the batteries installed on the prototype BELAZ-7558E is a South Korean company.

Prototype testing is expected to be completed during the last quarter of 2022. Production of this electric truck will start in 2023 already. According to marketing experts, BELAZ will be able to sell at least 20 such electric dump trucks annually at first. ■

Outlook strong as Weba supplies through pandemic

Momentum is picking up in demand levels from the commodities sector for companies like Weba Chute Systems, who has been able to quickly adapt to COVID-19 conditions.

According to Mark Baller, MD of Weba Chute Systems, the past financial year certainly had its challenges, but performance was better than expected and, more importantly, the outlook for the future looks robust. The company has embraced remote working and digital communication technologies, ensuring that orders are fulfilled both locally and abroad.

"Among the exciting projects we have been able to pursue despite the pandemic is the supply of transfer chutes to a Turkish gold mine expansion," says Baller. "We already have about 40 chutes in this plant, and have manufactured and delivered another batch recently – making up the bulk of chutes operating in this facility." Work in the southern African region has forged ahead, spurred on by an active manganese sector in South Africa's Northern Cape province, where Weba Chute Systems has been integrally involved for the past two decades. At one mine expansion, the company has supplied over a dozen of its custom engineered chute systems.

There have also been sales into Zimbabwe's platinum sector, which shows considerable promise for further growth in the near future. While the diamond industry has not been having an easy time, Weba Chute Systems has continued its relationship with producers in Botswana, both in the maintenance of equipment and in the occasional supply of new units. Ongoing business continues to come from mining customers in the Democratic Republic of Congo and Namibia. ■

Decades of innovation elevate Warman mill circuit pumps

Doing duty as an integral part of a mine's minerals extraction circuit, Weir Minerals' Warman mill circuit (MC) slurry pumps withstand the harshest conditions while delivering their mission-critical function.

Marnus Koorts, Weir Minerals Africa's product manager for pumps, emphasises that a mill circuit pump must deal with relatively large rock fragments from the primary mill, which can rapidly wear the pump's throat bush, impeller and volute liner.

"If this installation is not optimised, the abrasion could reduce the pump's wear life to a matter of weeks," says Koorts. "The significance of wear life is high, as the whole mill circuit comes to a halt when the primary mill's circuit pump stops – potentially affecting minerals extraction for the whole mine."

The Warman mill circuit pump is designed to withstand the harshest conditions.

He highlights that the company's Warman MC pump range is regarded as a global flagship for the mining sector, evolving over more than eight decades of continual development and innovation. A considerable portion of Weir Minerals' total R&D investment – which sees 1,3% of its total global sales being ploughed back into product improvement – is directed toward these pumps.

"Over the years, we have developed many unique and ground-breaking innovations," he says. "For instance, we developed the adjustable throatbush, a technology that we have advanced ahead of our competitors."

This innovation optimises the efficiency of the pump, ensuring that the gap between the rotating impeller and the casing is kept at the minimum specified. This, in turn, reduces recirculation and ensures that the pump's operating efficiency is routinely restored.

The addition of deep expelling vanes on the high-pressure side of the throatbush diminishes the formation of eddies, which means less turbulence and better hydraulic efficiency. Minimising recirculation also cuts the pump motor's energy consumption, generating savings on electricity costs that quickly justify the investment on a Warman pump with this capability. ■

14th overhead crane for Black Mountain Zinc

Cape Town lifting equipment company BB Cranes has secured an order for the 14th overhead crane to be installed at Gamsberg Zinc Mine in Northern Cape Province.

The 13 cranes already installed were designed and manufactured in Johannesburg by BB's parent company, Condra.

Placed by Mota-Engil, the order is associated with a contract signed between this Portuguese mining and construction group and Black Mountain Mining for further drilling, excavation and transportation work at Gamsberg.

Black Mountain Mining is the mine owner. The 13 cranes already installed were designed and manufactured in Johannesburg by BB's parent company Condra. They were installed by BB Cranes. The first 11 were delivered to the mine during its initial development in 2017, and a further two units were commissioned as a separate order last year.

There are currently two 10-t double-girder overhead cranes in service, one 40/8 t crane also of double-girder configuration, a number of 5-t single-girder machines and various hoists and lifting beams.

The latest crane for Gamsberg Zinc will be a 20-t, double-girder electric overhead travelling crane once again of Condra design, but this time manufactured by BB Cranes at its Cape Town factory.

To be delivered in September 2021, it will span 18,2-m and deliver a 12-m lifting height over a long-travel distance of 40 m. The crane will be used for maintenance and repair duties in Mota-Engil's workshops.

BB Cranes will manage manufacture, then deliver, install and commission its latest order as a turnkey project, supporting it with technical service and maintenance from Cape Town. The company has managed the lion's share of Gamsberg Zinc's crane maintenance requirements since the first machines were commissioned.

Three to four service teams are available to all BB customers, one of them on round-the-clock standby. The company employs two lifting machinery inspectors for certification. ■

Zest WEG's electrical installation for platinum mine expansion

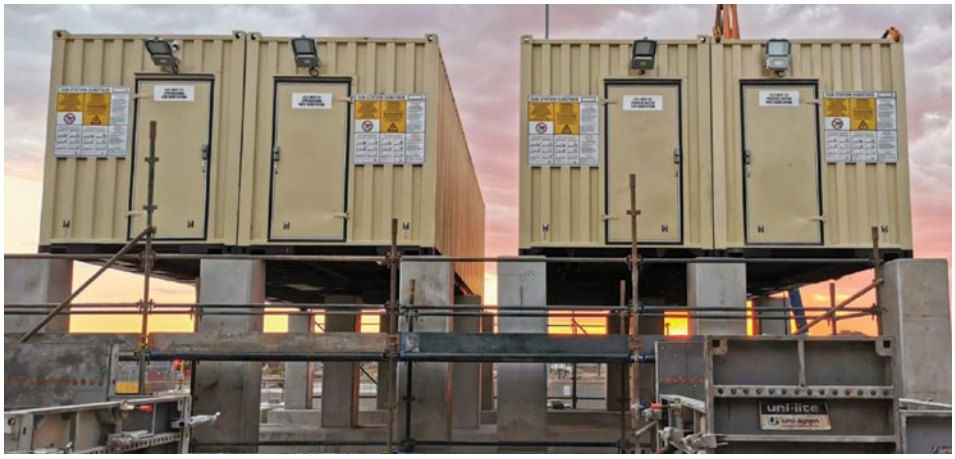
Zest WEG is installing a range of electrical control and instrumentation equipment at Anglo American Platinum's Mogalakwena mine in Limpopo province, working closely with engineering group DRA Global.

The construction is taking place within the Mogalakwena mine's existing North Concentrator Plant, around various plant areas. The Electrical Control Instrumentation (ECI) package is being led by Eben Kleynhans, E&I electrical project engineer from DRA.

According to Calvin Fisher, electrical and instrumentation construction proposals manager at Zest WEG, the Zest WEG work is being conducted for the mine's Coarse Particle Rejection (CPR) plant, and will be completed in the second half of 2021.

"In addition to applying the highest level of workmanship and professionalism, we are carrying out the project in line with our client's Mining Charter requirements on local procurement," says Fisher. "This means that over 70% of people involved in our scope of work will be drawn from local communities, and we are sourcing a significant level of our supplies from local businesses."

Equipment to be installed includes three 2 MVA transformers, stepping down from 11 kV to 550 V, and a 630 kVA mini substation for lighting and small power requirements. Containerised Motor Control Centres (MCCs), complete with Variable Speed Drives (VSDs), an HVAC unit, cable racking, cables, lighting and small power also form part of the scope of supply. In addition, two backup generators will be installed – one of 630 kVA capacity and the other 330 kVA.



Containerised Motor Control Centres form part of Zest WEG's scope of supply.

"The three new containerised MCCs and VSD sets will be placed on plinths near the CPR feed tank, CPR process water area and CPR building and a steel roof structure erected over the containers," he says. "The new transformer bay will be constructed next to the MCC, also with a roof over the transformer."

About 70 km of cable will be laid – ranging from low voltage to medium voltage cable – as well as 3 300 terminations and almost 2,5 km of cable racking. The various structures that Zest WEG will install require some 9 t of steel. The instrumentation to be installed will comprise about 170 instruments including flow transmitters, pressure gauges, level switches, temperature gauges and density transmitters. There will also be around 250 lights installed, mainly outdoors.

Fisher notes that the electrical installation specialists are typically among the last contractors on a project, and must be quite flexible to accommodate certain modifications that may have been required in the civils, structural and mechanical work completed beforehand.

"Wherever necessary, we work closely with the client to implement the plan smoothly while meeting their need for safe access to the equipment being installed, to allow maintenance to be readily conducted," he says.

Champion Iron to partner Caterpillar for advanced drilling tech

Champion Iron Limited has signed a letter of intent with Caterpillar to implement artificial intelligence-based advanced drilling technologies on Cat equipment at its Bloom Lake Mine.

The project will progressively implement a remote-controlled, semi-autonomous and fully autonomous Cat electric drilling fleet, utilising the technologies engineered, designed, and/or integrated by Caterpillar.

With Champion contributing its experienced workforce, and Caterpillar's independent dealer, Toromont Cat, its aftermarket support, the collaboration will aim to optimise Bloom Lake's operational productivity and reduce energy consumption, while demonstrating the capabilities of Caterpillar's advanced drilling technologies.

A Drill-to-Mill strategy (D2M) is expected to be deployed based on a series of tightly integrated systems, driven by Cat MineStar solutions, designed to optimise the drilling, loading and hauling processes. D2M is focused on delivering improved milling performance by supplying optimised mill feed, while contending with dynamic operational conditions.

Using real-time data, artificial intelligence and analytics, Caterpillar's integrated technology will support Champion's ability to assess the status of machines, technologies, and material to enable more timely and accurate operational decisions and consistent execution across Champion's entire mining value chain.

A Drill-to-Mill strategy is expected to be deployed based on a series of tightly integrated systems, driven by Cat MineStar solutions.

The goal of the collaborative effort will be to deliver a fully integrated drill-to-mill technology solution powered by data connectivity and advanced analytics to ultimately improve workflow between the mine and plant, providing a more efficient end-to-end enterprise process that delivers more consistent raw material for final product specification requirements.

The future of mining: how do we ensure technology is embraced?

Discussions about the future of mining are not complete without a focus on technology. Like many other industries, technology is launching mining into a new era where sustainability, diversity and innovation are the norm. In order to make mining operations fit for the 21st century, they need to overcome certain bottlenecks by embracing technologies that can make them safer and more efficient while reducing their overall impact on the environment. By *Kevin Pietersen*, partner at Hogan Lovells.

Kevin Pietersen, partner at Hogan Lovells.

Recently, Hogan Lovells, in collaboration with Africa Legal, the leading online thought-leadership platform for professional services in Africa, surveyed more than 400 professionals across the mining community and interviewed some of the world's leading mining experts on the future of mining. This resulted in the publication of three reports, the third of which focuses on technology.

The influence of technology on the future of mining has vast potential. With the adoption of deep technology such as data analytics, robotics, automation and artificial intelligence, mining companies can start to develop new ways of extracting minerals in remote locations, improve health and safety practices, and drive the transition to renewable energy. As mines across the continent mature and drilling becomes harder, technology will extend mine life by enabling existing resources to be maximised, and new development assets to be found, and unlock greater value for all stakeholders.

Pushing the envelope

Research and development is currently ongoing around the world to push the envelope of what is possible for the future of mining – from fully autonomous mines with driverless vehicles and robotic machinery to innovation that can reduce waste by repurposing mining by-products for other commercial uses. The possibilities that are opened up by deep tech adoption and the desire to continue to innovate, are truly exciting and promise to be genuinely transformative.

The adoption of new technology is a must-have for mines as it is part of a company's social licence to operate, given that companies are under pressure to operate in an environmentally friendly manner. Many new technologies present several eco-enhancing incentives including health and safety, carbon emissions and water impacts. Technology also means efficient production for mining companies. This is a good incentive for them to adopt new technology, and dominant mining companies have already embraced technology in their operations.

Implementing some technologies, however, will also change the nature of the employment opportunities available. Mining companies rely on local communities as a labour resource. The areas where most mines are located have an education system that is lacking to cover the new age jobs that are technology-focused. This presents difficulties for on-the-job training for new jobs that would otherwise benefit the local communities. Our survey results found that 69% of respondents believe skills gaps are the greatest future risk to further technological integration in the mining industry. Another issue is that adopting technology will in most instances result in loss of jobs, as current employees have skills linked to the way the mining company currently runs. Adoption of technology therefore often becomes an emotional and political issue, which is understandable. However, when it comes to accelerating innovation, we should also bear in mind the facts, available data and business needs.

Collaboration is key

To address this skills gap, collaboration is key. Mining companies can work together with universities by making use of the research that the university provides for the industry. Further, mining companies should work with civil society to educate and encourage STEM subjects to attract more of the local community to qualifications in fields relating to mining. The government also plays a key role, especially in developing countries. Often where there is large-scale mining, the government receives foreign direct investment. The government may then proactively create research and educational opportunities to increase the quality of the local workforce.

Accelerating innovation is one of the primary ways that we can ensure the mining industry is future fit, has longevity, and is environmentally responsible. This is why it is so critical that we empower people who work in the mine with new skills so that they too can benefit from the new lease on life that technology can give this sector. The best way to achieve this is through a partnership with all stakeholders. ■

Index to advertisers

Marching to maximum efficiency

We partner with you over the lifetime of your plant, driving continuous process optimisation to enhance plant efficiency and lower your overall cost per ton.

That's why the world's leading mining houses use Multotec mineral processing equipment.

MULTOTEC

Constantly working to lower your cost per ton

www.multotec.com

+27 11 822 1777 | enquiries@invalve.co.za

invalve.co.za

INVINCIBLE VALVES®
SINCE 1982

If its not INVAL®, it's not Invincible

TRUST IS WHAT MAKES OUR NAME OUR PROMISE.

Major industries in South Africa and globally trust Invincible Valves to continually innovate and invest in valve solutions for their industries.

With in-house rubber lining services for valves, pipes, fittings and vessels, we are able to offer complete service, maintenance and reconditioning services with exceptional service, pricing and quality standards.

The bond we have with our customers, coupled with world-class facilities means that the Invincible Valves team is able to continually provide customers with our enhanced services that leads to their profitability.

GENERAL INDUSTRY | MINING | PETRO-CHEMICAL | POWER GENERATION | WATER | SEWERAGE

LEVEL 2
BBBEE