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MINING REVIEW AFRICA

Minerals

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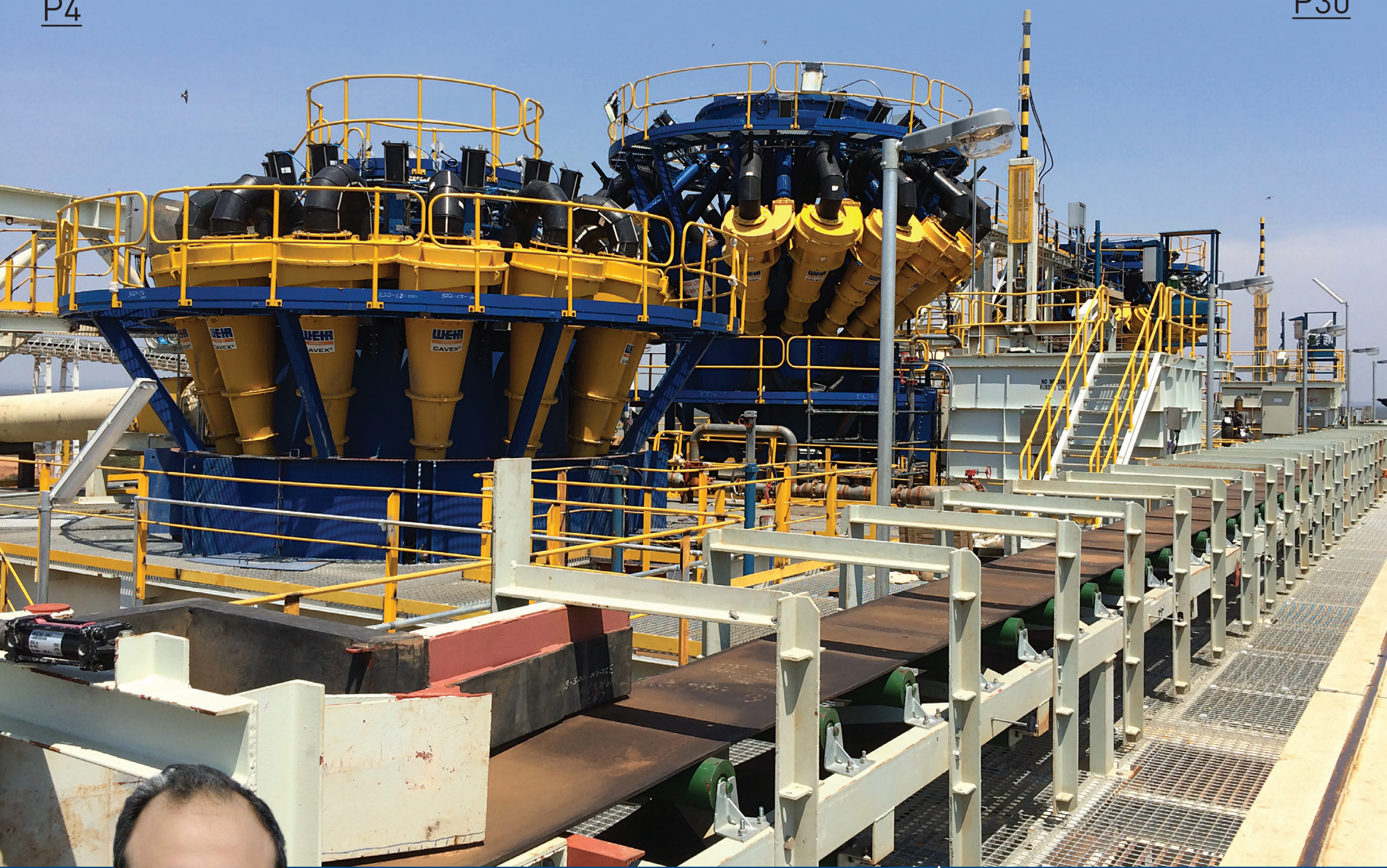

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Ahmed Abdel-Hakam, senior associate at Eversheds Sutherland

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The recent launch by Weir Minerals of its second-generation Cavex 2 hydrocyclone marks a new era in separation technology.

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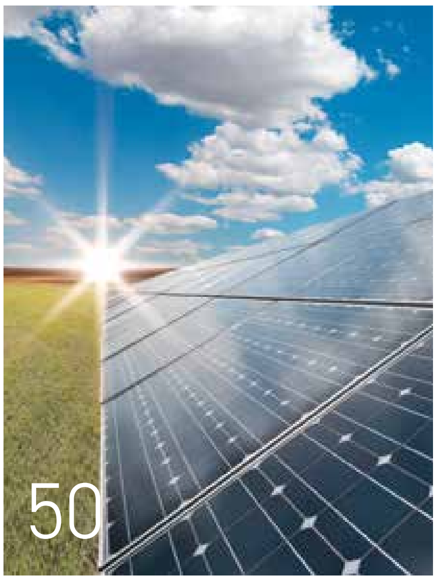

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Renewable energy

Miners fulfil the 'E' in ESG

And so we've officially turned the first page of our 2021 story – the year is no longer new. In fact, we're just a stone's throw from entering the second quarter of this calendar year.

Time truly flies when you're working from home and spending the majority of your day on Zoom or Teams. So much so that I've started contemplating asking the industry, not only about production figures, but also about percentage of time spent talking to colleagues on screen, or the number of virtual meetings conducted over the last month. I have no doubt those would be impressive statistics, depending on how you look at it, of course.

Regardless of our working circumstances, we have lots of reasons to feel upbeat right now. Commodity prices, generally speaking, are performing well, and our 'new normal' has almost become so normal that we no longer need to discuss COVID-19 in every conversation. These two points alone are enough cause for celebration.

Having painted the circumstantial picture I'm sure most of us can identify with, it's time to ask, 'What has my attention right now?' An important question whose answer lies in maximising on new opportunities that have revealed themselves over the last year.

For our industry, one overriding 'catchphrase' comes to mind, and yes, you guessed it – ESG. Such a commonly used acronym that I have no need to write it out in full since we all know what it is and we're all adjusting our business models to ensure we are ticking the 'E', 'S' and 'G' boxes.

It is of course a loaded acronym, and refers to a lot of different elements within our businesses. In this edition, we have covered one part of the 'E' – environment – and delivered a comprehensive overview of our industry's quick shift towards renewable energy.

Wind back the clock just two or three years and you would likely find green energy a low priority agenda item. Today, it has made it onto the top 10 list. You only have to read our article on page 58 to see just how many miners have already invested in this cleaner energy source, and more and more will follow.

The world and its investors are demanding a green footprint from industry and renewable energy is one way to achieve this; and it offers the added financial benefit of reducing operating costs quite substantially. Not to mention the reliability factor that producing your own energy delivers. This is something quite important in Africa where state-owned utilities continue the struggle to get it right.

Interesting then that we have brought coal and uranium into the same edition. How do these commodities fit into our energy future? I can only entice you to read the articles in this issue and find out what the experts – miners, funders and service providers – are saying.

No doubt you'll find this edition of ***Mining Review Africa*** a worthy read! MRA

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The new Cavex 2 hydrocyclone maintains the 360° laminar spiral design that was successful for the pioneering Cavex model

New generation Cavex hydrocyclone

Raising the separation bar even higher

The recent launch by **Weir Minerals** of its second-generation Cavex 2 hydrocyclone marks a new era in separation technology, according to **LERATO RAMANALA**, hydrocyclones product manager for Africa and the Middle East at Weir Minerals Africa.

"Built on the global success of our first Cavex hydrocyclone, which we introduced in the 1990s, we can now offer customers increases in their operational and circuit capacity of up to 30%," says Ramanala.

She highlights the worldwide success achieved by the pioneering Cavex model, based on its 360° laminar spiral inlet delivering reduced turbulence and improved separation. This has led to the rapid growth of its installed base globally, including throughout Africa.

The laminar spiral inlet geometry design provides a natural flow path into the Cavex hydrocyclone. Its unique shape has no sharp edges or square corners, allowing the feed stream to blend smoothly with rotating slurry inside the chamber. The result is greatly reduced turbulence throughout the entire hydrocyclone, creating even wear, long life and increased classification efficiency.

Design improvement

"The Cavex 2 hydrocyclone has further improved on this design," she says. "The LIG+ advanced laminar spiral inlet – together with the size of the feed chamber – reduces turbulence and allows the hydrocyclone to classify considerably more feed slurry."

Longer residence time for the slurry and lower turbulence are key to the performance of the Cavex 2 hydrocyclone. The increased slurry capacity – combined with the benefits of having an unchanged footprint – gives the Cavex 2 an enhanced performance that is unmatched by any hydrocyclone in operation today, Ramanala asserts.

Having the same footprint as the original Cavex or competitor cyclones allows Cavex 2 upgrades and retrofits to be easily applied without requiring changes to plant infrastructure.

"This means, for instance, that a plant does not need a new cluster, distributor, overflow launder or underflow launder when retrofitting for higher throughput," she says. "With spools and the new hydrocyclone, the upgraded system is ready to deliver."

Flexibility

Ramanala emphasises that operational flexibility is another important benefit from the added capacity of the Cavex 2 hydrocyclone, especially where plants are required to push their production and run all cyclones to their limits.

"Taking the example of a system in which 12 hydrocyclones are nested, it is preferable that only nine to 10 are operational at a time, so that maintenance can be carried out on two to three of them without disrupting the operation of the plant," she says. "Now, with the extra throughput enabled by the Cavex 2 hydrocyclones, there are always some units which can be taken offline for maintenance while plant throughput requirements are still being met."

This means that a Cavex 2 upgrade is not just relevant for plants wanting to increase their throughput, she argues. It is equally applicable for a plant that needs to regain its standby capacity, so that it is able to take certain items offline on a regular basis for planned maintenance.

With the recent buoyancy of certain commodity prices, she expects more mineral plants will be looking for ways to boost production and maximise returns.

"This is certainly a good time for a plant to extract more value through improved separation and throughput, and Weir Minerals Africa can help them do this," she says. The company's hydrocyclones are currently well employed in gold, platinum, chrome, coal, minerals sands, iron ore, manganese, potash, lithium, diamonds, zinc and copper mining operations. While new projects such as gold mines in West Africa have been an important customer for Cavex cyclone units over the past decade, there has also been significant take-up of retrofits in Brownfields projects, notes Ramanala.

Positive results

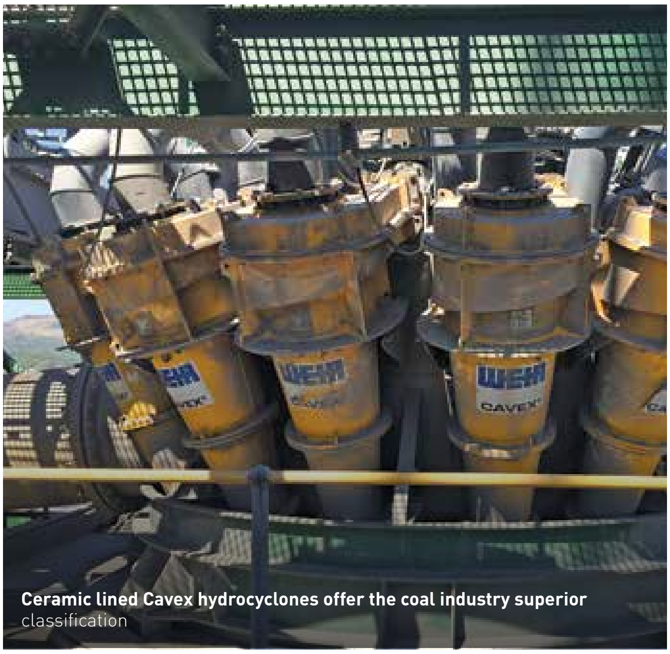
The Cavex 2 hydrocyclone maximises plant recovery by reducing the quantity of misclassified particles. Empirical evidence to date has shown an average improvement of the alpha parameter in excess of 10%, while the bypass has improved by an average of over 15%.

"Efficiency is further enhanced by fewer fines being returned to the mill," she says. "Our latest technology also assists mines with their efforts to reduce their carbon footprint, as less energy is consumed for small particle reduction."

"Our latest technology also assists mines with their efforts to reduce their carbon footprint,"

LERATO RAMANALA


The new Cavex 2 hydrocyclone cluster installed at a mine in Russia



Ceramic lined Cavex hydrocyclones offer the coal industry superior classification

As mines look to leverage digital technology in pursuit of more streamlined and productive operations, Weir Minerals Africa can also add value on this front through Synertrex technology, which makes the Cavex 2 hydrocyclone an intelligent product.

Synertrex is the company's in-house industrial internet of things (IIOT) technology which detects sub-optimal operating conditions in real time and improves its overall performance.

Digital advance

"For our new hydrocyclone, this means that performance can be further enhanced through a Synertrex-enabled monitoring system to detect sub-optimal conditions such as roping and semi-roping," she says. "Synertrex facilitates the continuous and efficient operation of the hydrocyclone as it can foresee risk and enhance performance."

Using cloud computing, the system draws data from smart sensors on the equipment, gathering critical operating data for advanced analysis. The data is transformed into powerful insights of the discharge condition which are relayed to the customer through a digital interface.

This allows for the identification of potential problems before they occur, reducing downtime and optimising equipment performance. It also paves the way for more remote management and simplified maintenance.

The Cavex 2 hydrocyclone has increased throughput with lower turbulence and reduced wear

Liner design

When dealing with highly abrasive substances, heat or pressure, the durability of the materials used in the hydrocyclone is critical to the longevity of equipment's wear components.

Liners are available in a range of materials including industry-leading Linatex premium rubber and other robust Weir Minerals natural rubbers – such as R55 – which are known to outlast competitors' elastomers in similar applications. The inclusion of metal and ceramic liners that are suited to the most aggressive applications can further extend hydrocyclone wear life.

An important factor in minimising turbulence has been the fine-tuning of the liner shape, resulting in longer life, less downtime for maintenance and lower total cost of ownership.

Liners can be replaced using a 'snap-in' system which requires no adhesive. Smaller models (400CVD and below) are also available with moulded fibreglass housings.

"The Cavex 2 hydrocyclone can be customised to suit almost any application, with a variety of spigots, vortex finders and liners," says Ramanala. "Our expert team tailors the units to suit customers' particular applications, while using the existing footprint." MRA

Angola's time to shine

Country's diamond sector on strong footing

Angola may be the world's fifth-largest producer of diamonds but the sector is a far cry from reaching its true potential. Currently, only 40% of the country's known diamond resources are being mined and recovered. Hurdles to development and foreign investment in the past have been mainly as a result of regulatory policies and weak legislation. However, **AHMED ABDEL-HAKAM**, senior associate at **Eversheds Sutherland** in the UK, believes that the correct policies are now in place to steer the country's diamond sector in the right direction. **Gerard Peter** reports.

Absel-Haam was speaking as a panellist on a recent Webinar held by *Mining Review Africa* and *Africa Mining Forum* titled *Investing in Central Africa's Gem: Unpacking regulation changed to expand Angola's diamond sector*. The wheels of progress are slowly starting to turn to make Angola a leading global diamond producer. Currently, investor confidence in the country's policies and legislation is still weak but the government has updated its legislation to propel the mining sector forward. "A few years ago, Angola may have suffered negative sentiment because of legislation. However, there has been a substantial shift in policy under the new leadership and this has really improved the country's diamond sector," explains Abdel-Hakam.

According to the senior associate, the government has been focused on the reorganisation of the entire mining sector. This includes the creation of a national resources agency, a new foreign exchange regime and putting in place technical regulations for the marketing of rough diamonds.

In addition, there has already been significant government investment in the diamond production, cutting and polishing industry and this is expected to rise. For example, the construction of the Sorino Complex, which is a major mining-focused project to the tune of US$100 million that is being financed by the state. It comprises four cutting and polishing plants and two training centres. There are similar projects in the pipeline. Plans are also afoot to create an Angolan Diamond Exchange to further attract foreign investment.

Addressing the challenges

One of the stumbling blocks to attracting foreign investment in the past has been the fact that foreign investment was restricted to 50%. However, Abdel-Hakam says that this should not be a deterrent. "A number of countries have restrictions in place. So irrespective of whether you can own 50% or more, the real issue I have seen among clients is not the amount of shareholding but a focus on free transfer capital which is the ability to transfer revenues from diamond mining out of the country," he explains.

That said, Abdel-Hakam does believe that there are challenges that the sector has to overcome in order to attract foreign investment. "The first is ensuring that Angola doesn't fall into the trap of implementing resource nationalism. This may be productive in the long-term but it is very counterproductive in the short-term because if done badly, resource nationalism tends to scare investors away."

The next challenge is ensuring political stability, something that Angola has done well under a political regime. "Angola should really focus on the current political stability in the country. Other countries in southern Africa have been negatively impacted by elections that seemed to drag on forever and this creates the underlying notion of uncertainty. Investors don't like uncertainty."

However, according to Abdel-Hakam, the biggest challenge is ensuring that Angola completes its ambitious reform plan, as investor and tax-friendly regulations have a clear impact on investment attractiveness.

Bouncing back from COVID-19 lows

There is no doubt that the diamond industry took a knock during the COVID-19 pandemic. Across the globe, demand for the precious stone dwindled and production was further hampered by coronavirus lockdown restrictions.

Angola saw a drop of about 7% in production in 2020; however, Adbel-Hakam says that the figure does not paint a bleak picture for the country. "Angola is not the only country that has suffered because of lower demand for diamonds. If you look at the bigger picture, neighbouring countries such as Botswana and South Africa also saw a drop in prices of between 6 and 10%.

"The real issue is how you position the sector in the post COVID-19 era. How do you allow companies to go back to 100% capacity? I believe that Angola's diamond sector is well-placed to bounce back. It will require a combination of factors including continuing privatisation plans, legislative reforms and engaging with mining companies to see what their requirements are to recover the lost production time. This will create a win-win situation because the more production there is, the better it is for the government."

Signs of intent

Abdel-Hakam adds that there are other promising signs that bode well for the Angola's diamond sector. For example, the creation of the Angola Diamond Exchange is a clear indication of the country's willingness to be a serious player in the global diamond market. Also, the introduction of online auctions and tenders should increase the number of players in the sector.

Moving forward, Abdel-Hakam states that stability will be the key driver for growing the mining sector. He breaks down stability into three main segments: political, economic and legislative. While the new regime is bringing about political certainty, Abdel-Hakam believes that more needs to be done in the economic and legislative areas.

"Economic stability includes, among others, the ability to import hard currency easily or to be able to take it out of the country. When it comes to legal stability, investors want to be guaranteed a fair rate of return for their investment and that they will not be hit with discriminatory legislature which can impact their investments.

"To do this, it is crucial that Angola continues its legislative reforms as this is the best way to avoid disputes with foreign investors down the line. Remember, the more disputes you have, the less attractive you become," he states.

While it may still be early days, Adbel-Hakam believes that there are promising signs that Angola's diamond sector will continue to grow if it continues with reforming its regulatory policies. "Basically, the move towards a creating an Angolan diamond bourse and diamond hub, along with the ongoing reforms, will catapult Angola to the top spot in the diamond production market.

"These initiatives are like to increase the number of participants in the diamond sector. It is important that Angola continues with this trend: now is not the time to miss the train on this," he concludes. MRA

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"…the more production there is, the better it is for the government,"

AHMED ADBEL-HAKAM

Coal investment

Still alive

A growing number of investment firms have categorically stated they will no longer invest in the coal sector – an industry they believe contradicts the ethical responsibility every business has towards building a sustainable future for planet Earth. The objective to eradicate coal completely is not a realistic short-term goal, particularly for developing countries, says **Standard Bank Group**, whose recently published **Fossil Fuels Financing Policy** outlines a strategic approach that will continue to see the business selectively invest in coal, writes **LAURA CORNISH**.

The new policy – officially launched at a digital media briefing in December last year – is not aimed at encouraging coal investment but rather aims to showcase Standard Bank's objectives when considering any coal-related investment as part of its efforts to improve its management of environmental, social and governance (ESG) risks, and contribute to the sustainable development of Africa.

It also follows the adoption in 2019 of policies on lending to coal-fired power projects and coal-mining operations specifically.

The *Fossil Fuels Financing Policy* says the following in its opening statement:

"Energy is essential in underpinning economic growth in emerging markets, specifically in Africa, where affordable and reliable energy access is fundamental to Africa's development. As fossil fuels will likely remain key to ensuring energy security in many African regions requiring broad access to electricity as well as transportation, Standard Bank Group has taken a proactive approach regarding its position and defined prudent parameters for its involvement in fossil fuels.

This is in line with [our] purpose of driving Africa's growth and role of providing financial services to meet the needs of Africa's people, businesses and economies."

The bank will likely be scrutinised for its almost standalone approach on coal investment, when in reality, it is one of the few institutions taking a 'smart' approach to the energy reality many countries find themselves in.

DID YOU KNOW?
Standard Bank's energy finance portfolio is increasingly focused on renewable energy projects. Since 2012, 85% of the bank's energy lending has been to green energy projects

In essence, the policy showcases its objective to finance environment-responsible coal projects – based on a range of strict conditions including compliance with the Equator Principles, International Finance Corporation's (IFC) Performance Standards and the World Bank's Environmental, Health, and Safety Guidelines.

The policy covers the provision of financial products and services to:

1. Thermal coal mining projects (new and expansions) and all associated mine-site activities (including planning, development, processing, rehabilitation and mine closure);
2. Existing and new thermal coal mining corporates (where greater than 50% of revenue is from coal mining) involved in the ownership, development and operation of thermal coal mining assets; and
3. Existing coal-fired power generation utilities (where greater than 50% of power generation is from coal fired power) involved in the ownership, development and operation of coal fired power generation assets.

"We continue to engage with our clients to find solutions that enable them to understand and manage their climate risks,"

KENNY FIHLA

Financing parameters (as outlined in the policy)

The financing parameters apply to exploration, extraction and processing of thermal coal. In evaluating thermal coal mining transactions, Standard Bank will consider, as appropriate, as part of its due diligence:

- The energy situation in the region and future energy demand in relation to government energy strategy, climate change, carbon commitments, and adaptation plans;
- Transition plans or initiatives that reduce a client's carbon footprint and improve their environmental performance;
- Analysis of technically and financially feasible and cost-effective power generation alternatives that are available in the same industry and country;
- Compliance with the bank's normal lending requirements, including the development of projects in compliance with the Equator Principles, International Finance Corporation (IFC) Performance Standards and World Bank Group Environmental, Health, and Safety Guidelines, and applicable laws and standards;
- Compliance with host country environmental and social laws, regulations and standards, including rehabilitation, closure planning and financial provision requirements;
- Compliance with international conventions, standards and treaties regarding greenhouse gas emissions in host country/region;
- Impact on human settlements, natural habitats and resources, as well as protected areas and how such impacts are mitigated;
- Effectiveness of mechanisms for tailings disposal, rock dumps, emissions and waste management;
- Health and safety practices and track record;
- Adequacy of environmental rehabilitation provisions;
- Accommodation and transportation of staff;
- Whether policies are in place regarding prevention of child labour or forced labour in their operations and associated activities;
- Whether headquarters are located in countries that are not under financial sanctions from UK, the European Union, the US or the United Nations;
- Opportunities for involvement of local communities, establishment of initiatives to benefit local communities as well as effective ongoing community stakeholder engagement;
- Level of disclosure and transparency towards all stakeholders; and
- ESG policies and performance track record, including review of ESG controversies.

"The publication of our *Fossil Fuels Financing Policy* is another important step forward for Standard Bank. We are fully aware that climate change is a material risk to our ability to generate value for all stakeholders over time, and to our purpose of driving sustainable development across the continent," Wendy Dobson, head of Group Corporate Citizenship at Standard Bank, said during the briefing.

The bank believes that the transition to a lower-carbon economy should be just and fair to developing countries, and to affected stakeholders. The Paris Agreement recognises that this transition will take longer in developing countries, especially in Africa, where access to reliable and affordable energy continues to constrain socio-economic development.

The publication of the *Fossil Fuels Financing Policy* follows the release of the group's first climate-related financial disclosure report, which is aligned to the principles and recommendations of the global Task Force on Climate-related Financial Disclosures (TCFD).

"We continue to engage with our clients to find solutions that enable them to understand and manage their climate risks, adopt good ESG risk practices, and grow their businesses sustainably," Kenny Fihla, chief executive: Corporate and Investment Banking at Standard Bank Group, concluded at the briefing. MRA

"We are fully aware that climate change is a material risk to our ability to generate value for all stakeholders over time, and to our purpose of driving sustainable development across the continent,"

WENDY DOBSON

Lucara Diamonds' Karowe

Embarking on a new journey, in 2021

2021 will be a pivotal year for triple-listed diamond junior **Lucara Diamond Corp.** (Lucara) as the company embarks on its journey to transition its 100% owned diamond-rich **Karowe mine** in Botswana from an open pit operation to an underground mine. The journey starts with the development of a vertical shaft, which upon completion in 2026, will represent a new and exciting future for the mine, president and CEO **EIRA THOMAS** tells **LAURA CORNISH**.

While 2020 was a tumultuous year for the diamond sector and dominated by weak rough diamond prices for most of the period, it did not deter Lucara from pushing forward with preparing for one of the most important events in its operating lifespan – becoming an underground mine.

The approaching completion of the open pit is fuelling this change, as is the anticipation of mining at depth – and gaining access to the richer and higher grade portion of the ore body.

"Our cash flow situation last year was negatively impacted by COVID-19 and the deterioration of the diamond market, and we accordingly had to adjust our 2020 capital expenditure for the underground project from US$53 million to $22 million," Thomas starts. "As is the case with any project slowdown, there were positive ramifications. We were afforded the opportunity to rethink certain aspects of the project which has improved its economics," she continues.

IN SHORT
The Karowe mine has delivered exceptional performance since its start-up in 2012, and this is set to continue until at least 2040 now.

Karowe's 2021 agenda

Now, with a forward-moving strategy solidly in place, Lucara must conclude

As an underground operation, Lucara will continue to process around 2.9 Mtpa the final step in this project-changing process to start its shaft-sinking expedition: Securing the necessary supplemental financing to fund the project. Even though the vast majority of the cash required to fund it will come from existing cash flow, the company is looking to add some debt to its balance sheet.

"I must stress though that we used conservative diamond prices in our 2019 feasibility study, but should the market remain strong, our financing requirements will be substantially lower," Thomas notes. To date, the company has had positive engagement with a broad group of lenders, a process that started during the pandemic. The prospects for securing that necessary debt looks strong.

Looking at project timing, 2021 is a crucial year. The underground expansion programme has an estimated capital cost of $514 million and a five-year period of development, with first ore anticipated from underground in 2026. Because the open pit resource will be fully depleted in 2026, sinking must start this year in order to ensure the underground mine is ready in time to prevent a significant drop in production as the changeover occurs.

"We will in earnest get going in 2021 to ensure a seamless transition in 2026 and will complement this project with buffer stockpiles to avoid schedule pressure, just to be safe," Thomas highlights.

Importantly, developing an underground Karowe mine will not only extend its lifespan; it will also give Lucara access to an ore body that has been verified as being more valuable at depth. Known as the EM/PK(S) geological unit, it is now understood to be the source of both the historic 1 109 carat Lesedi La Rona and the 813 carat Constellation; and only 15% to 20% of the open pit material, its higher grade and coarser size distribution frequency will deliver significant cash for the business.

"The value of the ore body is almost double at the shaft's depth of 800 m below surface. This equates to a very economic project (excluding high value diamonds from the economic models), using prices that are discounted from where they currently sit today. In all, this equates roughly to a payback period of just four years," Thomas states.

As a demonstration of her commitment to move shaft sinking into execution, Thomas confirms that a South Africa-based shaft-sinking specialist has been appointed and early works have started. The shaft will extend to a depth of just above 800 m for now. The ore body does continue at depth but a resource below the 800 m mark has yet to be confirmed. "To the depth we are targeting, Karowe has an additional 15-year lifespan and will continue to deliver diamonds until 2040," Thomas mentions.

For now, Lucara intends to continue operating with its current processing infrastructure and deliver approximately the same production rate and throughput of between 6 000 and 7 000 tpd or 2.9 Mtpa. This equates to between 350 000 and 400 000 carats annually, very much in line with the annual production targets Karowe is delivering against at present.

Importantly, Lucara announced in early January this year that the application for the renewal of Karowe mine licence (AK06) has been approved by Botswana's Minister of Mineral Resources, Green Technology and Energy Security. The renewal became effective on 4 January 2021 for a period of 25 years, securing Lucara's mining rights to 2046 – marking a critical step in the formal sanction of the Karowe underground expansion project.

"This is a world-class ore body and despite some excellent diamond recoveries and cash generation achieved to date, the best is yet to come for the mine. It is an exciting period we are entering into," Thomas emphasises.

End user market – digital adaptation

The Karowe mine's ongoing production performance was declared an essential service shortly into the 2020 COVID-19 lockdown period in Botswana. "We were therefore able to perform well against our overall production metrics," Thomas notes.

The weak diamond market and inability to sell diamonds on auction was by far Lucara's greatest challenge, however. The decision not to sell any diamonds in the second quarter of the year was not taken lightly. "Fortunately we had the financial fortitude and flexibility to make that decision at the time with a strong balance sheet, cash on hand and no debt."

Having decided not to rest on the mine's laurels, Thomas's focus shifted to its growing relationship with Louis Vuitton and Belgium's HB Antwerp – a technology company focused on diamonds, based in Antwerp. Given the extensive experience in the diamond sector of several of the Group's co-founders, the company has broadened

"Many diamond mines around the world are aging, some having already reached the point of closure. This is reinforcing the rarity of diamonds, which will drive their value up over time,"

EIRA THOMAS

341 carat diamond


378 carat diamond

KAROWE KEEPS ON GIVING

Large diamond recoveries continue to be recovered from Karowe. In addition to the 549 Sethunya diamond discovered in February 2020, the mine produced an unbroken 998 carat high white clivage diamond in November 2020, measuring 67 x 49 x 45 mm. This was recovered from direct milling of ore sourced from the EM/PK(S) unit of the South Lobe.

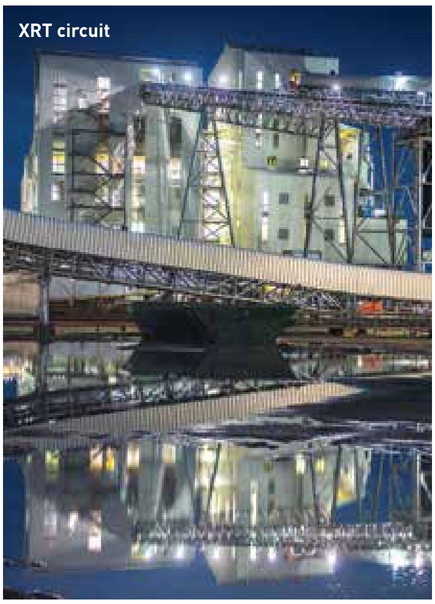
2021 started on an equally lucrative note. In January, the company recovered two +300 carat diamonds – more specifically an unbroken 341 carat top white gem quality diamond, recovered over the holiday period from milling of ore sourced from the south western quadrant of the South Lobe M/PK(S) unit; and a "magnificent" unbroken Type IIa 378 carat gem quality top white diamond recovered from milling of ore sourced from the M/PK(S) unit of the South Lobe. Both were recovered from the Coarse XRT circuit.

the concept of transparency with a focus on the end-to-end supply chain management in order to simplify the complexities and challenges of global diamond supply chains.

In July 2020, the company entered into a definitive supply agreement for the remainder of 2020 with HB in respect of all diamonds produced in excess of 10.8 carats in size from Karowe. Large, high value diamonds in excess of 10.8 carats in size from Karowe account for approximately 70% of Lucara's annual revenues. Lucara made a deliberate decision not to tender any of its +10.8 carat inventory after early March 2020 amidst the uncertainty caused by the global crisis.

Under the terms of this novel supply agreement with HB, the purchase price paid for Lucara's +10.8 carat rough diamonds would be based on the estimated polished outcome, determined through state-of-the-art scanning and planning technology; with a true-up payment on actual achieved polished sales thereafter, less a fee and the cost of manufacturing.

The benefits included a regular cash flow for Lucara using a superior pricing mechanism; significant potential revenue upside, particularly suited for Lucara's large, exceptional diamonds; increased tax revenue and additional beneficiation opportunities for the Government of Botswana; and the creation of a more


XRT circuit


Karowe open pit

Diamond sorting at Karowe

efficient, streamlined supply chain that achieves complete alignment between Lucara and HB to maximise the value of each +10.8 carat diamond produced at Karowe.

"We have not put all the diamonds through that system but would like to continue with this agreement and are optimistic about the potential to deliver more value in the longer term."

In November the three companies entered another agreement to collaborate on the planning, cutting and polishing of the exceptional 549 carat white gem diamond referred to as 'Sethunya' (meaning flower in Setswana). Sethunya was recovered unbroken from direct milling of ore sourced from the EM/PK(S) unit of the South Lobe of Karowe in February 2020. The agreement builds on the collaboration, announced in January 2020, with Louis Vuitton and HB on the historic 1 758 carat Sewelô, Botswana's largest diamond, recovered from Karowe in 2019.

Lucara is showing its muscle and delivering a strong future-looking pipeline, for a new Karowe mine but also taking into account the customer journey in purchasing the polished end product. MRA

549 carat white gem diamond, Sethunya

Roxgold's Séguéla project

Readying itself for 2022 gold production

2021 will be a pivotal year for TSX-listed gold producer **Roxgold** as it fast-tracks its **Séguéla** gold project in Côte d'Ivoire toward the goal of first production next year. Despite the challenges posed by the COVID-19 pandemic, the company made significant progress at the project during 2020. It grew its total mineral resources at Séguéla to nearly 1.5 Moz, completed the preliminary economic assessment (PEA) and received environmental and exploitation permit approvals, president and CEO **JOHN DORWARD** tells **CHANTELLE KOTZE**.

Drilling at Séguéla's Antenna deposit

IN SHORT

Having been a single asset producer since inception, the Séguéla project has the potential to more than double Roxgold's gold production and will cement the company's position as a West African multi-asset producer.

Since starting production in 2017, Roxgold's Yaramoko Mine Complex, situated in the Houndé Greenstone Belt region in south-western Burkina Faso, continues to outperform and prove itself as a cash flow generator for the company. Yaramoko managed to mitigate the operational challenges related to the COVID-19 pandemic and exceeded its production guidance of between 120 000 oz and 130 000 oz, producing 133 940 oz of gold in 2020.

"Having produced over 610 000 oz of gold to date and having recently undergone a resource update which continued our long track record of replacing depletion and maintaining the seven to eight year mine life, Yaramoko continues to demonstrate its ability to replace production and maintain a long mine life, while giving us the opportunity to focus on our growth objectives of becoming a multi-asset gold producer," says Dorward.

> We are still in the early stages of uncovering the upside potential that Séguéla has to offer and I believe there is still a lot more gold to be found,
>
> **JOHN DORWARD**

in the development of Séguéla by completing the project's feasibility study in the second quarter of 2021.

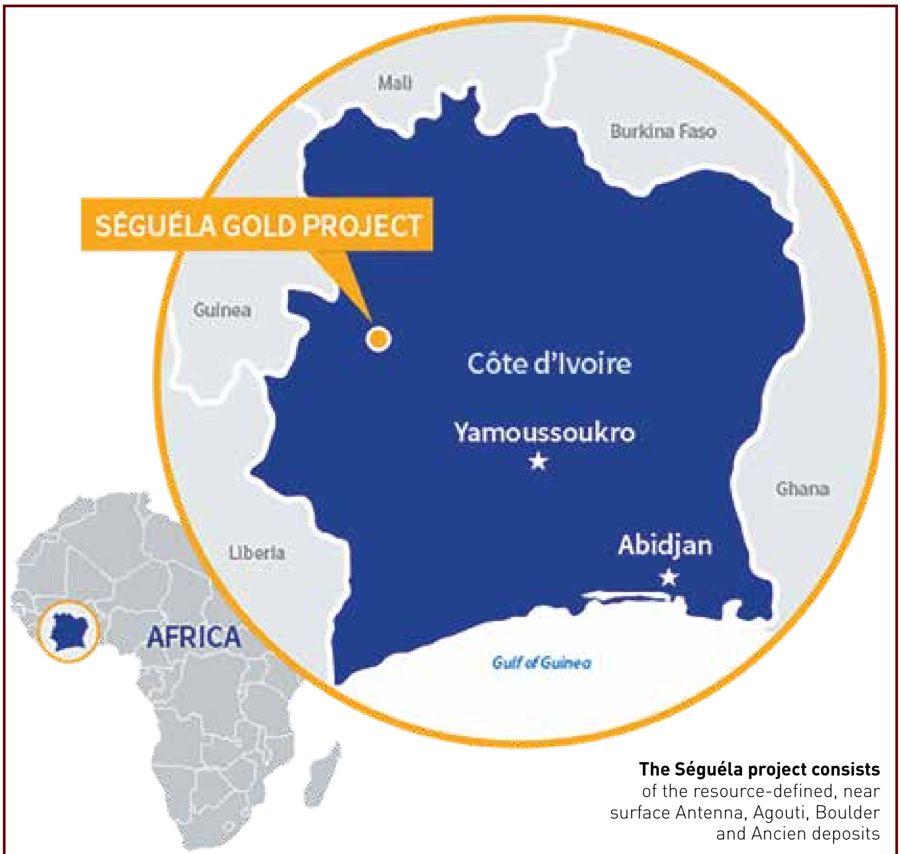
Dorward explains that the company had to defer the release of its feasibility study, having discovered a new high-grade deposit at the Séguéla project – Koula. In addition to complementing the already impressive portfolio of deposits including Antenna, Ancien, Agouti and Boulder, Koula, located about 1 km from the Antenna deposit, in itself added 281 000 oz of inferred gold resource grading at an impressive 8.1 g/t gold – a grade which puts Koula in the top tier of open pit deposits in the world. This was enough to tip the company's total indicated mineral resources over the 1 Moz mark (from the 529 000 oz considered in the PEA) – an increase of 79%.

While the preliminary economic assessment, released in April 2020, showcased the potential economics of Séguéla in delivering over 100 000 oz of gold over eight years at average all-in sustaining costs of US$749/oz, Dorward says the feasibility will be markedly different from the PEA because of the discovery of the Koula prospect.

Séguéla steals the spotlight

Roxgold identified the Séguéla project as a key second asset when acquiring the project, along with other tenements, from gold major Newcrest Mining in April 2019 for US$20 million. Confident in the exploration upside that the project and its wealth of satellite targets held, it wasn't long until the upside potential of Séguéla started to be uncovered - greatly exceeding the company's initial expectations and proving to be highly value accretive for the company.

Following a busy 18 months of development, while also navigating the operational challenges presented by COVID-19, Roxgold broke ground and commenced early works at Séguéla in late 2020. Following the upgrading of the site access road, construction of the accommodation village and front-end engineering of the process plant, the company is now firmly on track with the project critical path activities – aimed at facilitating a rapid ramp-up to full construction this year. The company is now on track to meet its next milestone



The Séguéla project consists of the resource-defined, near surface Antenna, Agouti, Boulder and Ancien deposits

"In addition to the high-grade Ancien deposit, which will allow the project to produce approximately 143 000 oz over the first three years of production, Koula allows the company to extend the period of high-grade, higher production levels for possibly six plus years, and extending the mine life," explains Dorward. It is for this reason that the feasibility study will be a clear step up in terms of life-of-mine production, the amount of ounces in the first few years will be greater for a longer period with little change in initial project capital which will translate to markedly improved project economics, he adds.

No end to the upside

In terms of further target testing at Séguéla, Dorward explains that the company's initial plan was to complete the infill, geotechnical and hydrogeological drilling needed to finalise the feasibility study – which it did around September 2020 – and accelerate the feasibility study to the start of the year. However, when the district exploration programme resumed target testing at the new prospect Koula, it just so happened that Koula delivered such exciting results that all four drill rigs were diverted to the deposit to undertake definition drilling and subsequently infill drilling to allow for Koula to be included in the feasibility study. With the infill drilling at Koula coming to an end, the drill rigs will once again resume target testing and Dorward looks forward to hopefully finding a similar target to that of Koula.

"We are still in the early stages of uncovering the upside potential that Séguéla has to offer and I believe there is still a lot more gold to be found at the project," Dorward concludes. **MRA**

BOUSSOURA EMERGES

Roxgold's third asset, the Boussoura project, south of the Yaramoko Mine Complex on the Houndé Greenstone Belt on the Côte d'Ivoire border, while still in its infancy, has the potential to become Roxgold's third project.

The primary targeted areas of the Boussoura project are Fofora, in the north, and Galgouli, in the south. Fofora has seen a minor amount of exploration in the past, while Galgouli was a new discovery made by Roxgold in February 2020. The company has drilled 200 holes with consistent assay returns demonstrating broad intersections of mineralisation along several vein corridors with strike lengths being traced for over 2 km.

Exploration success at the project continues to build the company's confidence in the potential for the project to become Roxgold's third high value asset.

Lubu has an indicated resource of 702 Mt and an inferred resource of 510 Mt, comprising 50% coking coal and 50% thermal coal

Contango's Lubu

A new coal player for Hwange

While the world moves away from power-generating thermal coal, coking coal is here to stay – because it is a key ingredient in the manufacture of steel. That's why LSE-listed **Contango Holdings**' (Contango) Lubu project in Zimbabwe, which comprises a substantial coking coal resource, ticks all the right boxes to deliver a financially lucrative business. **GERARD PETER** finds out more from executive director **CARL ESPREY**.

IN SHORT
While Lubu does have significant thermal coal resources, the focus will be on mining coking coal.

Lubu covers 19 236 ha of the highly prospective Karroo Mid-Zambezi coal basin, located in the Hwange mining district in north-western Zimbabwe. Historically, around US$20 million has been spent on advancing the project, including the completion of a pre-feasibility study; resource modelling and mine planning; and testwork to confirm the presence of thermal and coking coal.

Contango started as a shell company looking to acquire a near-term production asset rather than an exploration asset, and this led to its interest in and purchase of Lubu. "Having review multiple assets, it was determined that Lubu was a project we could bring into production quickly without the need for years of geological work to validate it. With extensive geological work completed, to an NI43-101 resource level, there was no exploration risk involved in the asset," explains Esprey.

Esprey adds that the company's DNA is built upon obtaining a known resource and building a cash producing asset thereafter. "Even it is small, the cash generated can then be used to expand without having to lean on the stock market too much," he notes. Today, the company holds a 70% share in Lubu with the remainder being held by local partners.

Since 2020, activity at Lubu has been progressing relatively well, with significant milestones being reached to bring it into production. However, given a new national lockdown coming into place in Zimbabwe earlier this year, Esprey expects some delays. That said, in January the site was inspected by the Environmental Management Agency (EMA) following camp site rehabilitation and access upgrades that have now been completed.

A meeting with the Binga District Council is due to take place in the near future to outline the two pit locations at Lubu ahead of pit development. Contango is currently finalising discussions with the proposed mining contractor ahead of opening the two pits. According to Esprey, this will be a significant milestone for Contango and will enable ongoing coking coal offtake discussions to be finalised.

Furthermore, it will allow bulk samples to be delivered to a number of multi-national companies who are assessing the viability of constructing full-scale coke production plants at Lubu.

Lubu has an indicated resource of 702 Mt and an inferred resource of 510 Mt. Together they comprise roughly 50% coking coal and 50% thermal coal. The resource exists across 12 seams, with the make-up of each seam and the percentage of coking coal and thermal coal changing with each seam as well. "By washing the coal we can determine any variantation of coal that we want and the only variable will be the yield," explains Esprey.

Contango aims to mine 100 000 tpm run-of-mine. At that rate Esprey says that Lubu's life of mine would be decades, even if the mine had to ramp-up production. "Obviously, as it gets deeper, the more difficult it will be to mine. Also, a lot of the resource is thermal coal and this would have to be taken into consideration should our production focus move in this direction," adds Esprey.

As Contango opens up trial pits, it will send thousands of tons of washed coal from different seams to factories in China from which the impurities will be removed to convert the product into coke. That coke will then be tested at an independent lab, which will further the discussion with offtakers.

Coke demand never dies

According to Esprey, the closure of thermal coal projects is having a positive impact on coking coal prices. "Most coal production comprises a hybrid coking and thermal coal resource. As some of the larger players start closing down thermal coal projects, they are also taking coking coal out of the market.

"The demand will not diminish, because you cannot replace coking coal and this can be seen in the coke price. The price is growing, not only because of the demand but because of the severe supply constraints. People are worried that as companies de-risk their businesses by stopping coal production, there is going to be a shortage of supply."

WHY COKING COAL WILL ALWAYS BE IN DEMAND

The underlying demand for coking coal is coke which goes into blast furnaces. Coke is an essential fuel and reactant in the blast furnace process for primary steelmaking.

As stated earlier, there have been some delays to progress at Lubu. One of these delays is the fact that Contango hasn't been able to finalise offtake agreements with companies that are based in China. This is as a result of new lockdown regulations in Zimbabwe. "Nothing is going to change until there is free flowing movement of people between Zimbabwe and China and this will delay progress at Lubu," emphasises Esprey.

While Lubu does have significant thermal coal resources, Esprey confirms that the focus will be on mining coking coal. "Even if you take half the resources of Lubu, there is enough coking coal to last decades. Also, the margins for coking coal are better and so is supply and demand for the product," he concludes. MRA

"Most coal production comprises a hybrid coking and thermal coal resource. As some of the larger players start closing down thermal coal projects, they are also taking coking coal out of the market,"

CARL ESPREY

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Samy Ilunga performing routine maintenance at Kipushi's 850 m level pumping station

Ivanhoe Mines

Advancing the historic Kipushi mine towards production

Canadian mining company **Ivanhoe Mines** together with its local partner, the Democratic Republic of Congo's state-owned mining company ***Gécamines***, is in the process of redeveloping the historic **Kipushi** zinc-copper-silver-germanium mine. At the time of first production in 1924 as the Prince Léopold mine, it ranked as of the world's largest open pit copper mines, but given the significant, very-high-grade zinc resource, the mine could rank among the world's largest and highest-grade zinc mines when it returns to production, writes **CHANTELLE KOTZE**.

IN SHORT

Ivanhoe Mines and *Gécamines* are working together on the extensive redevelopment and upgrading of the historic Kipushi zinc-copper-germanium-silver mine, which mined about 60 Mt of ore grading 11% zinc and 7% copper between 1924 and 1993.

Located in the DRC's province of Haut-Katanga, south-east of Ivanhoe Mines' Kamoa discovery, adjacent to the town of Kipushi and 30 km from the town of Lubumbashi, Kipushi operated as a high-grade open pit and underground copper and zinc mine throughout its 69 years of operation. In addition to copper and zinc, the mine produced 12 673 t of lead and approximately 278 t of germanium between 1956 and 1978.

The operation was placed on care and maintenance in 1993 and in 2010 the mine flooded due to a lack of maintenance. In 2011, Ivanhoe Mines acquired a 68% interest in Kipushi Corporation SA, or KICO, the mining rights holder of the Kipushi project, to become a joint venture partner with *Gécamines*, who owns a 32% stake in the project.

As it was rendered inaccessible due to the flooding, Ivanhoe Mines spent three years dewatering the mine and making it safe for drilling and further works underground. Access to the main working level, some 1 000 m below surface, was fully restored by the end of 2013. Once dewatered, the underground infrastructure was found to be in good condition and Ivanhoe Mines commenced resource drilling and the extensive refurbishment of the underground mine, as well as surface infrastructure. Where necessary, new and modern infrastructure has been installed.

According to Louis Watum, general manager at Kipushi Corporation SA, there is a significant amount of existing underground infrastructure at Kipushi, including a series of vertical mine shafts (P1, P2, P3 and P4) and associated head frames to various depths as well as underground mine excavations.

The newest shaft, the P5 Shaft, is 8 m in diameter and 1 240 m deep and provides primary access to the lower levels of the mine and the bulk of the historical resources, including the Big Zinc Zone. This shaft will act as the mine's main production shaft, once the mine is back in operation.

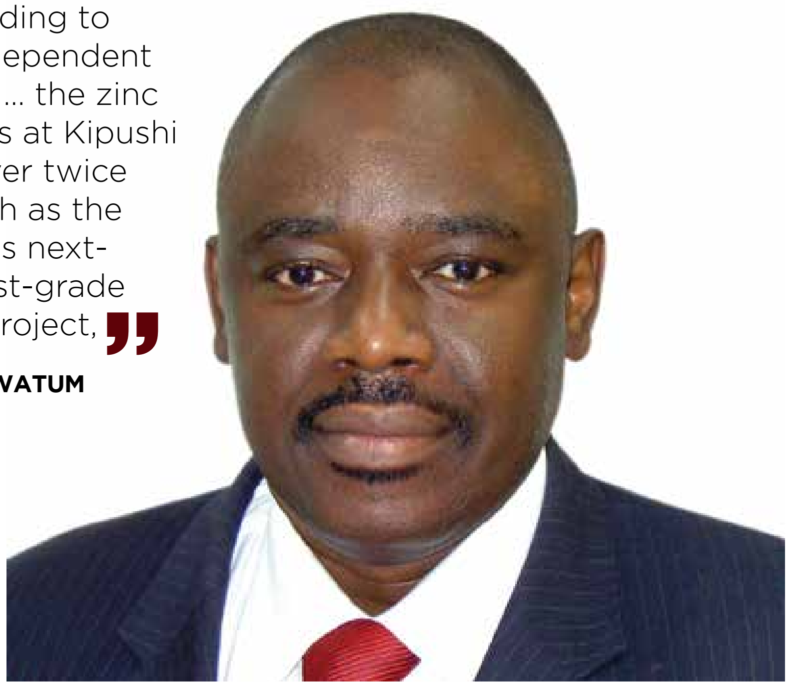
To enable rock hoisting, the old primary crusher and the rock load-out facilities at the bottom of the P5 Shaft were stripped out and replaced with new, modern equipment. The new primary rock crusher was installed in the 1 150 m level crusher chamber in May 2018. In parallel, the rock-hoisting winder, which had an annual hoisting capacity of 1.8 Mt, has been upgraded and is fully operational. The existing headframe was also fully refurbished, while the main personnel and material winder has also been upgraded and modernised to meet global industry safety standards.

The main haulage between the Big Zinc Zone access decline and the P5 Shaft has also been fully concreted to facilitate the hauling of the ore and waste using modern, trackless, mobile machinery. Located at the 1 210 m level of the shaft is a series of pumps to manage the influx of water into the mine for continual dewatering.

While there has been significant progress made in upgrading Kipushi's underground infrastructure, the restart of operations would require the construction of a new processing plant and associated supporting infrastructure on surface. Watum says that preparations have already begun for the construction of the processing facility. To date, the mine has been connected to grid power, and the ongoing pumping from the underground mine also provides an abundant supply of process water to be used in future processing and mining operations.

"Limited development and rehabilitation activities took place at Kipushi throughout 2020," says Watum. In the wake of COVID-19, mine development was temporarily suspended to reduce the risk to the workforce and local communities in March and in April 2020 the company announced cost-reduction initiatives to generate cash savings. The total budget of US$28.7 million for 2020 was focused on conducting care and maintenance activities, and to maintain pumping operations.

> "According to an independent study ... the zinc grades at Kipushi are over twice as high as the world's next-highest-grade zinc project,"
>
> **LOUIS WATUM**



225 000 tpa

Kipushi's estimated production of zinc when the mine resumes commercial production

Testing of the main pump underground
at Kipushi's 1 200 m level

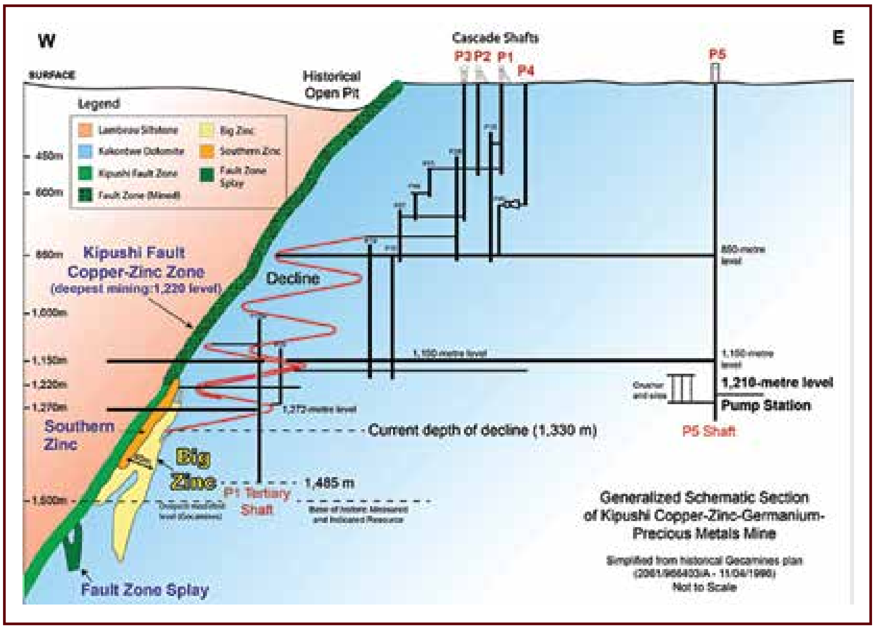
Big Zinc Zone = Big Potential

Shortly before production was suspended in 1993, *Gécamines* discovered the Big Zinc Zone at Kipushi, which, to this day, has never been mined.

"We have always held the belief that Kipushi had a lot more high-grade zinc, copper, and germanium than what was reported in 2011. After multiple drilling programmes, we expanded the zinc deposit in 2018 into what is currently the world's highest-grade zinc project with a measured and indicated resource of 11.9 Mt grading at 35.3% zinc," says Watum, adding that the mine also has a measured and indicated copper resource of 2.3 Mt, grading at 4.03% copper.

"According to an independent study by mining research consultancy group Wood Mackenzie, the zinc grades at Kipushi are over twice as high as the world's next-highest-grade zinc project, Watum adds.

This updated mineral resource is being used in the preparation of the Kipushi definitive feasibility study (DFS), which will update and refine the findings of the preliminary feasibility study (PFS) issued in December 2017, which demonstrated that Kipushi can be brought into production at



Schematic of Kipushi's underground layout

annual throughput of 800 000 tpa run of mine at a capital cost of US$337 million.

The PFS also showed that Kipushi could produce an average of 381 000 tpa of zinc concentrate over an 11-year initial mine life at a total cash cost of approximately $0.48/lb zinc. Based on a zinc price of $1.10/lb, the project would have an after-tax net present value at an 8% discount rate of $683 million.

One of the key findings of the PFS was an optimised process plant design that was achieved through additional metallurgical test work and trade-off studies. The optimised plant would use dense media separation (DMS), followed by milling and a flotation plant. "With the addition of milling and flotation to the flowsheet, an overall recovery of 89.6% can be achieved at a concentrate grade of 58.9% zinc. This is a significant improvement compared to the plant design in the 2016 preliminary economic assessment (PEA), which could only achieve a concentrate grade of 53.0% zinc, and would enable lower concentrate transport costs," says Watum.

"The DFS for Kipushi is in the final stages of completion, and some aspects of the design have progressed into a detailed engineering phase. After completion of the DFS, Kipushi will be ready for construction, starting with the process plant," Watum concludes. MRA

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Uranium

Is now the time to invest?

The uranium market has been in a lull for years but is this turning? With a bullish market predicted for 2021 and beyond, African uranium producers' projects, which have been sitting in limbo, could be ignited and quickly shifted into development on the back of the resurgence in this commodity. **GERARD PETER** reports.

Image: 123rf.com

These were some of the key talking points of a recent *Mining Review Africa* and *Africa Mining Forum* webinar titled *Uranium: A resurgence on the cards?* The topic was discussed by a panel of experts comprising Daniel Major, CEO of GoviEx Uranium; Brandon Munro, CEO of Bannerman Resources; and Dr Kelvin Kemm, CEO of Stratek.

Kicking off the conversation Major said that Africa is strongly focused on developing nuclear energy, pointing out that there are currently 13 countries who are seeking accreditation to go nuclear. "Currently, the continent is reliant on a carbon-based energy source but there is a range of uranium projects dotted all over Africa and there can be little doubt that it has the resources to develop nuclear energy," he stated.

Weighing in on the conversation, Kemm stated that as the world moves away from CO_2 energy sources, it is turning to wind and solar energy. However, such sources are not as reliable as people are made to believe. "It is a bit chaotic at the moment with regard to wind and solar energy. As such, we find ourselves in a situation with nuclear power as the preferred low carbon energy source." Did you know for example that wind turbines cannot be recycled or that rare earth materials can be more radioactive than uranium? These are all important considerations to take note of when looking for green energy options.

Growing demand outweighs supply

Regarding the current status quo of the uranium market, Major explained that the sector is turning the corner from a bad market brought on by the Fukushima disaster. "We saw a significant collapse in demand; however, that demand for uranium is now back to levels seen before Fukushima. This has been driven primarily by the construction of nuclear reactors on the Asian continent. Also, governments are now realising that it is important to have a mixed energy spread which includes nuclear energy," he stated.

Meanwhile, Munro added that while the current price of uranium is US$30/lb, this is a far cry from peak prices of $136/lb per pound prior to the Fukishima disaster in 2011. "Where we are today is

> "Is a resurgence on the cards? We have already drawn the cards and they say 'nuclear' and 'uranium',"
>
> **BRANDON MUNRO**

> We saw a significant collapse in demand: however, demand for uranium is now back to levels before Fukushima,
>
> **DANIEL MAJOR**

> There are all sorts of things that have put the brakes on nuclear power because of public fear and this also casts doubt among politicians as well as investors,
>
> **DR KELVIN KEMM**

in the early stages of recovery in a bear market that has seen uranium prices decline to as low as $18/lb pound in 2017.

"In terms of a price forecast for the future, it is important to remember that it is difficult to forecast in the short-term because there are a lot of different factors that can affect the price. However, in the medium to long-term, you can apply macroeconomics in a much more assured way. This is because in this sector there is very visible production of uranium which is controlled by the International Atomic Energy Association and this information is available to the entire world. Equally, uranium's primary use is to power energy plants. This means that you can accurately predict what the demand for uranium will be based on the number of reactors there are," he explained.

Taking this into account, Munro stated that the amount of uranium being produced currently cannot keep up with the demand for the mineral and that this situation will continue for several years; in fact, it may even get worse. Even more concerning is that Munro pointed out that the situation will be exacerbated because of the depletion of stock of some of the largest uranium producers in the world. In fact, four of the top ten uranium mines will close down this decade.

Given Munro's explanation, there can be little doubt that there is a need for new uranium projects to come on board. However, he alluded to the fact that the price would have to go up significantly for it to be an incentive to start or advance new projects, suggesting a price of higher than $60/lb as an enticing figure for uranium producers.

There can be little doubt that the Fukushima accident had a major impact on the uranium market. However, Kemm believes that this is also down to misinformation about the effect of radioactivity and perceived risks associated with nuclear waste. "There are all sorts of things that have put the brakes on nuclear power because of public fear and this also casts doubt among politicians as well as investors. Now, with the evidence coming out that wind and solar are not the best energy options, people are having to rethink their energy strategies and over the last year or two, there has been much more positive sentiment around nuclear power. This bodes well for the advancement of uranium projects."

Adding to the positive sentiment, Munro added that there has definitely been a resurgence in the uranium sector. "A lot has changed in the last 12 months: to such an extent that we are now on the cusp of a nuclear renaissance. So, is a resurgence on the cards? We have already drawn the cards and they say 'nuclear' and 'uranium'," he concluded. MRA

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Coal snapshot

Mid-term outlook is positive

While there is a concerted effort by nations to reduce reliance on coal for both energy and production purposes, research analyst **Fitch Ratings** believes that the medium-term outlook for the commodity remains buoyant. **GERARD PETER** reports.

There can be no doubt that the coronavirus pandemic has had an effect on global demand for both thermal and metallurgical (met) coal. According to Fitch, thermal coal prices had been exceptionally low, around US$49/t in August and September 2020 for the Newcastle 6 000 kilocalories grade, making 60 to 70% of global seaborne coal suppliers unprofitable and prompting production cuts. For the most part, the decrease in demand for thermal coal was driven by China.

However, according to Jenny Huang, director of Fitch's China Corporate Research team, the demand is likely to improve in 2021 following a very sluggish 2020. This demand will mainly be driven by a resurgence in the global economy, particularly in Asia.

"On the supply side, the extremely low prices last year have not been profitable for global suppliers, forcing some of them to cut production, especially in the second half of 2020. Hence, the overall inventory level has been low, thus contributing to a price rebound this year," Huang explains.

That said, Huang doesn't expect the recent surge in the coal price to be sustainable. This is largely driven by China's relaxation on import restrictions to help ease supply tightness in the local market, as well as an unusually cold winter in North Asia that boosts heating demand. The long-term outlook, however, remains bearish amid China's and India's intentions to increase domestic production, as well as the increasing share of renewable energy in the global energy mix.

Meanwhile, while many countries have pledged to achieve carbon neutrality around 2050, Fitch believes that these climate change pledges are unlikely to materialise in the next three to five years. For example, China's ambition to reduce its reliance on overseas markets in its 14th Five-Year Plan period (2021 - 2025) suggests sufficient coal supply will be an important national security consideration as the country is short of most other types of primary energy. Japan has also yet to provide a clear roadmap amid challenges to restart nuclear reactors. That said, new coal projects may still struggle to access external financing.

Weighing in on the conversation, Oliver Schuh, senior director of natural resources for Fitch's Europe, Middle East and Africa region, states that while many parts of the world have moved away from coal as an energy source, China still requires coal for energy intensive production processing. "70% of thermal coal around the world is used for electricity generation; while 11% is used for cement production and 19.2% by other industries – and a lot of these industries are in China," he adds.

Regarding emerging markets, Schuh states that there is no sign that thermal coal will be phased out in the near to mid future and suggests that a longer term approach will be needed.

"When it comes to the energy transition, you have followers and laggers, so some countries are more ahead with fulfilling

their climate change pledges than others. For example, China is a bit slow but that is because of its economic development plans that energy demand is increasing significantly. As such, you cannot accelerate as quickly with decarbonisation as other countries are doing."

Regarding Africa, Schuh explains that because the continent has a considerable amount of coal reserves and still relies heavily on thermal coal as an energy source, it will take much longer to phase out.

Met coal outlook

Up until 2019, met coal prices hovered around the $200/t price. Prices in 2H20 came down to USD140-150/t linked to US-China trade tensions, weak demand in some regions, robust production in China and port restrictions in China on coal intakes. The COVID-19 pandemic and associated weaker demand in the wake of capacity curtailments in many regions led to a decline in prices to $106/t by August 2020, with prices having recovered since to levels around $150/t in February 2021.

That said, Fitch expects met coal demand to slowly improve in 2021 as ex-China steel production recovers. China was the most active buyer on the global seaborne market in 2020, but Fitch expects that steel production in China reached a high in 2020. Steel output in India has rebounded strongly since the first round of lockdowns were lifted and it is expected to reach pre-pandemic levels in 2021. Additional hard coking coal (HCC) demand in the next five years will come from India, south-east Asia and Latin America. Total HCC consumption may not return to pre-pandemic levels until 2023.

Steel producers in north-east Asia were the most affected by the pandemic, with around 20% of capacities remaining idled as of February 2021. Most furnaces in Europe have restarted, with around 4% remaining curtailed. The second wave of lockdowns does not restrict industrial activity so have less of an impact on steel demand than it did in H1, 2020.

In addition, Schuh states that Fitch's conservative medium term price prediction is $140 once the supply/demand dynamic normalises. It is also expected that global met coal imports will increase by 44 Mt in 2024 from 2020 levels. According to the CRU Group, a more realistic prediction of the price is between $150 to $160 for 2022 to 2025.

Schuh expects the transition to low-carbon steelmaking to affect HCC demand only in the longer term. "Currently, there are no substitutes for met coal in the steel production process and while steel producers are looking at technologies such as hydrogen in the steel making process, right now there are no choices to substitute met coal over a ten-year horizon, maybe not even over 15 years," he concludes. MRA

Economic development imperative

Coal remains South Africa's lowest cost, baseload source of energy

If South Africa is to keep the cogs of industry turning and ensure post COVID-19 economic recovery as well as future economic development and growth, the country will have to continue relying on coal for primary energy generation as it remains the country's lowest cost, baseload source of energy, mining investment firm **Menar** MD **VUSLAT BAYOĞLU** tells **CHANTELLE KOTZE**.

South Africa should focus its efforts on finding ways to produce cleaner energy from coal

Image: 123rf.com

Despite the global trend by developed nations towards a low-carbon future underpinned by the development of green economies, the economic significance of coal mining in developing countries, such as South Africa, is clear when considering the total contribution of coal producers in terms of job creation, local economic development and local procurement opportunities.

In the absence of alternative cost-effective and reliable sources of baseload power, such as gas or nuclear energy, and until a cost-effective means to store renewable energy becomes available, baseload coal-generated power remains the only effective means for the country to keep the lights on, explains Bayoğlu.

Until such a time as renewable energy is able to provide stable baseload power, Bayoğlu says that South Africa should focus its efforts on finding ways to produce cleaner energy from coal. He therefore stresses the need that a 'just transition' to cleaner energy generation also includes coal and the use of clean coal technologies to mitigate the environmental impact of burning coal for energy.

Because South Africa cannot afford to simply shelve its coal-fired power stations and invest in the development of infrastructure necessary to import gas or to construct nuclear power stations, Bayoğlu calls on the government to consider a policy position that promotes research and development into clean coal technologies. "This would enable South Africa to benefit from its rich coal endowment in an environmentally sustainable way," he notes.

R133 billion

The total sales which coal generated for South Africa in 2020

Of concern at the moment is the effect that COVID-19 has had on junior coal mining companies in South Africa – the next-generation of project developers – which collapsed the domestic coal market as state-owned power utility Eskom generated less electricity, decreasing its demand for coal. The junior coal miners that survived this are faced with another hurdle – the inability to raise funds – with many banks unwilling to fund coal projects on the back of tighter global emission standards.

This is of great concern to Bayoğlu as exploration and the discovery of new ore bodies, not only coal, but other commodities too, is crucial to ensure the sustainability of the South African mining industry and the development of the country's economy.

Despite the decrease in coal consumption by Eskom due to COVID-19, demand has already begun to rebound on the back of increased

economic activity, says Bayoğlu. The domestic demand for coal by Eskom should soon stabilise to 2018/19 levels, he notes, while export demand is also expected to experience a healthy increase post-COVID on the back of the global vaccine rollouts and increased demand for South African coal from China, resulting from China's ban on imports of Australian coal.

Going forward, there is a fine balance that needs to be met to ensure that South Africa is able to produce the electricity it needs, according to Bayoğlu. "A steady supply of coal to meet the demand from South Africa's coal-fired power stations is critical to ensure that coal prices remain steady and cost competitive for Eskom to continue generating low-cost energy to stimulate economic activity and create jobs." Bayoğlu therefore urges his fellow coal suppliers to ensure that Eskom has reasonable options to purchase coal at the right price to support economic growth. "Without cost-effective electricity, economic recovery – and by extension job creation – will be impossible," he highlights.

As South Africa begins its road to economic recovery from the COVID-19 pandemic, with mining as a catalyst to accelerated industrialisation, innovation and job creation, Menar is very optimistic about the future of its business as a low-cost coal miner.

This year the company aims to begin development of two mines – the De Wittekrans export coal project near Hendrina in Mpumalanga and the Bekezela colliery near Springs in Gauteng. De Wittekrans will see Menar invest about R600 million in a Phase 1 development and create 430 jobs, while Bekezela colliery will cost around R1.5 billion to develop and create 800 jobs. These mines are being developed with the intent, in part, to provide Eskom with options to procure the right quality coal at a lower price – a major element in supporting Eskom's turnaround strategy to reduce its costs. MRA

↑ **The Bekezela colliery near Springs in Gauteng**

Image: 123rf.com

Coal

Still an economic lifeline

Coal has become a dirty word – it is associated with pollution and environmental degradation. Nonetheless, it remains the power supply lifeline in Africa and various other regions across the globe. But the landscape has changed, quite distinctly in South Africa, and those OEMs playing a vital support role to the industry must adapt or lose their market share, writes **LAURA CORNISH**.

Vibrating equipment specialist Kwatani's business model has always been centred on flexibility and adaptability and this has stood the company in good stead as it has with ease continued to meet the needs of an evolving coal sector – one that was impacted by the COVID-19 pandemic.

"While the overall impact of the pandemic reduced industrial coal demand worldwide, the fast reopening of the coal sector in South Africa in particular is a clear reflection of the importance this industry plays in the economic sustainability of the country," Kwatani CEO Kim Schoepflin starts.

"This does not however eliminate the threat imposed on the sector by investors pulling out of coal-related projects, and while this remains a concern, it is one that can only be addressed in the long-term. For now, our current order book and project pipeline (both new and replacement), in Australia, Russia and South Africa is a reflection of our current reality – coal is not dead. The expectation to incorporate clean technologies has become a far greater priority, however," she continues.

For now...

Regardless of the South African government's intention to reduce carbon emissions significantly by 2050, the country's coal-fired power supply needs are non-negotiable.

"What has changed over recent years is the client base. Some of the traditional, large-scale miners have

A double deck Kwatani multi screen being transported to the end user exited or are in the process of exiting the country's coal sector, plus Eskom's need to move away from the traditional cost-plus model, have seen the rise (and support) of a host of smaller, black owned and fully transformed mining companies," Schoepflin notes.

Both sectors of the market require a more unique and specialised service offering and Kwatani has ensured it is fully equipped to deliver on both fronts.

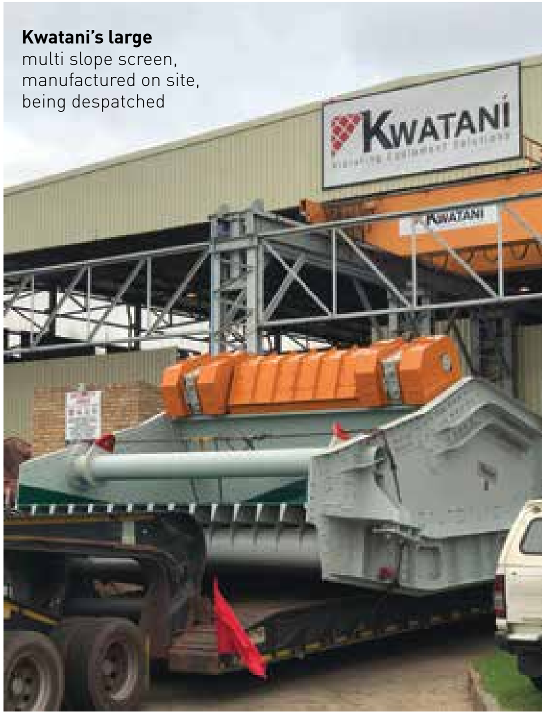
New entrant, small-scale coal mining companies have significant pressures to overcome to be successful – capital and budget constraints, and a shortage of skills and manpower are some of the more common challenges. These miners need to start producing and generating cash flow as quickly as possible. Kwatani's smaller range of screens, up to 2.4 m in width and fully customised to individual applications, is ideal for this market. "Our turnaround time to deliver, install and commission is fast and in line with short timeframes, as is our fast service and maintenance delivery thereafter," Schoepflin notes. In further support of the industry, Kwatani is a Level 2, BBBEE compliant business that contributes to empowerment scorecards.

Mega coal miners still committed to the industry have a different set of challenges to overcome – primarily managing the financial and operational costs associated with moving more overburden to access new coal reserves in more mature mines. "Their tonnage requirements have increased, as has their need to process more while using less energy and water," the CEO points out.

Kwatani has consequently seen an increasing trend for the supply of ultra-large processing screens – typically banana screens used for desliming and drain and rinse applications. Efficiency, enhancing utilisation of water and power and reduced downtime have become essential, Schoepflin reiterates.

For this market segment, Kwatani offers a range of custom-designed, high capacity performance screens that can be up to 4.3 m in width and 11 m long, which all deliver on structural integrity, ease of maintenance and extended lifespan, embodying the company's "Engineered for tonnage" principles.

Operating in a wet or abrasive/corrosive environment, Kwatani screens comprise special lining materials and paint specifications and compounds that ensure its screens can withstand the toughest conditions. And because each screen is custom-designed, they include full ISO-accreditation having undergone rigorous testing under the supervision of a qualified engineer. "The final step is ensuring our screens deliver the same results during the commissioning phase on site as those delivered during factory testing. "Our research and development laboratory is fully kitted out to do both wet and dry testing and further allows us to change all screening parameters during the initial testing design phases to ensure we can deliver on our clients' screening specifications."



Kwatani's large multi slope screen, manufactured on site, being despatched

"The fast reopening of the coal sector in South Africa in particular is a clear reflection of the importance this industry plays in the economic sustainability of the country,"

KIM SCHOEPFLIN

What COVID-19 has taught us

"We have learnt to embrace digital and in doing so operate remotely. As a result, our business continued to operate throughout the pandemic," Schoepflin highlights. In line with this, Kwatani installed three pilot condition monitoring systems with its screens in 2020 and is now currently analysing the data and translating it into meaningful interpretation of machine health, performance and efficiency. This is an important part of the company's maintenance offering.

"Our company has consistently grown over our 44-year history and this is largely thanks to our commitment to continuously invest in R&D, which did not take a back seat during the pandemic. We have now also developed a culture of resiliency, and we have learnt to become even more flexible and operate in the new world we find ourselves in," Schoepflin concludes. MRA


Image: 123rf.com

Load-haul on mines

Bargaining Council a must!

Hard times in the economy have led many companies with loading and hauling capability to offer their services to open cast mines as contractors; this trend has created a niche market for some players, but it does require registration with the relevant bargaining council.

“Load and haul work on mines is essentially a civil engineering activity,” says Lindie Fourie, operations manager at the Bargaining Council for the Civil Engineering Industry (BCCEI). “This means that – to remain legally compliant – companies offering these services to mines must register as a member of the BCCEI.”

Fourie highlights that a range of tasks undertaken by contractors on mines will obligate them to become members and to comply with the various requirements of the BCCEI. According to the scope of the BCCEI – as determined by the National Economic Development and Labour Council (NEDLAC) – these activities include the “loading, hauling and dumping of mineralised and/or waste material to waste dumps or processing plant feed (ROM pad) stockpiles”.

Other activities within the scope include excavations, bulk earthworks, topsoil stripping, drilling, blasting, preparation of bench areas, and the construction and maintenance of access and haul roads.

“Contractors who are providing mines with services relating to dust suppression of loading areas, haul roads and dumping areas also fall under the BCCEI,” says Fourie, “as do those companies doing rehabilitation of earthwork areas or waste dumps, topsoil spreading, hydro-seeding and watering.”

Service providers

She highlights, however, that these conditions do not apply to companies who have a direct financial interest in the value of the commodities being mined. Rather, the BCCEI registration is only required for those vendors who sell their services to a mine for an agreed rate, which is not linked to the value of what is actually mined during these activities.

“Usually, contractors are engaged by the mine to move material and they are paid a fixed monthly fee, or according to the tonnage of what they move,” she says. “The contractor is not concerned with the grade or revenues gained from the material itself.”

She emphasises that the BCCEI is a statutory body created in terms of the Labour Relations Act (LRA), so companies who fall into the civil engineering sector cannot choose whether

> “Bargaining councils play a strategic role in the country’s economy, through the co-regulation of stable and productive employment relations,”
>
> **LINDIE FOURIE**

or not to register; registration is, in fact, compulsory.

Strategic role

"Bargaining councils play a strategic role in the country's economy, through the co-regulation of stable and productive employment relations," she says. "As an industry-based forum of organised business and labour, we help to regulate employment conditions and labour relations in the civil engineering industry. The importance of this task makes it vital for everyone in the sector to actively participate in this forum."

She says the BCCEI provides the necessary administrative infrastructure and technical expertise to ensure effective collective bargaining, industry compliance and dispute resolution.

"There are important benefits to be gained – for both employers and employees – from the centralised bargaining model," she says. "Perhaps most importantly, the process creates a more even playing field for companies, so that those who provide decent wages and benefits to employees are not undercut in tenders by competitors who exploit their workers."

Most small companies do not have the infrastructure and expertise to engage in lengthy and complex negotiations on the terms of remuneration, for instance. The skilled and experienced representatives of the parties to the BCCEI are able to provide this service, and to arrive at terms which are mutually acceptable to employers and employees.


Image: 123rf.com

"This in turn creates a more stable working environment for everyone, so that civil engineering projects can proceed smoothly without unexpected stoppages or strikes arising from issues governed by the collective agreements ," she says.

Support and advice

For companies who are not sure whether they fall into the jurisdiction of the BCCEI, there are designated agents from the organisation who are available for information and advice, says Fourie. Through their daily work, these agents are familiar with the civil engineering industry so can provide clear guidance on the requirements for membership.

"They can also assist companies with the registration and advise them of the other services available," she says. "These include our highly professional dispute resolution services for which we are accredited by the Commission for Conciliation, Mediation and Arbitration (CCMA)."

There is also an industry retirement benefit fund, medical aid and funeral benefits, although these are not administered by the BCCEI.

These designated agents also help to communicate to employees the benefits of central bargaining, which usually achieves a more desirable outcome than plant-level negotiations. She re-emphasises that two of the main purposes of the LRA – promoting orderly collective bargaining and collective bargaining at a sectoral level – are enabled by the BCCEI. Through the BCCEI, employer and employee representatives can negotiate conditions of employment and other benefits unique to the civil engineering industry.

"This is where the real value of the BCCEI lies, and through our designated agents we ensure that those collective agreements are enforced by everyone in the industry," says Fourie. MRA

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Unlocking maximum value

Optimisation strategy pays off for Tharisa

JSE-listed PGM and chrome co-producer **Tharisa** has not let the COVID-19 pandemic derail its target of reaching 200 000 ozpa of platinum group metals (PGMs) and 2 Mtpa of chrome concentrate in the near term, head of investor relations and communications, **ILJA GRAULICH** tells **CHANTELLE KOTZE**.

The company's plan to increase its production formed part of its larger Vision 2020 strategy, which should have culminated in the completion of a number of optimisation and growth projects last year, but this delivery timeframe was delayed by the implementation of South Africa's national lockdown measures, which were aimed at preventing the spread of the virus, explains Graulich.

"Despite not being able to complete the optimisation projects as part of our Vision 2020 on time, which included the optimisation of our Genesis and Voyager plans and the construction of our latest plant, Vulcan, we made significant headway at improving the operation of our Tharisa mine, which is currently operating extremely well," says Graulich.

During Tharisa's 2019 financial year, the company set in motion a plan to significantly reset its mining operations. This included a revised pit layout, which was reoptimised to create flexibility within the mining operation, an improvement in waste stripping to 8:1, an investment in a modern mining equipment fleet to increase its ROM tonnage, the stockpiling of some of its ROM material and the debottlenecking of the processing plants.

"The significant progress made in optimising the mining operation during the course of 2019 and 2020 has been demonstrated by the consistent performance and availability of the operation over the past several quarters," says Graulich. This has enabled the company to mine the required volume to meet the targeted 2 Moz of chrome concentrate from FY2022 onwards. The Vulcan plant,

The Voyager and Genesis plants have a combined nameplate capacity of 400 000 tpm which will enable the company to meet this target, remains on schedule and within budget for commissioning at the end of the 2021 financial year (FY2021), which runs from 1 October 2020 to 30 September 2021.

In order to meet the 200 000 ozpa of PGM production, Tharisa will be undertaking a PGM optimisation project this year, which aims at optimising both the volume and grade being fed into the plant. Having mined the required PGM volume over the past few quarters, the task this year is optimising the PGM feed grade right by the second half of FY2021, with increased focus on mining the right reef blend and through improved crushing and blending, says Graulich.

During FY2021, the company has recorded increases in both PGM and chrome production, which provides a solid platform for Tharisa to meet its FY2021 production guidance of between 155 000 oz to 165 000 oz PGMs (6E basis) and 1.45 Mt to 1.55 Mt of chrome concentrates, says Graulich.

PGM production was up 14.2% year-on-year on a 6E basis to 39 300 oz compared with 34 400 oz in Q1, FY2020 and in line with 40 500 oz in Q4, FY2020. Meanwhile, chrome concentrate production (excluding third party) was up 8.7% year-on-year to 372 300 t compared with 342 5000 t in Q1, FY2020 and marginally stronger compared with the 370 800 t in Q4, FY2020. The company's speciality grade chrome production was up 15% year-on-year to 93 800 t, compared with 81 500 t in Q1, FY2020 and flat versus 93 200 t in Q4, FY2020.

Graulich expects a bright future for the PGM and chrome producing Tharisa mine as it continues to improve the operation's mine life. Through constant optimisation of the open pit, Tharisa has gained an additional year of mine life despite a full year of mining of the open pit. At present, the open pit resource is expected to continue until 2034 before a transition to underground mining commences – likely to extend operational lifespan even further, with a planned 40-year underground mine life using highly mechanised on-reef mining methods. MRA

An aerial view of the Tharisa Minerals mine and operations

THARISA'S MINING AND PROCESSING OPERATION AT A GLANCE

The Tharisa mine, which is located within South Africa's main PGM and chrome producing area on the south-western limb of the Bushveld Complex, contains a large 97.5 Mt reserve (1.40 g/t 5PGE+Au and 18.9% Cr_2O_3). Mining is carried out across two pits containing five chromitite layers, namely MG1, MG2, MG3, MG4 and MG4A – with the PGMs concentrated in the MG2, MG3 and MG4 reefs, while MG10, MG1 and MG4A contain the chrome-rich reefs.

The PGM and chromite ore is processed via two independent processing plants that were designed specifically to treat the MG chromitite layers. Both use a similar process flow entailing crushing and grinding for primary removal of chrome concentrate from spirals. This is followed by PGM flotation from the chrome tails and a second spiral recovery of chrome from the PGM tails.

The smaller 100 000 tpm Genesis plant processes reef layers with lower PGM and higher chromite grades (MG1 and MG4A). Speciality chrome recovery circuits are integrated into the feed circuit of the Genesis plant, known as the Challenger plant, which recovers high-value foundry and chemical grade chrome concentrates. The larger 300 000 tpm Voyager plant processes reefs with higher PGM and lower chromite grades (MG2, MG3 and MG4) and produces both chemical and metallurgical grade products.

"Significant progress has been made in optimising the mining operation during the course of 2019 and 2020,"

ILJA GRAULICH

Solar

The new future for mobile crushing?

COVID-19 has taught the mining industry a few key lessons – none of which are new, but all of which have now become vital for long-term operational sustainability. Adaptability to market conditions and the associated requirement to enhance production performance, along with greener footprints and innovative power usage solutions, are just some of the focal points that have made it onto boardroom agendas. And one such initiative ticks all these boxes, writes **LAURA CORNISH**.

Open-pit haulage routes are considered one of the costliest and biggest environment-compromising areas in any mining operation. Articulated dump trucks require hundreds of litres of diesel to operate and this only increases as pits deepen and the distance to truck material grows further.

"The concept of mobile, in-pit crushing is by no means new to the industry and has been marketed to industry as an alternative to traditional trucking and the associated costs. In 2021, however, this service will reach a new level of innovation as we introduce the optionality to use the process to enhance or establish a greener footprint on site," says Sandro Scherf, CEO of mobile crushing and screening specialist business Pilot Crushtec.

At the end of February 2021, the company started commissioning its first ever electric dual power, in-pit mobile crushing and screening plant/train for a new manganese operation in the northern Cape. The train is designed to operate using diesel as well as electricity – a functionality that speaks to the above mentioned benefits.

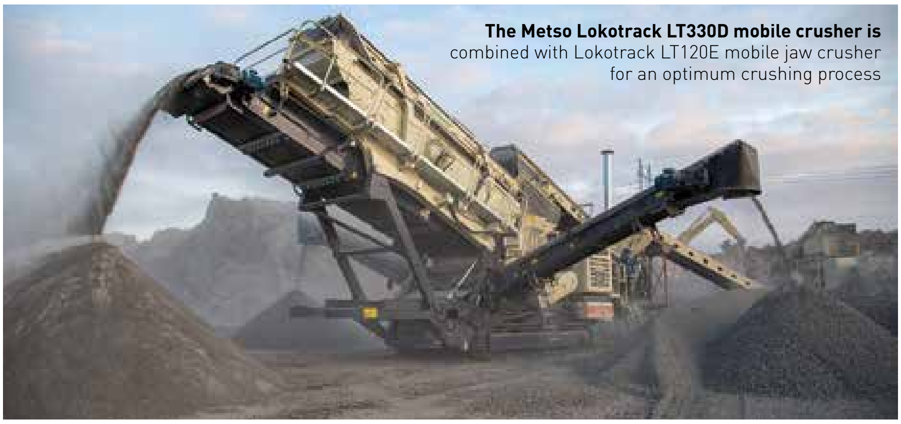
"This particular train has taken the concept of energy innovation one step further, an important consideration for Africa in particular which in most parts struggles with unreliable energy supply from state-owned utilities. We believe this train will be the first to be operated using solar energy," Scherf reveals.

Thanks to the mine's desire to improve its overall energy footprint, it has invested in the establishment


Image: 123rf.com

of a solar farm to drive most of the operation's energy needs – including in-pit crushing. "This project will demonstrate the true level of innovation that can be delivered when mine, contractor and OEM collaborate together to exceed traditional boundaries and operational limitations," the CEO continues.

The full train – comprising a Metso LT120E primary jaw crusher, a newly designed Metso LT330D cone crusher with a built-in screen and a Metso ST2.8 dual powered scalper – is designed to process 400 tph, taking ROM blasted material with a feed size of up to 700 mm. It will require 500 kW to operate. The train will initially operate using diesel, only to prevent a delayed production start-up until the solar farm is completed. When this sun-powered facility is operational, the in-pit train will switch over to its intended power operated mode.

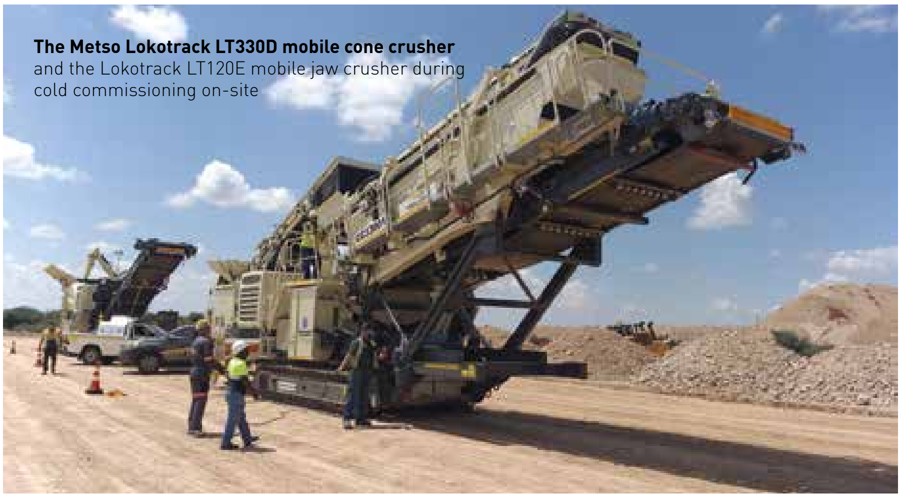

The Metso Lokotrack LT330D mobile crusher is combined with Lokotrack LT120E mobile jaw crusher for an optimum crushing process

"The constraint of limited power supply is quickly becoming a redundant concern as more mining companies are looking to power their operations using renewable energy sources – of which there is an abundance in Africa. The installation and operation of our first solar-powered crushing and screening train demonstrates our capabilities in a new world which demands greater environmental compliance and sustainability and reduced operating costs, and as such we anticipate seeing a fast and steady increase in the demand for this type of crushing solution," Scherf highlights.

Mobility reduces cycle and commodity uncertainty risk

Commodity prices at present are looking healthy, likely driven by COVID-19 related market uncertainty and supply shortages. "Global instability, however, is at present still one of the only certainties we can be sure of – ironically. This requires a flexible operating style and flexible decision making," Scherf notes.

Regardless of the positive commodity price environment, the mining industry must be ready for change or at the very least be able to adapt quickly to change. To benefit from a strong commodity environment, mines and contractors are looking for fast mobilisation, lower capital expenses and shorter duration



The Metso Lokotrack LT330D mobile cone crusher and the Lokotrack LT120E mobile jaw crusher during cold commissioning on-site

contracts. "The faster mines can move into production and benefit from a high price environment, the better it is for their businesses. The reality is that mobile crushing and screening can deliver on this," Scherf points out.

While mobile crushing is ideally suited to the junior market sector, whose processing requirements generally range between 350 tph and 800 tph, machines can be built and cater to larger scale operations – up to 2 000 tph – all of which Pilot Crushtec has the capabilities to deliver on.

Regardless of the machine requirements, the industry is also looking for technological advancements that can assist them in securing an optimal operating performance from their machines, Scherf continues. Machine monitoring and preventative maintenance are the key areas of focus at present in this regard.

"Technology innovation is not new to us, and is not an area we have focused on or invested in as a result of COVID-19. This has been incorporated into our product offering for years. As the official distributor for a range of equipment items from Metso Outotec, we have the additional value-add benefit of offering our clients the Metso Metrics system – a data analytics system that collates machine performance and parameters, and in doing so identifies areas of weakness or situations that may cause an unscheduled breakdown," Scherf explains.

Mobile crushing and screening, equipped to perform technologically, and using alternative sources of energy are undeniably two areas that can deliver positive financial and environmental impact for the mining sector. Pilot Crushtec can deliver on both fronts and drive that accretive value the industry is currently so desperate for. MRA

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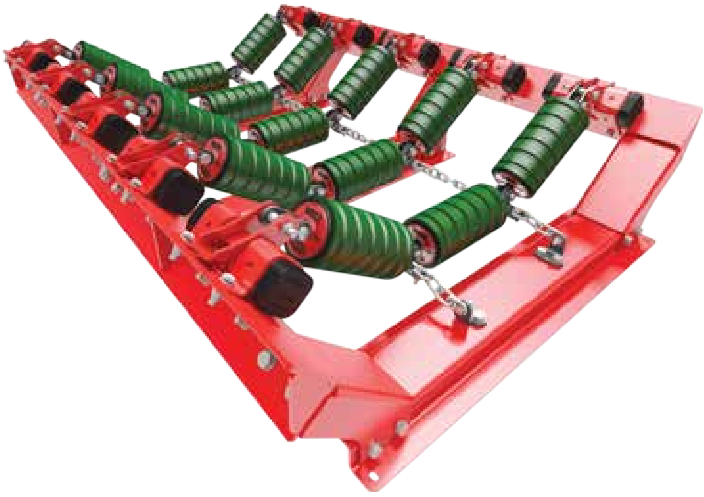

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Booyco PDS solutions are suitable for both surface and underground operations

Proximity detection systems

It's now about Zero Harm

The implementation of proximity detection systems (PDSs) has not been an easy journey. Although the technology has been around for 15 years, mines were initially reluctant to implement the technology due to heavy costs. And while **Booyco Electronics** CEO **ANTON LOURENS** states that there is still a resistance to change, with some companies now arguing the technology is not far enough advanced, he believes that the industry's drive for Zero Harm is seeing all options to achieve this being considered – including PDS installation. **GERARD PETER** reports.

The argument that the latest PDS technology is not at a stage which delivers on its promises is simply not true – at least for those companies that are established in the market and have a track record to prove their value. Booyco Electronics is a prime example of this. The company was established in 2006 and has more than 15 years of experience in the PDS field where significant development of late has identified and rectified the shortcomings of the initial and first generation of PDS equipment.

According to Lourens, the primary reason why a company chooses a PDS solution is to protect both its assets and more importantly, its people. "When companies first approach us, it is to ensure they are compliant with the Mine Health and Safety Act that states that you need to carry out risk assessments and address those significant risks.

It is with this in mind that Booyco Electronics developed solutions that show value and deliver a real return on investment. Lourens explains that once a company deploys a PDS solution, the functionality and opportunities that can be extracted from the technology and equipment deployed provides massive upsides from a productivity point of view, including maintenance scheduling and realtime checking.

One of the PDS solutions that Booyco Electronics offers for both surface and underground applications is its latest CXS offering, which is a comprehensive and integrated response to EMESRT (Earth Moving Equipment Safety Round Table) Level 7, Level 8 and Level 9 safety levels.

The Booyco CXS helps mitigate the risk of collisions between pedestrians and vehicles or between vehicles. "We have identified fit-for-purpose technologies and in our opinion the best fit-for-purpose technology for identifying people both on surface or underground is making use of magnetic fields called Very Low Frequency (VLF) technology. It is close range and can also detect people who should not be around machines on start-up. For surface operations, the Booyco CXS also uses GPS and RFID applications. RFID allows vehicles to 'talk to each other' through radio frequency. This helps identify potential safety threats among the vehicles," Lourens adds.

The brains trust

All of this input is consolidated in the Booyco Host Unit (BHU) which Lourens says is the brains of the system. The BHU is based on best safety practices in the automotive industry. It receives information from the pedestrian sensors, the trackless mining machine (TMM) sensors and the wheeled mobile equipment sensors, and then conducts the necessary proximity calculations to alert users to any impending danger.

The Booyco CXS allows end users to achieve Level 9 compliance

The device does all the calculations for potential risk scenarios. It carries all the information in terms of braking tables for different vehicles. Also, it is a CAN-BUS driven device enabling it to do effective health checks and diagnostics between the various sensory inputs.

Furthermore, Lourens adds that the BHU is very scalable. "For example, if a customer just wants a vehicle-to-vehicle solution, they simply purchase a BHU with a surface sensor and if in six months, they want to add people, they can just purchase additional sensors."

The BHU connects seamlessly to OEM and third-party interfaces based on CAN-BUS and ISO 21815-2 standards. It also offers additional functionalities such as electronic checklists and overspeeding controls. "We also offer a key control, a control measure that ensures that only a person who has the valid credentials to operate a vehicle can do so. All of this is a value proposition that resides in the BHU to ensure that we offer a value add to the customer," adds Lourens.

In addition to this, the company has developed BEAMS (Booyco Electronics Asset Management System), a cloud based software reporting suite. BEAMS can be used on web browser platforms, thereby making information available to every relevant stakeholder at any time.

Lourens believes that the utilisation of additional features such as BEAMS is now starting to come to the fore because companies are now seeing that they can have the tools that can be of real benefit to their operations while enhancing safety.

Collaborative partnerships

At the same time, however, Lourens points out there is no one-size-fits-all solution. "For example, it is important to note that the technology used in underground operations is different to surface operations. For instance, you can use GPS on surface but there is no coverage underground so it won't work.

"Also, there are times when a company discovers that the risk for people is quite low and as such, it only requires a vehicle-to-vehicle solution. On the other hand, when operations are very labour intensive, companies require a people-orientated PDS solution. So there are different requirements for different operations, but ultimately these PDS deployments are based on risk assessment."

Therefore, it is important to understand the client's operational requirements in order to deploy the correct sensing technology. It is for this reason that Booyco Electronics places an emphasis on creating collaborative partnerships with its clients. "You need to have user buy-in and we have adopted an integrated approach," explains Lourens. "This ensures that all stakeholders involved in the project understand the operational capability of the system and also its limitations. This ensures that there are no unrealistic expectations of what our systems actually do."

It is for this reason that Booyco Electronics also has a dedicated training department to help its clients. Also, once a system is installed, the company runs a cold commissioning period where data is recorded to determine what interaction information is recovered from the systems so that efficiency can be improved, while also reducing nuisance alarms and identifying hotspot areas.

However, Lourens avers that the biggest contribution of PDS implementation is to drive Zero Harm. "Our absolute priority is to make sure that people go home safely at night and that is at the core of implementing a PDS solution," he concludes. MRA

"Our absolute priority is to make sure that people go home safely at night and that is at the core of implementing a PDS solution,"

ANTON LOURENS

Materials handling

The safest of safety solutions

With safety being paramount in the mines, **MANITOU** has consistently been redefining the benchmark of operational safety in hazardous, combustible and explosive subterranean mining environments.

The company is one of the few materials handling suppliers in the country able to customise its equipment specifically for African mining environments whilst ensuring compliance to the standard safety regulations. This ability, combined with Manitou's large range of standard solutions, means that the company is able to satisfy most requests.

Manitou has a wide range of mining machines, with the largest in the range being the MHT-X 14350 telescopic handler, with a 35 t capacity and reach of 14 m. It is designed with a renewed emphasis on size for increased productivity in the increasingly heavy-load handling requirements characterising modern heavy mining and industrial applications.

With its enhanced capacity for the handling of large tyre handlers, underground platforms, etc., the MHT-X14350 can perform a wide range of other applications in handling and moving heavy parts and components. The vehicle maintains its handling characteristic in rough, uneven terrain through enhanced frame-levelling ability and high ground clearance.

A key safety benefit of this large telescopic handler is its automatic attachment recognition system which assists the telehandlers in calibrating their weight limits and envelope tolerances.

Attachments

A complete range of underground attachments ensures that the right tools are available for the job. These quick-hitch attachments include, amongst others, tyre handlers, strut handlers, wheel motor handlers, cable & conveyor belt handlers, specialised height and distance cut-out personnel cages, jibs, buckets, as well as other attachments customised uniquely for mining applications – offering full utilisation of the MANITOU machine.

Scaler

Inclusive to the MANITOU mining equipment range is the MANITOU scaler which enables operators to scale hard and soft rock from secure areas on its 7 m, 180° rotational turret, either from within its fully-enclosed cab, or from up to 20 m remotely for maximum safety. Combined with a Manitou mine specification telehandler, customers are delivered with a safety compliant, highly productive solution.

Platform

Platforms dedicated to underground mining applications make reaching heights simple and safe. Designed to withstand impact, this attachment has reinforced safeguards, allowing up to three people to be accommodated and providing greater safety for operators working on high-risk sites.

Beyond machinery

Manitou listens to its customers to best satisfy their expectations and create value with the objective of seeking out the best performance, the greatest ease of use and the highest level of reliability, including when it comes to the total cost of ownership and the product's second life.

Customers need more than just equipment; they need handling solutions and a partner that will look after the long-term maintenance of their equipment to ensure an extended service life.

With a customer-centric approach, Manitou is able to provide packaged solutions to suit the specific requirements of the customer including full maintenance-leased, demo-stock and short-term rental equipment. Manitou's comprehensive range of machines are supported nationally with a world-class service and a support network to ensure maximum performance, uptime and productivity. Through their dealer network and Manitou Centres, experienced maintenance teams are on standby 24/7, 365 days a year. A 95% parts availability over the counter ensures that all units can achieve maximum uptime. Training options (customer site based or Manitou office based) are also available to empower the customer and their operators to get the most out of their Manitou machine in a safe and productive manner. MRA

Renewable energy

Mining's new normal?

Operating in a COVID-19 world is not the only new normal adjustment the mining industry has been making over the last year. Adopting renewable energy as a hybrid or even primary energy source is rapidly becoming a widely accepted solution for the African mining sector and one that is fast emerging as another new normal. And there are numerous projects in implementation phase to prove this. Written by **LAURA CORNISH, GERARD PETER** & **CHANTELLE KOTZE**.

Incorporating alternative, renewable energy sources into a mining operation was not until fairly recently a viable option. The cost to build a solar-powered plant was exorbitant and reliability of supply deemed a significant concern.

But the energy space has evolved quickly – renewable energy technologies have become globally accepted and the increase in demand has made prices affordable. Investors' intensifying demand for sustainable operations that are compliant with ESG principles has also seen the mining industry consider clean energy as a mechanism to achieve this. South Africa in particular has also made significant strides in this space with government permitting the industry to secure and generate its own energy.

The result – a rapid emergence of new renewable energy projects in various phases of implementation across the African mining sector – and here are those projects sitting at the forefront of new energy innovation:

B2Gold's Fekola mine in Mali

Since B2Gold first acquired the Fekola gold mine, located in a remote corner of southwest Mali, exploration studies have revealed the deposits to be almost double the initial estimates. A recent site expansion has just been completed, and while the existing power units provide enough power to support the

increase in production, the company has sought to reduce its energy costs, cut greenhouse gas emissions, and increase power reliability.

The addition of a 35 MWp solar photovoltaic (PV) plant and 17 MW of energy storage to the existing 64 MW thermal engine plant was decided. This new energy mix is anticipated to save over 13 million litres of heavy fuel oil (HFO), reduce carbon emissions by an estimated 39 000 tpa and generate a payback in just over four years.

Wärtsilä's GEMS, an advanced energy management system, has been set up to control the energy across the fleet of power sources, thermal, renewable, and battery storage. The integration, control, and optimisation capabilities provided by GEMS allow the thermal units to be run at the most efficient rate and enable the battery storage to handle the large load step changes and volatility of the solar PV generation assets.

In the context of the Fekola mine, which is an off-grid electrical island, the battery is performing a lot of different services simultaneously;


Image: 123rf.com


Renewable energy will enhance the operating efficiency of B2Gold's Fekola operation

including frequency response, voltage support, shifting solar energy, and providing spinning reserves. The energy load is very flat, with a steady consumption rate of around 40 MW as the mining equipment is operating consistently, 24/7. However, if an engine trips offline and fails, the battery serves as an emergency backstop. The controls reserve enough battery energy capacity to fill the power gap for the time it takes to get another engine started, and the software inside each inverter enables the battery to respond instantaneously to any frequency deviation.

Following the temporary suspension of solar plant construction activities in April 2020 due to COVID-19 restrictions, construction recommenced in October. At the end of December overall construction progress was approximately 70% complete but a fire in early January (currently under investigation) in the solar storage yard destroyed approximately 25% of the solar panels for the project. B2Gold expects that 25% of the solar capacity will become available in the first quarter of 2021, 50% in the second quarter, and the remaining 25% by the third quarter.

The solar plant is therefore not a necessary component to sustain the higher process plant production rate but is expected to reduce Fekola's operating costs and emissions by decreasing power plant fuel consumption and maintenance costs.

The Fekola mine project incorporates the largest off-grid hybrid power solution in the world, demonstrating the growing case for clean energy and its sustainable and economic potential for mines in Africa and beyond.

Resolute Mining's Syama mine in Mali

Mali is a hot spot for renewable energy in the mining sector. Gold miner Resolute Mining is another company investing in a cleaner energy footprint for its automated underground Syama operation.

Interim CEO Stuart Gale notes Syama's energy strategy will occur in two separate phases – the first being to replace a series of diesel powered generators with three 10 MW heavy fuel oil (HFO) power generators. "They are efficient, offer reasonable cost savings and importantly will lower our carbon emissions," he says. Once fully operational, this new power station is expected to generate long term electricity cost savings of up to 40% and reduce carbon emissions by approximately 20%.

Power station (right) and HFO farm (left) construction areas for Resolute Mining's Syama mine

Unfortunately, due to COVID-19, the completion of the HFO plant was not completed at the end of 2020 but Gale is confident its revised March 2021 completion date is realistic and on track. The new plant will also have a 10 MW battery storage system, designed to provide spinning reserve displacement and outbalance sudden jumps in load.

What is truly exciting for Syama is the potential second phase of its energy journey, which includes the installation of an additional 10 MW HFO generator in 2022 and 20 MW of solar PV power in 2023, to be housed on the surface of the current tailings storage facility (which will be closed to accommodate this new infrastructure) – an intelligent use of space.

Once the solar power system is installed, the 10 MW battery storage system will also manage the output of the solar power system, smoothing out fluctuations in PV generation and facilitating integration into the hybrid system.

Resolute Mining has also signed a power supply agreement (PSA) with globally leading power generation provider Aggreko for the hybrid plant. The terms of the PSA provide that Resolute will pay a levelised cost of energy tariff of US$0.15/kWh based on current heavy fuel oil prices. This cost compares favourably with the current energy cost at Syama which ranges from $0.23/kWh to $0.26/kWh based on prevailing diesel prices.

The PSA also includes an incentive programme whereby Aggreko may share 25% to 50% of the resulting fuel savings for Resolute if improved efficiencies for key performance indicators are achieved. This provides an incentive to further reduce the cost of power for Resolute. The new power plant will be funded and operated by Aggreko with limited capital contribution required by Resolute.

"This is an incredible initiative for Syama and further drives this mine into an era that embraces technology and ESG principles," Gale highlights.

Pan African Resources' Evander Mines in South Africa

South Africa's mining sector, albeit more mature than those of most other African countries, is no stranger to energy supply constraints. This has led several mining companies to investigate the option of supplementing their grid-supplied energy with renewable energy solutions to ensure a reliable energy supply when there are unscheduled power disruptions experienced from the national grid.

Mid-tier gold producer Pan African Resources felt it prudent to investigate renewable energy solutions, not only for the anticipated long-term cost savings owing to the above-average inflation increases proposed by State-owned power utility Eskom over the coming years but also to reduce the company's carbon footprint.

The company investigated the feasibility of various renewable energy power options for its flagship Elikhulu tailings retreatment plant at Evander Mines. Elikhulu is one of the world's largest tailings retreatment facilities and processes 1.2 Mt of historic tailings per month from the three existing slimes dams at Evander.

A solar PV plant solution was found to be the only feasible solution on a site-specific, safety and economic basis as it would reduce the company's production costs, improve its sustainability, and benefit returns to shareholders over the longer term.

Pan African Resources has engaged juwi South Africa for the construction of the proposed 10 MW solar plant, which will provide up to 30% of Elikhulu's annual power requirements and savings of some 26 000 t of CO_2 per year, which is between 3% and 5% of the group's total annual emissions.

There are plans to increase the size of the solar plant to an estimated 25 MW to allow clean energy feed to the adjacent Egoli project at Evander Mines, which will be South Africa's newest underground gold mine with a life of mine of 14 years. Egoli will commence production in three years' time, and the cost benefits of using solar energy as well as the required capacity will be incorporated into the feasibility study updates to the project. Further reductions in the group's emissions will result from the proposed expansion of the plant as well as from similar plants planned at the company's Barberton Mines operations.

According to Pan African Resources CEO Cobus Loots, the solar plant, which has an expected life of 20 years, will generate electricity at much lower costs (depreciated cost over 20 years estimated at R0.83/kWh) than could be provided by Eskom (with a tariff of R1.03/kWh), and makes this investment compelling from an economic point of view.

"We welcome any initiatives by the government that will enhance our ability to operate and improve our sustainability, without the requirements for a lengthy application and approval process by the Department of Mineral Resources and Energy and associated entities," says Loots.

The company expects to generate first power in the third quarter of 2021.

The Elikhulu tailings retreatment plant at Evander gold mine

Bushveld Minerals' Vametco plant

Bushveld Minerals' Vametco mine in South Africa

AIM-listed integrated vanadium producer Bushveld Minerals' energy subsidiary, Bushveld Energy, is under way with plans to demonstrate the technical and commercial capability of hybrid mini-grids using solar PV and vanadium redox flow battery (VRFB) technology for energy storage. In doing so, the company will, through the mini-grid project, also provide renewable energy to its Vametco mine in South Africa, reducing its reliance on power consumption from the national grid.

For the hybrid mini-grid project, Enerox will supply the 1 MW/4 MWh VRFB; and Abengoa will manage the engineering, procurement and construction of the project, including the integration of 3.5 MW of solar PV. Bushveld Minerals signed a memorandum of understanding with Thebe Investment Corporation, involving it as a strategic equity partner in the development and funding of the project, which is currently under way.

Despite COVID-19, the engineering phase for the project commenced in 2020 and has been completed. Once the debt and equity financing closes, the company can apply for a generation licence with the National Energy Regulator of South Africa and proceed to construction, which is expected to take place later this year.

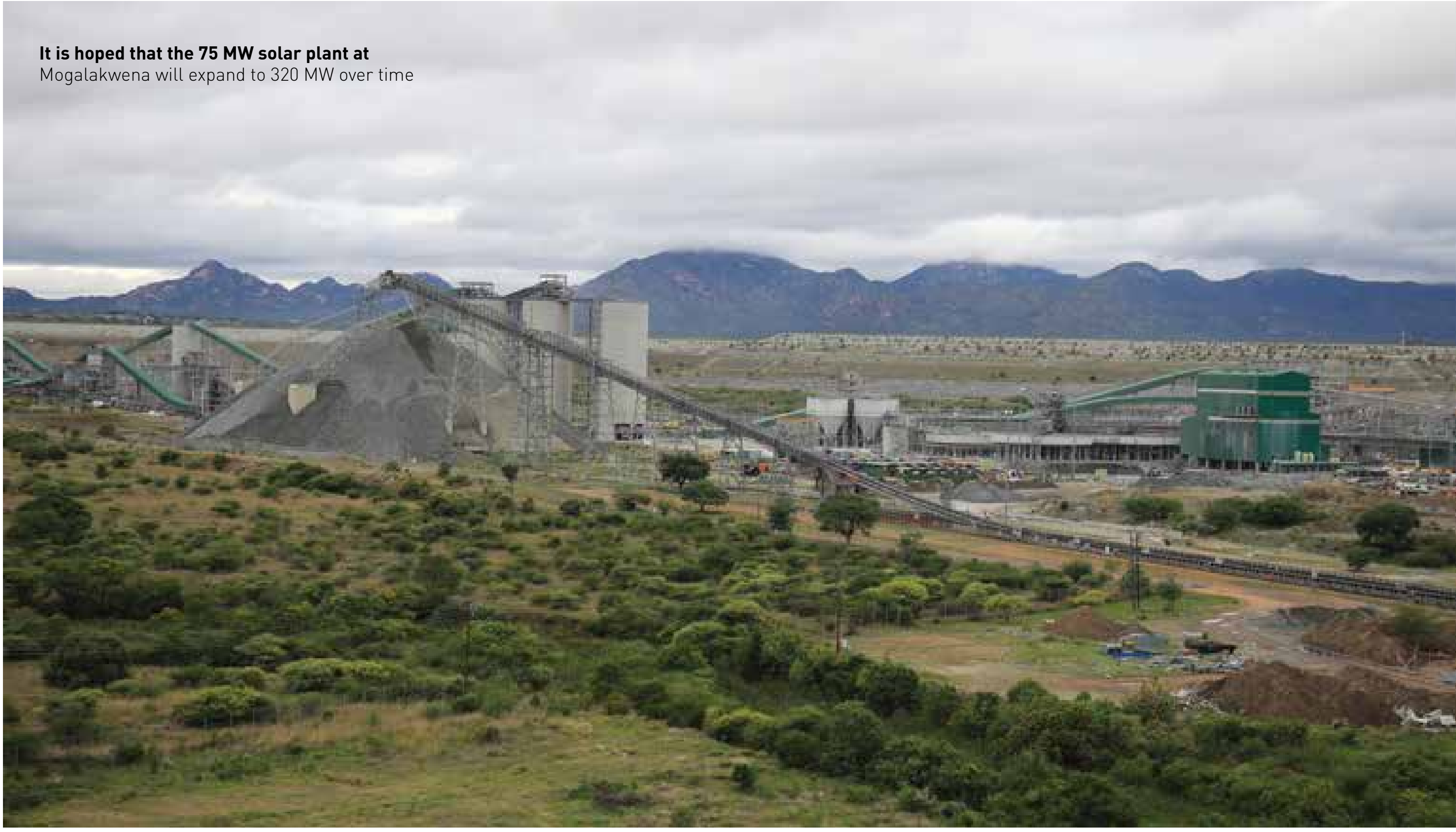
This hybrid mini-grid project, which will supply just under 10% of Vametco's energy consumption and help reduce carbon dioxide emissions by more than 5 700 t/y at the site, is the precursor to its plan of supplying a larger amount of energy to Vametco in future, says Bushveld Energy CEO Mikhail Nikomarov. He notes that plans are also under way to progress self-generation options for all of Bushveld's existing and future electrical energy needs within its facilities.

"We have identified energy needs of more than 125 MW of solar PV and 180 MWh of battery energy storage within our facilities," adds Bushveld Minerals CEO Fortune Mojapelo. This plan has been in development for a number of years now in response to Eskom not granting capacity increases due to lack of capacity to fulfil this.

Therefore, as a means to mitigate risk and to prepare for the fact that the company will need more and more energy as its expands its projects and production in South Africa, Bushveld has developed a self-generation energy strategy, leveraging its energy business, to enable the business to progress with its growth and expansion plans.

With increasing pressure on the mining industry to decarbonise, Nikomarov highlights a trend that has emerged over the past 12-18 months in which mining companies are not only considering mini-grids from a purely financial sense as a means to decrease their electricity costs by displacing the high cost of diesel of HFO generation. Instead, companies are considering how much of their carbon footprint renewable energy mini-grids can displace.

"Shareholders and investors are increasingly considering the environmental and sustainability benefits of renewable energy," says Mojapelo, noting that companies can be penalised for not meeting emission standards. Moreover, companies that can prove that they are decarbonising beyond the minimum requirements may stand to benefit in future from



It is hoped that the 75 MW solar plant at Mogalakwena will expand to 320 MW over time

incentives that may enhance the business case for decarbonisation going forward, he adds.

Anglo American Platinum's Mogalakwena in South Africa

The renewable energy market in South Africa continues to grow and there is a belief that more opportunities will arise to generate and procure renewable power to address supply constraints and the carbon footprint in the country.

It is in line with this that Anglo American Platinum is forging ahead with the development of a solar plant at its Mogalakwena platinum mine in Limpopo. The plan is to build a 75 MW solar plant at Mogalakwena, with the option of expanding this to 320 MW over time.

The company's estimates show that the planned investment in renewable power at the mine will deliver economic value by decreasing exposure to rising electricity tariffs and carbon taxes. Beyond the economic value, it will also enable Anglo American Platinum to improve energy security and increase long-term security for its products as customers and export markets push for lower carbon content.

The request for proposal phase for a solar plant at Mogalakwena has closed and the company is currently in the assessment stage to select a preferred supplier. Once a supplier has been selected and the design finalised, it will be submitted for various internal approvals, including to the Anglo American Platinum and Anglo American boards. Once all internal approvals have been obtained, the company will be in a position to apply for the various regulatory approvals and licences.

The solar project also ties in with the company's aim to lead the global mining industry in fuel-cell mining haul truck adoption, by ultimately using renewable energy sources to produce green hydrogen. The development of a fuel cell truck is currently underway, and the first motion at Mogalakwena is expected before the end of the year.

In response to the global challenge of climate change, Anglo American Platinum's activities are focused on radically reducing its energy consumption through its FutureSmart Mining methods and technology adoption, as well as switching to low-carbon energy sources and increasing renewables in its energy mix.

Aligned with this approach, the company has set 2030 targets to improve energy efficiency and reduce absolute greenhouse gas emissions by 30%, against a 2016 baseline. It aims to achieve carbon neutrality by 2040.

Gold Fields' South Deep in South Africa

Another company that is well on its way of harnessing the power of the sun to improve energy efficiency is Gold Fields.

In February, the National Energy Regulator of South Africa (NERSA) approved the licence for the construction of a 40 MW solar power plant at its South Deep mine.

The solar PV plant will be constructed on the same site as the South Deep mine and all power generated by the plant will be consumed by the mine. The solar plant has the potential to provide around 20% of South Deep's average electricity consumption.

Nick Holland, Gold Fields' CEO states, "The solar power plant will increase the reliability and affordability of power supply to South Deep, ultimately enhancing the long-term sustainability of the mine.

"The approval of this licence sends a strong, positive message to mining companies and their investors, potentially leading to decisions being taken to sustain and grow mining operations in the country, especially in deep-level, underground, marginal mines. Enabling companies to generate their own power also gives Eskom room to address operational issues at its power plants."

Gold Fields' energy objectives are based on four pillars – energy must be reliable, available, cost-effective and clean – which promote a shift to self-generation using renewable energy sources. "We are fully committed to making our contribution towards net-zero emissions," states Holland.

During 2020, Gold Fields successfully implemented solar and wind power plants, backed by battery storage, at two of its Australian mines, Agnew and Granny Smith. It also committed to renewables at its other Australian mines, Gruyere and St Ives, as well as the Salares Norte project in Chile when it starts operations in 2023. All its other mines are also reviewing renewable energy options.

Since full commissioning of the Agnew microgrid, renewable electricity averages over 55% of total supply at the mine. During 2020, renewable electricity averaged 8% for the Australia region and 3% of total group electricity. Once the South Deep project is commissioned, renewable energy's contribution to the group total will rise to approximately 11%.

"We expect our investment in renewable and low-carbon energy sources to contribute significantly to our carbon emission reductions over the next few years. Power from the South Deep solar plant will partially replace coal-fired electricity from Eskom, enabling us to significantly reduce our Scope 2 carbon emissions," Holland concludes. MRA

Gold Fields has finally received approval for the construction of a solar plant at South Deep

Energy revolution

Mines show willingness to adopt green energy, where feasible

By Laurie Hammond, partner at Hogan Lovells and Andrew Carey, partner at Hogan Lovells.

Mining companies in South Africa are actively starting to consider green energy technologies to help drive forward their sustainability agendas. It is a complex subject, with various factors in play such as cost, availability and government regulation.

The recent annual Hogan Lovells *"Future of Mining: Sustainability"* report showed that almost one-third of mining companies in Africa have targets around renewable energy utilisation. Other responses to our survey showed that mining companies in Africa believe that a priority for driving sustainability in the sector is increased renewable utilisation. Green energy is of critical importance on their agendas.

Respondents to the survey said increased utilisation of green energy brings various benefits, including net carbon reduction, greater adherence to voluntary Environmental, Social and Governance (ESG) standards and having an increased positive impact on communities, diversity and inclusion, employee wellbeing and increasing water recycling.

As we advise our clients, green energy is only one part of a sustainability plan to future-proof a business. Sustainability can mean different things for every company based on each company's particular ESG considerations and conditions.

South Africa's three largest mining companies are all members of the 27-company strong International Council on Mining and Metals (ICMM), an international organisation dedicated to a safe, fair and sustainable mining and metals industry. Every ICMM member company adheres to 10 Principles and

According to Hogan Lovells, almost one-third of mining companies in Africa have targets around renewable energy utilisation

Image: 123rf.com

eight Position Statements on issues relating to sustainable development.

The core business of mining is extracting minerals, not power generation. With power being highly regulated and given that it may not be practically viable for every mine to build its own wind or solar plant, a tailored assessment has to be carried out for every business as part of its overall sustainability goals.

The South African government and Eskom have now decided to encourage mines to generate more of their own power, to take pressure off the grid. This programme has got off to a steady start. The first self-generation licences were issued at the end of last year and we expect the process will speed up this year. We are aware of several mines that are eager to generate their own power, but it requires a huge investment, which may be out of reach for smaller operators.

Other renewable options are open to mines, apart from building an onsite plant. For example, this could be investing in a renewable power plant offsite that can wheel power through the grid to feed its operations or working with the supply chain to use renewables where feasible.

Focusing exclusively on renewable power obscures the other important areas where mining companies are putting in considerable effort to become sustainable.

The top reasons for focusing on sustainability – besides the fact that it brings environmental benefits and is the "right thing" to do – were cited by respondents as an improvement in commercial metrics (financials and productivity), access to more investors, increased brand equity and global climate restoration.

Mining companies correctly consider access to investors as a reason to focus on sustainability. Companies in all sectors are under pressure from investors to disclose more information about their performance across a range of ESG areas and activist investors are using their power and influence to force through more sustainable strategies at their investee companies.

Investors are increasingly looking holistically at the impact of the businesses in which they invest on the communities and locations in which they operate. For example, in the aftermath of the 2019 Brumadinho dam disaster in Brazil, the ICMM is working with the Church of England Pensions Board (with over US$3 billion of assets under management) and the United Nations Principles for Responsible Investment (UNPRI), among others, to establish an international standard on tailings storage facilities.

From 10 March this year, new EU regulations will require European fund managers and other regulated financial institutions to comply with new sustainability disclosure requirements. Similar regulation around the world is likely to dovetail with pressure from end-investors to divert capital flows towards projects, enterprises and assets that are managed in transparently sustainable ways.

The bottom line is that sustainability is good business. A company's longer-term prospects depend on how it manages its water resources, uses sustainable energy sources, monitors its supply chain, pursues environmentally responsible policies, and commits to diversity, citizenship and wider social responsibility.

Hogan Lovells is well-placed to advise mining clients, not only on green energy projects, but also on all other aspects of sustainability, particularly through our dedicated Impact Financing & Investing team. MRA

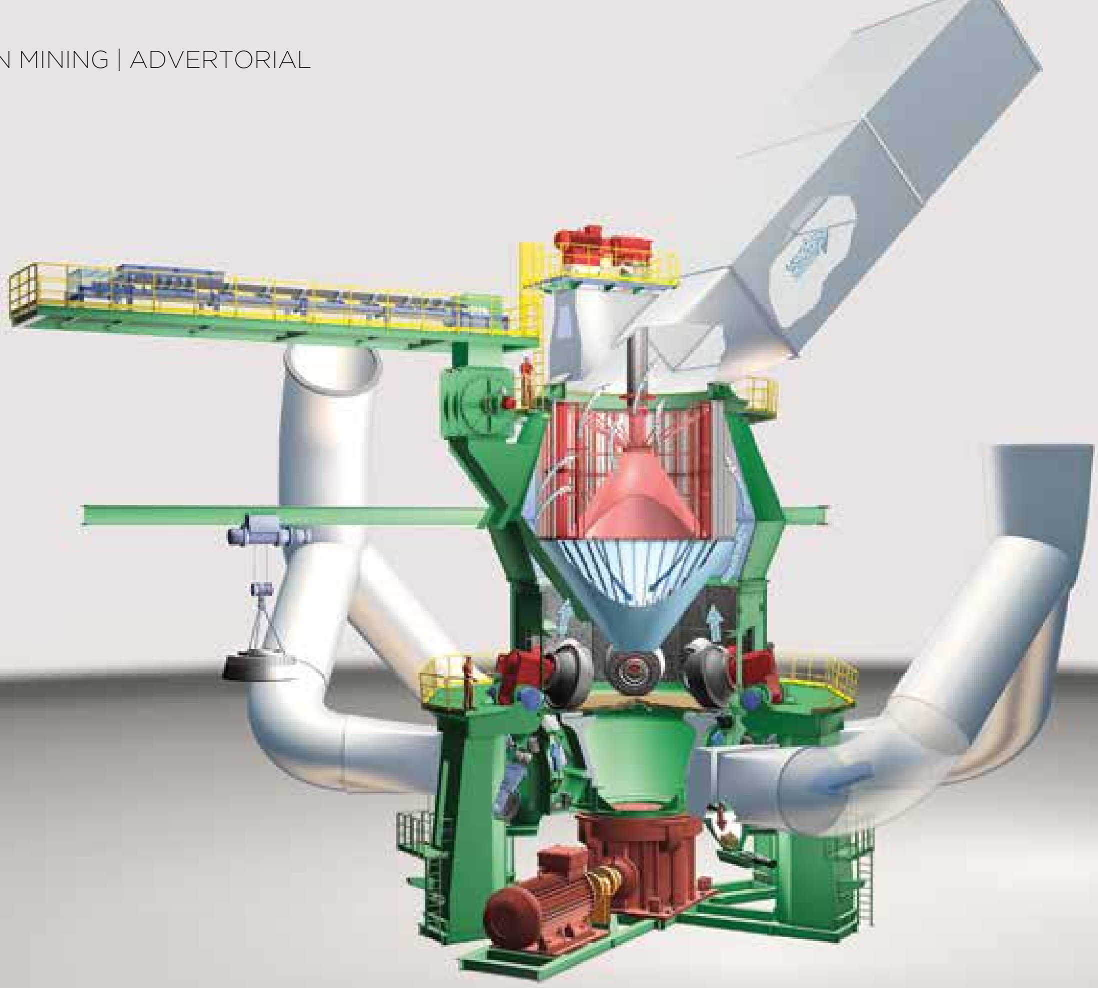
ABOUT THE AUTHORS

Laurie Hammond

Hammond focuses on cross-border transactions in Africa. She has a broad range of experience advising clients across the commodity value chain, acting for lenders and borrowers in a variety of sectors from mining, energy and natural resources to logistics and infrastructure. She has worked in the London and South African markets and is both an admitted solicitor and an attorney.

Andrew Carey

As co-head of Impact Financing & Investing, Carey works with clients to future-proof their businesses and attract capital in a growing ESG-focused investor market. He has worked on Social Impact Bonds and Development Impact Bonds and other environmental and social sustainable finance transactions. Carey has provided advice to the US Loan Syndications and Trading Association regarding the UK Green Loan Principles and Go Lab regarding Contracting Guides.



Power play

Energy savings in the mining industry

Operating expenses (Opex) is one of the biggest profit or loss indicators on any mine and controlling these expenses is always a difficult task due to many factors. One such factor is power.

Constantly increasing tariffs, outages and breakdowns due to power surges, not to mention the constant change in the ore bodies' mineralogy, all add to these costs. "Looking at a mine's operating costs, power consumption within the comminution circuit can contribute up to 50% of a mine's electricity usage," states Jonathan Smith, sales and marketing manager for comminution specialist Loesche SA.

Smith adds that the mining industry has been trying to streamline and make the comminution section of the mine more economical. However, this has always been difficult as the technology used is not power-friendly. The circuit also has a large footprint with many associated pieces of equipment which also require power.

Taking run of mine ore and processing it to the correct size for the recovery circuit has a direct cost and this can be described as the kilowatt hours required in electricity to obtain the required fineness. "Added to this pressure is the growing volume of complex ores that have heterogeneous mineralisation which in turn requires a fine grind to extract the available mineral. This results in further power requirements," states Smith.

As the world looks to go green, the mining sector has one of the hardest tasks ahead of it as a mine consumes large amounts of electricity, water and chemicals. For a mine to comply with future environmental targets, drastic steps need to be taken to reduce these factors.

The vertical roller mill (VRM) from Loesche is a solution for mines today which has a direct and positive effect on all spheres of the environmental pressures experienced. Apart from water and chemical usage savings, the major saving is related to power and the effect on a mine's financial bottom line.

Some of the savings realised are attributed to the feed particle size reducing the footprint. Depending on the size of the VRM, the feed size can be up to 140 mm lumps which allows for the tertiary and even the secondary crushers and related equipment to be removed from the circuit. As the VRM uses a dry circuit, the use of water and the need for pumps etc. up to the recovery circuit can be removed as well. The VRM allows for the comminution and recovery circuits to be de-coupled by using a surge silo which allows for each part of the plant to stay operational whilst basic maintenance is being done.

Power saving comes in the form of energy required to reduce the ore to the required recovery particle size. "Apart from the reduction of equipment prior to the mill, the VRM uses a particle-on-particle crushing milling principle. This means that all the power used is put into this phase and not into moving around grinding media. This can equate to between 38% and 45% less power being used by the mill alone compared to other mills," adds Smith.

Due to the dry process the VRM also removes the particles via an air gas stream and classifies the material immediately. Particles of the correct size are transported to the bag house with the oversize moving back onto the table for additional grinding via the gravity designed grit cone. In doing so, the mill does not retain the ore for longer than necessary and produces a better feed for the recovery circuit. This ensures that the power required is utilised correctly and not wasted.

Digitisation creates power efficiency

In addition, Loesche offers the Digital Ready 4.0 real-time artificial intelligence operating system which constantly monitors the milling process and makes small adjustments to ensure the mill is producing the best throughput all the time, even as the ore characteristics and wear liners change. "As such, the system will ensure the best control over the electricity used and will identify any underlying maintenance issues," states Smith.

Digital Ready 4.0 has four segments which talk to each other. The operating system software is monitored by the expert software adjusting the mill constantly through small insignificant changes. The surveillance software monitors the mill's health and the asset management system ensures that the spare parts holding is up to date and ensures that parts are ordered on time. The digitalisation side allows for offsite monitoring of the mill as well as the control if needed.

Looking at all industries worldwide, the four main categories operations look at are power usage, efficient productivity, perfect replacement and reliability – which when added together ensures good lifetime and availability of the equipment.

"The quality of the Loesche mill, combined with the digitisation software, gives the end user peace of mind knowing the comminution circuit is operating optimally, thereby ensuring that the profitability of the operation is being kept at its highest level at all times," Smith concludes. MRA

"…power consumption within the comminution circuit can contribute up to 50% of a mine's electricity usage,"

JONATHAN SMITH

Karoo deep drilling

Baseline research project vital for shale gas exploration activities

The South African government, through the Department of Mineral Resources and Energy (DMRE), instituted a moratorium on shale gas exploration until evidence-based data and information on the potential impact of shale gas exploration, particularly on the environment, are available.

The Council for Geoscience (CGS), an entity of the DMRE, is conducting geoscientific research in the Karoo Basin to develop a geoenvironmental baseline model which will influence the regulatory requirements for shale gas exploration and exploitation activities in the country. The research is being conducted in an area that has been earmarked as a shale gas "sweet spot" in Beaufort West, Western Cape Province. To this end, CGS has conducted baseline studies, including geological and geophysical mapping, at regional and local scales. Continuous monitoring mechanisms for groundwater and seismicity have been put in place. Comprehensive environmental screening to ensure environmental soundness has been completed.

With the baseline studies having characterised and enhanced our understanding of the geology and the environment, the study has begun to delve into subsurface geological dynamics by drilling five shallow observation boreholes to a depth of 169 m and two semi-deep monitoring boreholes to depths of 517 m and 1 402 m, respectively. This work has enhanced our understanding of shallow and semi-deep groundwater dynamics above and below the dolerite sills, respectively.

Two of the shallow observation boreholes which proved to be particularly high yielding were donated to the Beaufort West Municipality in February 2018. At the time, the Western Cape Province was being ravaged by one of the most severe droughts in recent history. The two boreholes, with a combined capacity of 33 million litres of water per month, continue to bring much needed relief to the community. To date, the municipality has extracted and distributed well over 397 million litres of water.

Research provides valuable information

The KDD project has now commenced with the drilling of a 3 500 m ultra-deep vertical stratigraphic research borehole. The data from this research borehole will add valuable information on the subsurface geology of the area, particularly the complex dolerite network in the area and its implications in respect of groundwater and hydrocarbon potential. The borehole is envisaged to intersect the carbonaceous shales of the Whitehill and Prince Albert Formations of the Karoo Supergroup thereby enabling an assessment of their hydrocarbon potential. Results from the borehole study will aid our understanding of the brackish water at depth and provide insight into preventing the contamination of fresh water during exploration activities.

The information emanating from this research will also underpin the formulation of an evidence-based regulatory framework that will lay the groundwork for shale gas development in South Africa. Successful and environmentally prudent shale gas development in South Africa will pave the way for a just transition to a low carbon economy.

Moreover, energy security and will have a significant impact on the country's economy. In 2010, the United States Energy Information Administration proclaimed that the Karoo Basin in South Africa has technically recoverable shale gas resources in the order of 485 trillion cubic feet (Tcf). Renewed interest by energy companies has therefore resulted in applications for exploration licences and technical cooperation permits. MRA

COUNCIL FOR GEOSCIENCE

March 2021

The Council for Geoscience (CGS) is the national custodian responsible for the collection, compilation and curation of all onshore and offshore geoscience data and information. The CGS aims to use this information and knowledge to develop geoscience solutions to real-world challenges in South Africa.

GEOSCIENCE MAPPING

Geoscience mapping is the core function of the CGS and aims to develop fundamental geoscience knowledge using an integrated and multidisciplinary approach as well as innovation that merges several onshore and offshore geoscience themes such as geology, geotechnical studies, geochemistry, geophysics and economic geology for mineral and energy resources and their mineralising systems information to boost sustainable exploration for economic growth.

ENGINEERING GEOLOGY AND GEOHAZARDS

As the custodian of the national seismological network, the CGS monitors and maintains a geohazard inventory for South Africa. This information is primarily used in developing effective and novel geohazard mitigation solutions for safe and judicious land use. Modern artificial intelligence techniques are applied in subsidence mapping and seismic hazards characterization.

WORLD CLASS FACILITIES

The geoscience functions are supported by a multi-faceted laboratory that performs a wide range of analytical services such as petrography, whole rock geochemistry, petrophysics, coal science and hydrochemistry. The CGS also manages a geoscience museum, library, bookshop, and national core repository which are used by the scientific community and the general public.

AFRICAN FOOTPRINT AND OTHER COLLABORATIONS

As the permanent secretariat of the Organisation of African Geological Surveys (OAGS), the CGS has an impressive footprint in the African continent where various geoscience services have been rendered in line with global standards, international policy and governance. The CGS also collaborates with various academic institutions and science councils around the world.

WATER AND ENVIRONMENT

The CGS carries out hydrogeological studies and aquifer modelling and is also responsible for environmental geoscience research which aims to provide sustainable solutions to monitor and mitigate the impact of geology and mining activities on the health of the environment including its inhabitants.

CGS AT WORK

- The CGS is undertaking an integrated and multidisciplinary geoscience mapping programme across South Africa.
- Some of the recent projects include:
  - Multidisciplinary geoenvironmental baseline investigations in the Southern Karoo for possible shale gas development, which uncovered previously undefined groundwater aquifers.
  - Regional soil geochemical sampling and detailed follow-up surveys, particularly within the Northern Cape, North West and Mpumalanga provinces.
  - Geothermal energy and carbon capture and storage research, which aims to expand the current renewable energy mix of South Africa and decrease the carbon footprint.
  - Ground stability and geotechnical assessments for infrastructure development in the Northern Cape and Free State Provinces.

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Council for Geoscience

R&D investment

Delivers results for Vibramech

Vibrating screen specialist **Vibramech** is committed to research and development (R&D) initiatives – with the objective of minimising its clients' investment costs through optimum design. "This results in the production of even more durable equipment," says MD **DAVID MASSEY**.

Vibramech's exclusively appointed R&D mechanical engineers focus their competencies on a wide range of structural improvements and innovative design changes, across all of its products. They conduct continuous research programmes on a variety of applications, ranging from isolator optimisation to structural dynamic and fatigue optimisation of complete screens and feeders.

"Our team utilises the most advanced simulation software to conduct finite element analysis (FEA), as well as multibody dynamic analysis to improve engineering efficiency and reliability and to optimise components in their design phase. This is complemented by practical tests such as destructive and non-destructive testing, modal analysis, vibration analysis and strain gauge measurements to ensure the integrity and reliability of our products are maintained," Massey outlines.

More recently, the company has started employing new technologies such as wireless sensors to continously monitor the performance of its client's equipment. This enables Vibramech to constantly monitor the health and condition of the equipment in the field, with potential breakdowns on site being rectified before the client is even aware of such problems. This continuous monitoring will lead to reduced downtime and associated costs for a client and provide a client with complete peace of mind for the already robust and reliable Vibramech equipment range.

"We understand the harsh operating conditions which vibrating screens, grizzlies and feeders are subjected to in the mining industry, worldwide. As such, we are cognisant that our designs need to cater for both abrasive and corrosive environments. As sound dynamic behaviour is essential to ensure vibrating equipment reliability, all equipment is built to perform within strict dynamic parameters. All internal mating surfaces are machined in order to maintain stringent dimensional tolerances," Massey states.

In addition, the company's quality assurance programme makes provision for a full 3D vibration analysis to be conducted on all equipment prior to release. This is used as a benchmark for the life of the equipment.

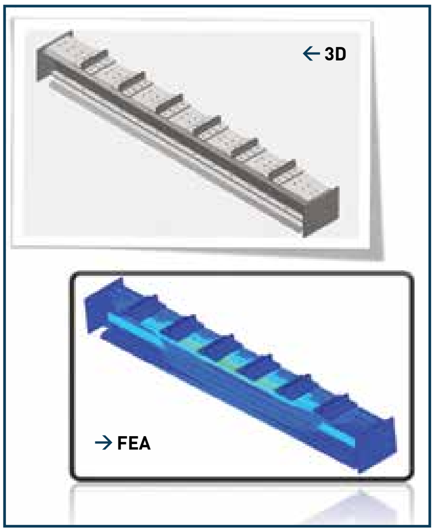
As an original equipment manufacturer (OEM), all equipment is manufactured in-house by Vibramech at its 20 000 m^2 premises in Chamdor, 35 km west of Johannesburg, South Africa. Almost every piece of equipment is tailor-made to suit a client's specific requirements, from both a plant layout viewpoint and process considerations.

A present staff complement of 200 controls all activities from sales through to engineering and manufacturing. All equipment is designed and manufactured by Vibramech without the use of manufacturing subcontractors. This ensures complete control over quality and scheduling. Furthermore, its flexible and practical approach to screen design enables the client to optimise the vibrating equipment geometry to suit its specific requirements, resulting in tailor-made equipment.

Vibrator motor and geared exciter repairs form part of Vibramech's service offering, with repairs conducted to OEM specifications. URAS vibrator motors and geared exciters are part of Vibramech's key product offering, which, along with other OEM vibrator motors and geared exciters, are repaired at Vibramech's factory.

Vibramech has distributed URAS vibrator motors as part of its vibrating equipment product offering since 1981 and is the exclusive URAS vibrator motor distributor for Africa and the Middle East.

Vibramech ensures a robust equipment design that will provide many years of reliable service, resulting in lower operating cost and reduced downtime. MRA



↑ **Deck support beam**

Please visit Vibramech's new website at *www.vibramechglobal.com* for an overview on how Vibramech could assist with your current and future mineral processing requirements.

IMS Engineering's data analysis control room

IMS Engineering

COVID-19 the catalyst for change

COVID-19 has been incredibly destructive for the business world, in South Africa and globally. This however was not the case for comminution, screening and separation solutions expert **IMS Engineering**. "The virus was our catalyst for change and pushed us to revaluate the business and embrace and invest in new technology to overcome the challenges associated with operating remotely – and in so doing has pushed the company into a new era," MD **PAUL BRACHER** tells **LAURA CORNISH**.

IMS Engineering has always proven itself to be a solutions orientated company, providing customised equipment that is designed and built to the specific requirements of individual applications. In 2020 this business model was elevated as the company quickly introduced and enhanced its technology support offering. "We consequently achieved a record year and anticipate this success to accelerate further in 2021," Bracher starts.

Getting the most from your machine

Technology is not new for IMS Engineering, the MD notes. The company introduced its Integrated Monitoring Optimisation Support Technologies (I-MOST) system to the market in 2018 which allows stakeholders to operationalise their equipment data in order to optimise its performance and efficiencies through valuable insights. Such a system delivers valuable insights when the data is properly analysed and quantified, enabling IMS Engineering to provide greater product support in a real-time capacity.

"It is the analysis of this data that truly showcases the value of I-MOST and this is what we focused on heavily in 2020," Bracher reveals. Having invested in a data analysis control room at its head office in Spartan, managed with the support of a newly employed data analyst, IMS Engineering now considers itself a Fourth Industrial Revolution (4IR) leader within its fields of specialty.

The value of this technology still however lies in its delivery and execution. And while the company's local service technicians understand and embrace the I-MOST benefits and functionality, the control room bridges the gap between the on-site technicians and the head office based experts who can remotely advise on machine performance, and identify potential problems through immediate data analysis reviews. "This will enhance our entire team's expertise quickly and ensure that while many of us can't gain access to site, we don't compromise our standards and in fact can offer assistance far more quickly that we have done in the past," Bracher highlights.

The I-MOST system concentrates its efforts on the first four pillars of Industry 4.0:

- Big data and analytics;
- IoT, networks and security;
- Horizontal and vertical integration; and
- Machine learning and AI.

The smart analytics platform, which allows equipment owners to monitor their mission-critical assets remotely, has over the past two years gathered a tremendous amount of actual installation data (over 2 billion data points). Acquiring the data from remote locations in Africa is a challenge on its own; while mediating the large amount of time-series data appropriately in order to access and process it rapidly is one of data science's biggest obstacles. The I-MOST achieves this through a mixture of hardware, network protocols and cloud services. The data ingestion is scalable to allow for a multitude of data streams to be managed simultaneously.

Through the in-depth knowledge base provided by IMS Engineering to interpret and extract meaningful and actionable results, methodologies and algorithms to process this raw data were developed. The outcomes of this processed data provide a deeper understanding of the equipment and provide insight into its performance and efficiencies.

Additionally, the technical, operational and managerial horizontal and vertical integration of all business units – by means of accessibility to a real-time dashboard from anywhere in the world and on any platform – allows customers to speak the same language when discussing key performance indicators and have a high level overview of their key functions. The transparency of this data allows for more productive actions to arise from different organisation perspectives. These customisable visualisations are the real heart of the I-MOST once all the data preparation is accomplished in the previous phases.

Furthermore, I-MOST uses machine learning techniques to predict critical failures days and even weeks before they occur, which potentially negates downtime and service costs. The system alerts the client of a specific concern and through a collaborative effort with IMS, is able to identify and rectify the issue beforehand. "We can state with confidence that we can predict wear life on our equipment two to three weeks in advance. And unlike many systems on the market that produce false positive results, we have to date achieved 100% accuracy with our testing in this area," Bracher notes.

You see, I see

While the I-MOST system, now driven by a central control room, is an impressive offering to the market, it is not the only technology investment IMS Engineering delivered in 2020.

The company's ability to assist its clients remotely has been further elevated following the introduction of its I-CARE system – in essence a virtual reality mechanism that allows IMS Engineering personnel to be on site, without ever leaving their office.

"Through the use of a data-connected headset, we are now able to see and move around site with our clients. In doing so, we can guide anyone on starting, operating or maintaining a machine. The combination of I-MOST and I-CARE technologies allows us to easily and quickly identify product codes and provide detailed drawings and instructions for each product – right down to component level so that we can get the plant back into operation without any compromise," Bracher highlights.

In summary, I-CARE:

- Improves frequency and quality of communication;
- Dramatically improves front-line breakdown response time and accuracy of diagnoses of problems;
- Integrates remote weekly inspection information into improved preventative maintenance planning and stock availability for planned jobs; and
- Ensures service consistency irrespective of location – expert guidance received via specialist at head office and through integration with I-MOST.

CYBERSECURITY

Throughout the data acquisition and data processing phases, clients' data confidentially and security remains a paramount concern. The I-MOST system has unique proprietary security protocols to secure the client's data and prevent any malicious attacks from entering their control system network. I-MOST strictly monitors the system and maintains no control whatsoever over the equipment.

Full-scale audits are required to have every piece of equipment that IMS Engineering sells and the parts that make up that machine on record. This process is well underway and will be completed in 2021. "The market will be able to maximise on I-CARE in 2021 and truly gain the benefits of what our full technology suite has to offer," Bracher states.

The inability to travel freely to site, restricted by the health and safety implications of COVID-19, poses no challenge to IMS Engineering. And regardless of the future, the company is equipped to deliver a solution to its clients that is driven by technology, reduces time travel delays and ensures 'on-site' access to its highest level experts.

The virus has undeniably pushed this company into a new era – one that has moved from a more traditional product-focused company to a knowledge-based company – which in just a short space of time has transformed the business into a position of excellent equipment and service delivery. MRA

"It is the analysis of [our] data that truly showcases the value of I-MOST and this is what we focused on heavily in 2020,"

PAUL BRACHER

Tech-driven training

Creating safer mines

By Stuart Woolmington, CEO of WinWin International

"The most important thing to come out of a mine is the miner."

Image: 123rf.com

These immortal words are believed to have come from 19th century French sociologist and mining inspector general, Frédéric Le Play, and they are as truthful today as they ever were.

The challenges for any mining operation are countless and research shows that the vast majority of incidents can be linked back to human error. As such, the need for in-depth, hands-on and continuous health and safety learning at all levels of mining work grows more urgent by the day.

Health and safety issues within mining are often exacerbated by the inability to bring real-time information to a risk environment. Historically, the enormous amount of information to be taught and serious lack of learning technology has meant that learning tends to take place in old-style training rooms, often with generic content and outdated systems. It is little wonder that the industry's health and safety statistics are cause for concern.

Making learning real

Fortunately, health and safety in mining is one of the many areas being positively impacted by innovation within the world of learning and development technology. One of the most exciting ways in which such advancements have broken new ground is to bring education to miners in simulated environments which feel true to reality. In other words, providing hands-on training that illustrates how to decrease or remove risk and injury in close to real-life situations, brought about by clever technology. For the longest time, this type of non-traditional learning was considered beyond imagination and surely impossible. Thankfully, this is no longer the case.

Revolutionising the industry

For several years, there has been a solid focus on changing the ways in which the mining industry learns. Below are three ways in which innovation and technology are making a real difference, particularly in the critical area of health and safety:

1. **Immersive learning:** Traditional training rooms have been given new purposes, such as that of hosting VR and AR learning experiences. These solutions offer real-time health and safety training and examples, as though the miners are right where the action is. These types of technology are easy to use, cost-effective and no longer limited by the need for connectivity to be innovative.
2. **New content and 4IR learning technology:** Imagine trying to remember all of the health and safety information you have learnt throughout your career, word for word. Could you imagine all of this information being easily available to you, in fresh, well-curated and easily digestible bites of content, wherever you are, whenever you need it? That's the power of learning technology. Whether it's information on safety processes or detailed compliance tasks, it's possible to have all of this content on hand wherever the learner is, empowering them at every step. Through the use of 4IR learning technology, miners are reskilled to better understand and support health and safety strategies; and risks on miners and mines are dramatically reduced. This technology also improves compliance in ways that allow miners to sustainably build safer mining environments in some of the most remote locations in the world.
3. **Integration of key stakeholders:** As training and compliance move into the digital age, health and safety information is easily available to all stakeholders within the mining supply chain. Contractors, suppliers, communities, unions and SMMEs are all able to be upskilled and integrated into the exciting and innovative journey of learning technology. **MRA**

ABOUT THE AUTHOR

Stuart **Woolmington** is the CEO and founding member of WinWin International. He has more than 30 years' experience in learning and development and strategic communications.

Embracing recovery

DRC Mining Week live event is back

DRC Mining Week will return to Lubumbashi from 5 to 6 October this year and already there are +100 confirmed exhibitors who look forward to welcoming the return of the flagship event in one of Africa's hottest mining destinations.

"We are ready to embrace a COVID-19 recovery and celebrate the mining sector which has once again shown and proven its resilience amid a global and sweeping pandemic," says Emmanuelle Nicholls, group director, Mining and Natural Resources at organisers Clarion Events Africa.

Nicholls adds, "Along with our partners in the mining community we are excited to be back with a two-day event that will be held following strict COVID-19 protocols and safety regulations. We know that while everyone is desperate to connect and make deals, we take the health and welfare of our clients and visitors very seriously. We will therefore make sure that social distancing, sanitising, mask wearing, elbow knocking and other regulations are observed."

Due to the COVID-19 restrictions, this year's event in October at the Karavia Hotel in Lubumbashi will be a slightly smaller affair with approximately 100 exhibitors and sponsors, 50 speakers, 190 delegates and 1 500 visitors. The longstanding, headlining sponsors who will return with *DRC Mining Week* are Glencore, Kamoto Copper Company, Rawbank and SEP Congo.

Staying in touch, digitally

Meanwhile, Nicholls states that the event has also had to pivot towards digital and virtual engagement during lockdown periods. "Also, we really appreciate how our partners and clients have followed and supported this progression. Moreover, we have been able to reach a new audience that would not necessarily travel to the DRC, but is excited about the investment and trade opportunity which the mining sector offers."

"Because we have a lot to talk about in the run-up to the live event, we will keep that engagement and momentum flowing with a *Virtual DRC Mining Week* from 15 to 17 June with regular topical webinars every month in French and English in partnership with *Mining Review Africa*. So, for those mining professionals that are unable to attend in person in October, we invite you to take advantage of the many digital opportunities to connect and share both prior to and during the live event," Nicholls concludes. **MRA**

IMPORTANT DATES

DRC Mining Week Digital Event: 15-17 June 2021

DRC Mining Week live event:
- Keynote opening session: 5 October 2021
- Expo and conference: 5-6 October 2021

Location: The Pullman Grand Karavia Hotel, Lubumbashi, DRC

For more information visit:
Website: http://www.drcminingweek.com
Twitter: https://twitter.com/drcminingweek
Facebook: DRC-Mining-Week
LinkedIN: https://www.linkedin.com/groups/4922857

or scan the QR code for more information