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- **PUBLISHING UNIT LEAD:** Sean Macnamara
sean@interactmedia.co.za
- **EDITOR:** Leon Louw BA (CUA) Hons BA (EM)
llouw@interactmedia.co.za
- **SUB-EDITOR:** Tarren Bolton, tarren@interactmedia.co.za
- **CONTRIBUTORS:** Peter Leon, Janine Espin, Mxolisi Mgojo, and Gean Botha
- **ADVERTISING EXTERNAL SALES:**
Chantalle Schilling (Van Eeden)
chantalle@interactmedia.co.za
- **DESIGN AND LAYOUT:** Glyniss Bone
glyniss@interactmedia.co.za
- **PROCESS COORDINATOR:** Lebo Bucibo
lebo@interactmedia.co.za
- **SUBSCRIPTIONS:**
Maxlee Marange ▪ mmarange@interactmedia.co.za
Ralph Shongwe ▪ ralph@interactmedia.co.za
- **MANAGEMENT**
Finance: Laetitia Arnott ▪ laetitia@interactmedia.co.za
- **COVER IMAGE CREDIT:** Menar
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BLANKET REWARDS FAITHFUL SHAREHOLDERS

One of the most remarkable gold mining companies operating in Africa, Caledonia Mining, has commissioned a new shaft at the Blanket gold mine in Zimbabwe. According to Steve Curtis, CEO of Caledonia, the mine's Central Shaft will increase Blanket's production to between 61 000 ounces and 67 000 ounces in 2021, and to more than 80 000 ounces per annum in 2022. Curtis was speaking at this year's virtual Junior Mining Indaba, held during the first week of June 2021.

Caledonia managed to complete an expansion project and construct a shaft in what some would consider one of the most difficult mining jurisdictions to do business in. Zimbabwe's economy has been in freefall since the 1990s and for a business to not only survive, but to thrive in this business environment, is an extraordinary feat. Besides the recent expansion, Caledonia has been rewarding its shareholders on a quarterly basis, one of the few mining companies in the world to do so.

"We increased the dividend for the fourth time at the start of January 2021 to 11 cents a share and we increased it again to 12 cents per share in April 2021. This is a 75% cumulative increase from the level of 6.875 cents since October 2019, creating genuine value and returns for our shareholders," said Curtis.

Shareholders in Caledonia might be in for more treats in the future as the company ramps up its

exploration programme in Zimbabwe. In December, Caledonia entered into an option agreement on two properties, Glen Hume, and Connemara North, in the Gweru mining district in the Zimbabwe Midlands. These options give the company the right to explore each property for periods of 15 and 18 months respectively.

"If our exploration is successful these properties will add further impetus to our growth. We have made good progress on the drilling campaign at Glen Hume, and we are evaluating the results of the first phase. At Connemara, where we have the benefit of evaluating historical drill data, we are preparing a geological model before we commence drilling this summer," Curtis said.

Caledonia's Blanket mine has been a stalwart in the Zimbabwean mining industry. The company's tenacity and resilience despite a deteriorating political and economic environment, and its philosophy of looking after its shareholders first, is commendable. Its exploration projects are exciting and could add further value to the growth prospects of a remarkable story in African Mining. Blanket's success is a good example to any operation in Africa and proof that it is possible to thrive even in extreme adversity. ■

Leon Louw, Editor

Leon

MINING INDUSTRY LEADERS STEER PATH TO SUCCESS

It is time for smaller-scale miners to determine their own futures with bold decisions to extricate the mining industry from the economic and Covid-19 doldrums that the market finds itself in.

Afrimat CEO, Andries van Heerden, says that strong leadership is required right now to put mining companies, and their supply chains, in a position to benefit from opportunities that already exist or may materialise in the future. "Leaders words and actions today will undoubtedly shape the future of our industry tomorrow, so let's make sure we paint a positive picture and invest in a brighter tomorrow."

Speaking at surface mining industry association, ASPASA's, CEO and top leadership seminar, he added that there is a lot to be positive about right now with the industry have experienced a sharp "V"-shaped recovery since hard lockdown ended last year. This is a sign of the strength of the industry and how demand for mined materials has remained high despite the lockdown situation.

While all mined materials remain in strong demand, building materials such as sand, stone, clay, cement, and other materials will be required to rebuild our economy and are expected to grow steeply in months to come.

"This is a tough industry that has always had its ups and downs. Now it is time to get on with it and position our mines to meet ever growing future demands. These include the Presidency's commitment to unlock large-scale infrastructure and construction projects that will need the entire industry to span together to provide the sheer volumes of materials needed.

"The projects outlined so far involve road, rail and other infrastructure projects across the country. Simultaneously, the private sector is moving ahead with plans for new construction projects, and this is already showing in the latest plans passed by authorities and construction works in progress already. We need to realise that there is a strong recovery taking place already and now is the time to capitalise.

"In hindsight, at the start of hard lockdown last year, we thought the outcome would be far worse than it actually is. On a positive note, interest rates are the lowest in our lifetimes, personal and company taxation saw a decline last year and there are more construction contracts being awarded than before," says Andries.

Data gathered for the independent and highly respected Afrimat Construction Index shows that there was a sharp recovery in production volumes of mined commodities since work resumed after hard lockdown. It shows the resilience of the local market and reflects a strong V-shaped recovery in remuneration, hardware sales, mortgage advances and other key markers.

A commodity boom driven by demand from China, USA and the rest of the world is leading a charge to the recovery of the industry to previous highs. Challenges such as funding still need to be overcome, but it is anticipated that innovation from within the

market itself may alleviate these challenges. "One thing is certain though; the old way of funding is gone, and we need to innovate if we are to survive."

Andries suggests that low points experienced by the industry over the past years has led to a serious shortage of skills throughout the industry and that opportunities now exist to train and retrain staff to fulfil new and changing roles within the industry. Investments in skills should be a top priority to prevent the mining industry falling into third world ways of existence.

"As leaders we need to choose whether we going to be victims or whether we take charge of the situation to ensure future sustainability. We need to roll up our sleeves, upskill our people, get involved behind the scenes in our industry associations, communities and in private/public sector initiatives to help things along for the industry.

"Perhaps most importantly, we need to join and get behind ASPASA to make sure it is as strong as possible and is able to truly represent our interest in every sphere of our businesses. ASPASA makes a big impact on the success of our industry, and it remains incumbent on us to make a big difference.

"While we acknowledge that things are tough out there, we also want to remind the industry that it's a tough industry and nothing is different to the past 20 years of ups and downs. Let's stop the negativity and start to take positive steps to shape our industry for the future," says van Heerden.

REMOVING THE SHACKLES ON MINING

According to Roger Baxter, CEO of the Minerals Council South Africa, there are at least eight major constraints that will need to be removed for the local mining industry to flourish.

Speaking at surface mining industry association, ASPASA's CEO seminar, he explained that the economics of the sector is vast and accounts for about 8% of the country's gross domestic product on its own or 17% when multipliers are factored into the equation. The industry also accounts for over R50-billion in PAYE contributions and is responsible for a large chunk of the country's Company Tax revenue.

So, it is important that the industry be nurtured back to health and that hurdles to its success be removed. Baxter identified the following eight constraints that need to be dealt with to stimulate the industry:

- Lack of shared vision: This needs to be achieved through leadership, social and economic cooperation
- Regulatory reform: The country needs to overhaul and modernise regulations and legislation surrounding mining
- Industry modernisation: Despite hardships it is imperative that miners invest in modern techniques and equipment to improve productivity
- Available infrastructure: The industry needs reliable and cost competitive infrastructure including electricity, rail, and port infrastructure.

- Environment, social and governance: Sustainable mining can only be achieved through responsible mining including zero harm and injury caused on mines and inclusivity
- Exploration strategies: The country needs to improve mapping of the entire sub-region as well as develop an improved exploration strategy
- Eradicating crime: Strong measures need to be implemented to combat crime on our mines and to stamp out illegal mining
- Promotion: South Africa needs to implement strategies to promote the country as a prime investment destination

Baxter said that despite these challenges the industry is in a relatively good position having bounced back from Covid-19 lockdown restrictions. Since then, the industry has recovered to 0,8% higher production volumes than pre-Covid-19 figures despite 60 000 employees still not returning to work due to cautions relating to age or comorbidities.

“But more work needs to be done. South Africa needs to improve across all fields of mining. A good example is in exploration where countries like Canada attracts USD2-billion and Australia attracts USD1.8-billion in investments in exploration while SA attracts a meagre USD194-million.

“This will need a new mining cadastral with tax incentives such as offered in those countries. Also, relevant geological information is required online to attract junior explorers and interest major mining companies. Simultaneously, the country needs a one-stop-shop application process to streamline applications for prospecting rights.

AFRIMAT ACQUIRES GRAVENHAGE MANGANESE MINING RIGHT

Open-pit mining company Afrimat has acquired the Gravenhage manganese mining right and associated assets in the Northern Cape Province, its biggest acquisition to-date.

According to Afrimat CEO Andries van Heerden there are many positives to the acquisition, the first being that the group will be adding another commodity – manganese – to its diversification strategy within the bulk commodities segment of the business, the second being that this sizeable acquisition will propel Afrimat into the mid-tier mining space.

Van Heerden explains that the resource is well-positioned within Afrimat operationally as it is not dissimilar to its existing operations given the process and is considered attractive in both size and quality of the resource. Gravenhage is a long-life, near-development manganese resource situated in the northern part of the Kalahari Manganese field approximately 120km from Afrimat’s existing Demaneng iron ore mine. Current studies show an extensive Life of Mine (LoM) more than 20 years. A Definitive Feasibility Study was finalised confirming the technical and economic feasibility of the Gravenhage Manganese Project based on an initial open cut operation with

the potential for subsequent underground mining. The resource and its significant potential have been well defined by continued exploration drilling.

Van Heerden says that Afrimat has ensured sustainability through diversification. “The successful development of Gravenhage will increase our scale in the ferrous-metal value chain and provide further exposure to foreign currency denominated earnings.”

Afrimat has been able to successfully invest into commodities that generate a strong cash flow – cash that the group has in turn spent on making further strategic acquisitions to grow cash incrementally. “This approach has proved successful for us and will be applied to this acquisition and in turn by ensuring focused execution of Gravenhage, I am confident we can achieve growth of the group,” says Van Heerden.

Operational synergies with the Demaneng iron ore mine are expected to be realised, and a plan is in place to accommodate logistics to extract manganese product from Hotazel to ports for outbound international markets. Afrimat already has an excellent working relationship with Transnet through Demaneng and it is envisaged that the further co-operation of Transnet as a partner to enable new entrants like Afrimat into the manganese sector, will be forthcoming.

Van Heerden makes it very clear that economic viability and profitability are one thing, but that Afrimat is equally passionate about the longer-term contribution it will be able to make to the immediate local community, the Northern Cape province and in turn the South African economy through its dedication to job creation and skills development and transfer. “We know from experience how important this commitment is,” said van Heerden, going on to say that this sustainable intervention is a core part of the Afrimat culture.

According to van Heerden the manganese price has lagged other commodity prices, such as iron ore. “In true Afrimat style, we will ensure from the outset that the mine will remain profitable even at the bottom end of a commodity cycle,” he said.

Afrimat is purchasing the Gravenhage manganese mining right and associated assets from Aquila Steel and Rakana Consolidated Mines for a total purchase consideration of roughly R650-million (or the Rand equivalent of USD45-million and R15-million for the property).

There are conditions precedent that include approval in terms of section 11 of the Mineral and Petroleum Resources Development Act, Competition Commission approval, the granting of a water use license, and approval having been obtained by Aquila Steel from the Chinese State-owned Assets Supervision and Administration Commission of the State Council for the sale of the assets and the assumption of the assumed liabilities as contemplated in the agreement.

In conclusion van Heerden indicated that while this represents a large acquisition for Afrimat, it would be supported by the group’s experience of undertaking solid research and due diligence and underpinned by vigilant execution.

STOREDOT ACCELERATES TO FAST CHARGING EVS WITH SILICON AND TIN

First published by the International Tin Association

Pioneering lithium-ion battery start-up StoreDot is focusing on silicon and tin to achieve extreme fast charging. Their first five-minute batteries will be available for testing later this year, while mass production will begin in 2024.

StoreDot announced today that they will work with Chinese manufacturer EVE Energy to mass-produce their XFC FlashBattery for electric vehicles (EVs). "XFC technology is absolutely critical to accelerating the adoption of petrol- and diesel-free vehicles by eliminating the barrier of range and charging anxiety," said EVE's Chairman of the Board, Dr Liu Jincheng. Daimler, BP, and Samsung are also key investors in the StoreDot technology.

A key component of the development is a new anode material that replaces graphite with new high-capacity materials. "Most of our efforts currently are focused on transitioning to silicon and tin", said StoreDot CEO Doron Myersdorf.

StoreDot had previously sent Gen 1 samples to potential customers with germanium-based anodes but found this metal was not sufficiently abundant and not affordable. Their Gen 2, silicon-tin, fast charging cell already records an energy density of 240 Wh/kg, with a longevity of 1 000 cycles possible by the end of the year.

By 2028, this energy density could almost double with the launch of Gen 3 cells. These are designed with a hybrid form of solid-state technology and could store 440 Wh/kg. Lead-acid batteries, by comparison, hold 35-40 Wh/kg.

Traditionally, lithium-ion batteries use a graphite (carbon) anode. These are extremely stable at normal charging rates but have a high electrical resistance. During fast-charging, this causes needle-like dendrites to form on the graphite anode surface, damaging the battery.

StoreDot have replaced the solid graphite anode with tightly packed balls of silicon-tin to reduce resistance and increase conductivity. These nanoscale balls swell during charging, but there is enough room between the balls to limit swell-induced damage that has previously caused problems for non-graphite anodes.

EVs currently struggle to compete with petrol and diesel vehicles when it comes to refuelling; 3-4 miles per minute charging is the current industry standard for EVs. StoreDot hope their Gen 2 cells will provide 20 miles per minute, with Gen 3 reaching 25 miles per minute. If charging station innovation can keep up with StoreDot, their silicon-tin extreme fast charging cells could transform commercial EV charging.

For the latest industry and association news, events/ exhibitions information, articles, etc. visit our website www.africanmining.co.za

SA DEPARTMENT PROMISES WATER LICENCE IN 90 DAYS

The Department of Water Affairs has implemented its plan for a 90-day turnaround on water use licence (WUL) applications – applying this new timeframe as of 1 April 2021.

This step is to be applauded, according to SRK Consulting environmental scientist Megan Kim Govender, although it does mean that applicants will now need to be more prepared with their submissions. The DWS announced last year a revision to its regulations on WULA procedures, reducing the targeted timeframe from 300 days. All submissions after 1 April 2021 will follow the 90-day review and decision process while applications initiated before 1 April 2021 will still follow the 300-day process.

"By speeding up the process, it is hoped that applications can be adjudicated faster, and licences issued more quickly – allowing developers to initiate projects sooner," said Govender. "However, more detailed studies and preparation must be conducted upfront to ensure a complete submission that meets all DWS requirements."

She warned that the new system may give DWS case officers less time to request information that might be unclear, incomplete, or missing from the submission – in which case the whole application may be rejected. This would send applicants back to the drawing board and delay their projects.

"There will be no opportunity for the applicant to submit any missing information or refine details during the 90-days," agreed Jacky Burke, principal scientist at SRK Consulting. "Applications must contain all the necessary specialist information, design requirements and supporting information first time around."

WULA submissions must now include detailed engineering specifications, in accordance with the DWS's technical advisory notes (TANs) and design checklists, said Burke. This is in line with global best practice, which is moving toward closer integration of engineering aspects with environmental, social and governance (ESG) issues and financial sustainability in all projects.

Govender noted that the pre-application phase of the WULA will include a pre-application meeting with the DWS case officer, meetings with the DWS sub-directorates (for instream water uses and engineering designs), site visits, technical report compilation and the completion of the necessary departmental forms.

"Once the full WULA – including supporting information – is submitted, the clock will start ticking and DWS will have 90 days to assess the application," she said. "It will be important for applicants to cover all the bases to reduce the chance of rejection."

She recommended that, in addition to the regulated pre-application meeting with DWS, applicants should also request a pre-submission meeting to check that there are no obvious gaps or shortcomings in their documentation. Certain DWS offices already conducted such meetings.

"One of the changes that the new system brings is that applicants will now generally have to advance their projects to feasibility stage – rather than pre-feasibility – before their WULA submissions can comply with the levels of detail required by the department," she said. "Nonetheless, it is wise to engage knowledgeable consultants, with experience in the application process, at an early stage in the project life-cycle." ■

COLOMBIA: ROPEWAY REDUCES CARBON



All images: RopeCon

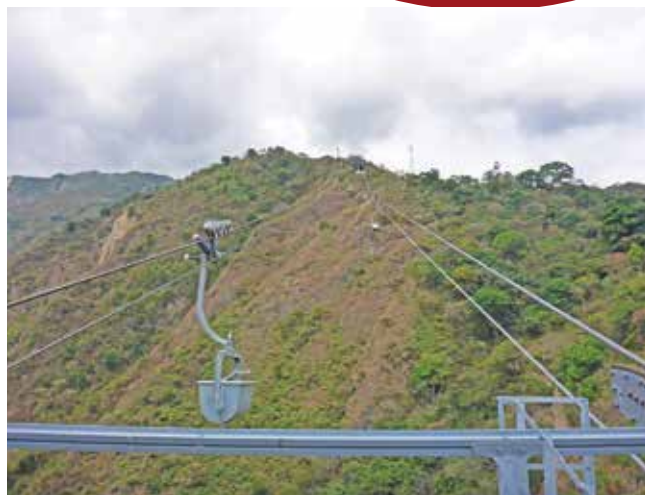
Zijin-Continental Gold Sucursal Colombia is developing the Buriticá gold mine in the northwest of Columbia.

Zijin-Continental Gold Sucursal Colombia is developing the Buriticá gold mine in the northwest of Columbia, approximately 72km from the city of Medellin. The area where the mine is located is mountainous and therefore logistically challenging. The reusable residues of the gold extraction process are used in an underground backfill, which is why they must be taken from the bottom of the valley to the mouth of the mine at 1 700m above sea level, thereby covering a difference in altitude of approximately 646m. What would be an arduous and long way for trucks with plenty of exhaust emissions becomes a swift and efficient job if a material ropeway is used.

In October 2017, the Austrian Doppelmayr company was awarded the contract to build a 1.4km long ropeway with material buckets and for a transport capacity of 175 tons per hour. The system was conceived as a continuous bi-cable ropeway. It has a fixed tensioned track rope for the material buckets with their carriage to travel on. The buckets are driven by the continuously moving haul rope loop to which they are attached via detachable grips.



The reusable residues of the gold extraction process are used in an underground backfill, which is why they must be taken from the bottom of the valley to the mouth of the mine at 1 700m above sea level, thereby covering a difference in altitude of approximately 646m.



In October 2017 the Austrian Doppelmayr company was awarded the contract to build a 1.4km long ropeway with material buckets and for a transport capacity of 175 tons per hour.

To allow for the haul rope to be run at a constant speed, the buckets are detached from the loop in the stations and braked before they are loaded via a chute. Once a bucket has been filled, it is accelerated to running speed again and re-attached to the haul rope before leaving the station. In the unloading station, the bucket is once more taken off the haul rope. At the designated unloading point a special mechanism unlocks the latch on the bucket, the bucket is tipped, and the material is safely transferred onto another chute. The bucket then returns to its original position. It is locked again and re-attached to the haul rope before travelling back into the valley empty.

In the past, continuous bi-cable ropeways have often been used for material transport applications. For the Buriticá project, Doppelmayr's engineers have revised the design and mechanics of continuous bi-cable ropeways from scratch and optimised it for the transport of material in buckets. The system complements Doppelmayr's portfolio of material transport solutions. It was put into service in February 2021 and has a transport capacity of 175 tons of residues per hour.

Doppelmayr Transport Technology is a 100% subsidiary of the international Doppelmayr Group with headquarters in Wolfurt, Austria. Within the group, Doppelmayr Transport Technology is the point of contact for the transport of goods and materials.

Doppelmayr is the technology leader and pioneer in ropeway engineering and is also present in other lines of business. Apart

from material transport systems the group also designs, plans, and manufactures passenger ropeways for winter and summer tourism as well as for the urban transit sector, rope propelled APMs (e.g., the systems currently operating at the airports of Toronto and Mexico City) or fully automatic high-rise warehouses.

Technical data of the ropeway:	
Length:	1.4km
Difference in elevation:	646m
Conveying capacity:	175t/h
Carriers:	20
Running speed:	6m/s
Number of towers:	1

CHINA: TEREX MOVES ON CHINA



Terex Materials Processing

The Powerscreen Premiertrak 400X range of portable jaw crushers are designed for medium scale operators in quarrying, demolition, recycling, and mining.

Terex Materials Processing (MP), manufacturer of processing equipment, has purchased a new facility in the Jiading District of Shanghai in China to manufacture Powerscreen equipment for the domestic China market. Powerscreen provides mobile

crushing and screening equipment for quarrying, construction, and other applications.

The 18 000m² facility will provide a solid foundation for Powerscreen to commence production in China, accelerating manufacturing plans by approximately two years.

According to Kieran Hegarty, president of Terex Materials Processing this investment by Terex to manufacture locally in China marks the next chapter in Powerscreen's growth story. "It demonstrates a long-term commitment to the region and will enable us to be a formidable competitor in China.

It will also deliver significant economic benefits to the local area, in terms of supporting key supply chain partners and providing skilled jobs. Additionally, this expansion will support our growth plans without impacting Powerscreen's production capacity at its other Terex facilities."

Powerscreen first entered China in 2016, as a response to government investment in infrastructure and legislation supporting the use of recycled materials. Since then, Powerscreen has continued to build a growing market presence through its China sales and service team, building its distribution network, attending industry exhibitions, and hosting customers through open days.

A dedicated team from Northern Ireland will be onsite to oversee scale-up of production in China and ensure processes are to the same robust standard of Powerscreen's manufacturing centre of excellence in Northern Ireland. Work is already underway, with Powerscreen equipment onsite for the training of the China team. It is expected that the first locally produced machines will come off the line before the end of the year.

"Mobile crushing and screening equipment plays a basic, yet vital, role in the sustainable building of infrastructure. This facility will accelerate our manufacturing plans for China and will enable us to assist commercial ventures in China with the right equipment, carrying the Powerscreen name, built by a local team and sold through an enhanced distribution network," says Hegarty.


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AUSTRALIA: SOLID INTERSECTION AT RED MOUNTAIN

ASX-listed Zenith Minerals recently announced that exploration activity at the Red Mountain gold project in Queensland, Australia, is continuing to provide highly encouraging high-grade gold drill assay results. Drilling to date has outlined a sub-vertical, shallow north-east plunging, high-grade gold zone to a vertical depth of 200m, with the zone remaining open down plunge and the subject of ongoing drill testing.

According to Peter Bird, chairman at Zenith Minerals, the company has to date only tested the northeast quadrant representing a fraction of the prospective ring structure.

“Another solid high-grade drill intersection at Red Mountain on the north-western flank in hole 042 firms up the location of the high-grade gold shoot which is now shown to be plunging to the northeast. The company has to date only tested the northeast quadrant representing a fraction of the prospective “ring structure.” Resource definition will add significant value to the business. Red Mountain is only one of three exciting core projects being advanced by the company, whilst a fourth – the Earahedy zinc-lead joint venture provides exciting additional value potential,” says Bird.

AUSTRALIA: DECLINE FOR HAVIERON

Newcrest Mining and Greatland Gold have opened the underground decline at the Havieron gold-copper project in Western Australia.

The project is a joint venture (JV) between Greatland Gold and Newcrest, with the latter allowed to earn up to a 70% interest in the project once exploration and development milestones are achieved.

The regulatory approvals for Havieron’s construction were provided on 29 December 2020 with the project rapidly advancing development.

The decline will develop the Havieron orebody along with a drilling program that is currently underway at the site. Newcrest oversees exploration activities at Havieron.

Greatland Gold CEO Shaun Day says that the opening of the underground decline is a significant milestone for the project and the next step will involve a pre-feasibility study.

“This is a momentous step in the development of Havieron as a world-class gold-copper mine. I am delighted by progress on site and this fast-tracked milestone is indicative of the potential scale of the deposit and the opportunity seen by our partners Newcrest,” says Day.

“By providing access to the top of the orebody, the decline sets Havieron on course to become a large, multi-commodity, bulk tonnage, underground mining operation. Alongside the ongoing growth drilling, the next key milestone will see the completion of a pre-feasibility study and we are on track to deliver this in the second half of 2021,” says Day.

The Havieron project is located around 45km east of Newcrest’s Telfer gold mine. Under the joint venture, any material extracted from Havieron will be processed at Telfer.



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AUSTRALIA: AGRIMIN APPOINTS EPC CONTRACT

Agrimin has awarded Primero Group with a front-end engineering design (FEED) contract for the process plant at the Mackay potash project in Western Australia.

Under the contract, the NRW Holdings subsidiary will also deliver the associated non-process infrastructure at the 426 000 tonne per annum sulphate of potash (SOP) project.

Primero had already completed a definitive feasibility study of the process plant in July 2019, making it well placed to receive the FEED contract.

Novopro Projects will continue in its role as project consultant at Mackay. Following the FEED contract, Primero will provide Agrimin with an engineering, procurement, and construction (EPC) contract, which will allow Agrimin to proceed with a final investment decision.

The project is projected to contain 123 million tonnes of SOP at a processed grade of 52% potassium oxide.

After the project was granted its major project status by the Australian government in 2020, Australia's Minister for Industry, Science and Technology Karen Andrews described just how important the Mackay potash project was to the industry and the country.

"The project will create approximately 300 jobs during construction and 200 jobs during operations and is estimated to support more than 600 jobs through the broader region and supply chain," Andrews said.

"Value-adding to our critical minerals offers Australia huge economic opportunities but given this fertiliser is used extensively by our farmers, it can also further strengthen our sovereign capability."

As the world's largest undeveloped SOP brine deposit, Mackay's estimated 20-year lifespan is aiming to produce USD315-million in annual sales revenue.

Agrimin's Mackay potash project includes the mine, processing plant, integrated logistics chain and port facility.

AUSTRALIA: CORE'S CAMPAIGNS CONTINUE

ASX-listed lithium developer, Core Lithium, announced that major exploration and resource drilling campaigns are set to recommence at the Finniss Lithium Project (Finniss), located near Darwin in the Northern Territory.

Core has recently awarded key drilling contracts to enable the company's drill service providers to plan and mobilise to site. Finniss Reverse Circulation and diamond core drilling is expected to commence in coming weeks.

Core's geological team is currently on site, preparing drill access and site logistics, ahead of the most extensive exploration and drilling campaign in the company's history.

Core has also submitted and is awaiting approval to commence drilling on the exciting new Leviathan acquisition. Early assessment of historical drilling information in 3D looks very promising, and Core expects to update the market on the new Leviathan acquisition shortly. The aim is to complete the purchase of these assets in 2021 and to significantly increase Mineral Resources and potentially increase the Finniss Project's life of mine.

According to Core Lithium's managing director Stephen Biggins Core is about to launch the largest exploration and resource drilling campaigns in the company's history with the aspiration of more than doubling Core's Lithium Resources and Finniss Project's Life of Mine.



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ALTUS EARNS THE RIGHT

- **Location:** Morocco
- **Phase:** Exploration
- **Resource:** lead/zinc

London-listed Altus Strategies has been granted three new distinct exploration projects as well as exploration licences adjacent to existing projects totalling 221km² in the Kingdom of Morocco. The projects were awarded to the company's 100% owned subsidiary, Aterian Resources, as part of a competitive tender process.

According to Steven Poulton, CEO of Altus, the new projects will increase the company's Moroccan portfolio to ten projects totalling 675km². "In addition to the new projects, we have also been granted licence blocks contiguous with our existing Takzim and Zaer Copper projects," says Poulton.

"The new projects are all located in the Central Moroccan Hercynian Massif, a region that is highly prospective for copper, tin, tungsten, lead, and zinc, and hosts numerous active and historical mines, as well as development-stage projects. The 67km² Amsa project is located approximately 8.5km southwest of the Achmmach tin project which is being advanced by Kasbah Resources," says Poulton.

"Our field team will commence exploration shortly, focusing on the priority targets defined by satellite image interpretations. Altus has applied for a number of further projects across Morocco through the tender process and we look forward to providing an update on the results of these submissions in due course."

Meanwhile Altus has commenced a 17 500m Reverse Circulation (RC) and Air Core (AC) drilling programme at the company's 100% owned Diba gold project in western Mali. The drilling programme follows the completion of an initial 48km² ground magnetic survey, which has defined several additional targets.

According to Steven Poulton, CEO of Altus, the company's field team is undertaking a high-resolution ground magnetic survey, which has covered 48km² of the licence to-date. "This survey has generated numerous structural targets across the licence, including at Diba NW, located 0.8km northwest of the Diba deposit, and at Diba Far East, located 7km east of the Diba deposit.

"The 10,000m RC programme will test the high-grade zone within the Diba deposit, where previous intersections include 3.34 g/t

Au over 60m from 17m (including 13.60 g/t Au over 9m) and 43.83 g/t Au over 5m from surface. The programme will also seek to expand the current MRE at the Diba deposit, as well as test the potential extension of the Diba NW prospect.

"The 7,500m AC programme will target a high priority 4km long and northerly striking zone, which may represent a potential extension of the Diba NW prospect. Diba NW was discovered by an RC programme completed by Altus earlier this year. Intersections from Diba NW included 1.45 g/t Au over 22m and 1.87 g/t Au over 10m (not true widths). The AC programme will also test Diba Far East, which contains numerous artisanal gold workings with shafts reportedly dug up to 20m deep, coincident with significant structural targets identified from the ongoing ground magnetic survey.

"On completion of these programmes, Altus anticipates commissioning an updated independent MRE and Preliminary Economic Assessment for the Project. Diba is a significant discovery in West Africa," says Poulton.



LINDI CONSTRUCTION UNDERWAY

- **Location:** Tanzania
- **Phase:** Development
- **Resource:** Graphite

Australian company Walkabout Resources has commenced construction prestart activities at its Lindi Jumbo Graphite Mine in Tanzania, in order to bring into production what is scheduled to be one of the highest margin graphite projects in the world.

Securing a USD20-million debt funding facility from CRDB Bank of Tanzania for the high-grade, large flake graphite project in April 2021 was a critical milestone in the company's advancement to construction, as was the company completing the first stage of its companion equity contribution in May 2021.

Commenting on the imminent commencement of construction, the chief operating officer at Walkabout Resources, Allan Mulligan says: "The Lindi Jumbo Mine is rapidly materialising and on track for first production in the second quarter of 2022. At Walkabout, we have always done what we said we would do, and it has been very rewarding finalising planning and project logistics this week. Our focus in stage 1 and 2 construction are on those items on the critical path including the civils required for plant erection and the continued manufacture and shipping of plant equipment from our EPC contractor in China.

The CRDB debt facility provided a critical platform from which to commence raising the companion equity. Our second tranche capital raising is underway in tandem with price tensions in the large flake graphite market and as we mobilise contractors under stage 1. As such, we are expecting a very positive response from shareholders."

At completion of the third tranche equity raising, Walkabout will be fully funded to production with construction and commissioning expected to take 9-12 months. Such a short time to production gives Walkabout an early mover advantage.

"What sets Lindi Jumbo apart from most other graphite deposits is its very high percentage of Large, Jumbo and Super Jumbo-sized

flakes in concentrate, positioning us to capture premium priced and value-added industrial markets. With large flake graphite prices increasing by more than 2% in April and demand from the lithium-ion battery industry expected to outstrip supply by 2025, Roskill has predicted prices will continue to rise," concluded Mulligan.

Lindi Jumbo represents the first serious construction effort of a mining project in Tanzania since the 2017 Mining Act amendments. Since April this year, new President Samia Suluhu Hassan has seen Tanzania renew discussions with international resource companies to expedite large projects, tackle coronavirus with a new advisory committee and also reinvigorate international relations to promote investments and drive trade. This can only benefit Lindi Jumbo as Tanzania revitalises its approach to attracting international businesses. ■



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NEW DAWN FOR TANZANIA?

By Peter Leon, edited by Leon Louw

Tanzania entered a new dawn earlier this year when President Samia Suluhu Hassan took over the presidency after the untimely death of John Magufuli. Peter Leon, partner, and Africa Co-Chair at Herbert Smith Freehills made the following comments during a recent seminar.



The change of tone ushered in by President Samia Suluhu Hassan over the past two months could indicate a welcome new economic direction in Tanzania.

Before considering which changes President Hassan and her cabinet may consider, it is important to briefly recall the key drivers and the changes which the government introduced under the Magufuli administration.

At the time John Magufuli was elected President, electoral support for the Chama Cha Mapinduzi party declined from 80% in 2005 to 58% in 2015. President Magufuli, in response to the CCM's ailing support, campaigned on a platform of anti-corruption and fiscal discipline, as well as recommitting the country to Julius Nyerere's economic philosophy of 'socialism and self-reliance', dubbed Ujamaa.

Both during and after his election campaign, President Magufuli made foreign mining companies a common target for attack in his public speeches and branded foreign mining companies generally as "people who call themselves investors with the intention of stealing from Tanzanians", claiming that "trillions of shillings were stolen".

In March 2017, the then Ministry of Energy and Minerals announced a total ban on the export of unprocessed mineral concentrates and ores. Subsequently, in April 2017, President Magufuli established two committees to investigate the mining sector.

In July 2017, after a short legislative process lasting only six days and entailing little meaningful public participation, President Magufuli assented to three new laws which significantly increased government control over the extractives sector:

- The Natural Wealth and Resources Contracts (Review and Renegotiation of Unconscionable Terms) Act, 2017 (Unconscionable Terms Act);
- The Natural Wealth and Resources (Permanent Sovereignty) Act, 2017 (Permanent Sovereignty Act); and
- The Written Laws (Miscellaneous Amendments) Act, 2017 which amended the Mining Act, 2010.

Among other things, the laws, with immediate effect:

- Mandated the government to renegotiate any investor-state contract terms that Parliament deems "unconscionable", and to

treat them as "expunged" if the renegotiations are unsuccessful or unsatisfactory to Parliament;

- Entitle the government to a minimum 16% free-carried equity stake in the holder of a mining right (which may be increased to 50%);
- Ban the export, and restrict the handling, of raw minerals;
- Raise royalties to 6%;
- Restrict the repatriation of investments and returns;
- Prohibit mining companies from keeping earnings in offshore bank accounts;
- Limit recourse to international arbitration.

In January 2018, the Minister for Mines published a suite of new regulations under the Mining Act, 2010. Among other things, the Regulations introduced new local content obligations, amended existing obligations relating to the issue, renewal, and transfer of mineral rights; and imposed obligations on the export, import and trade in minerals.

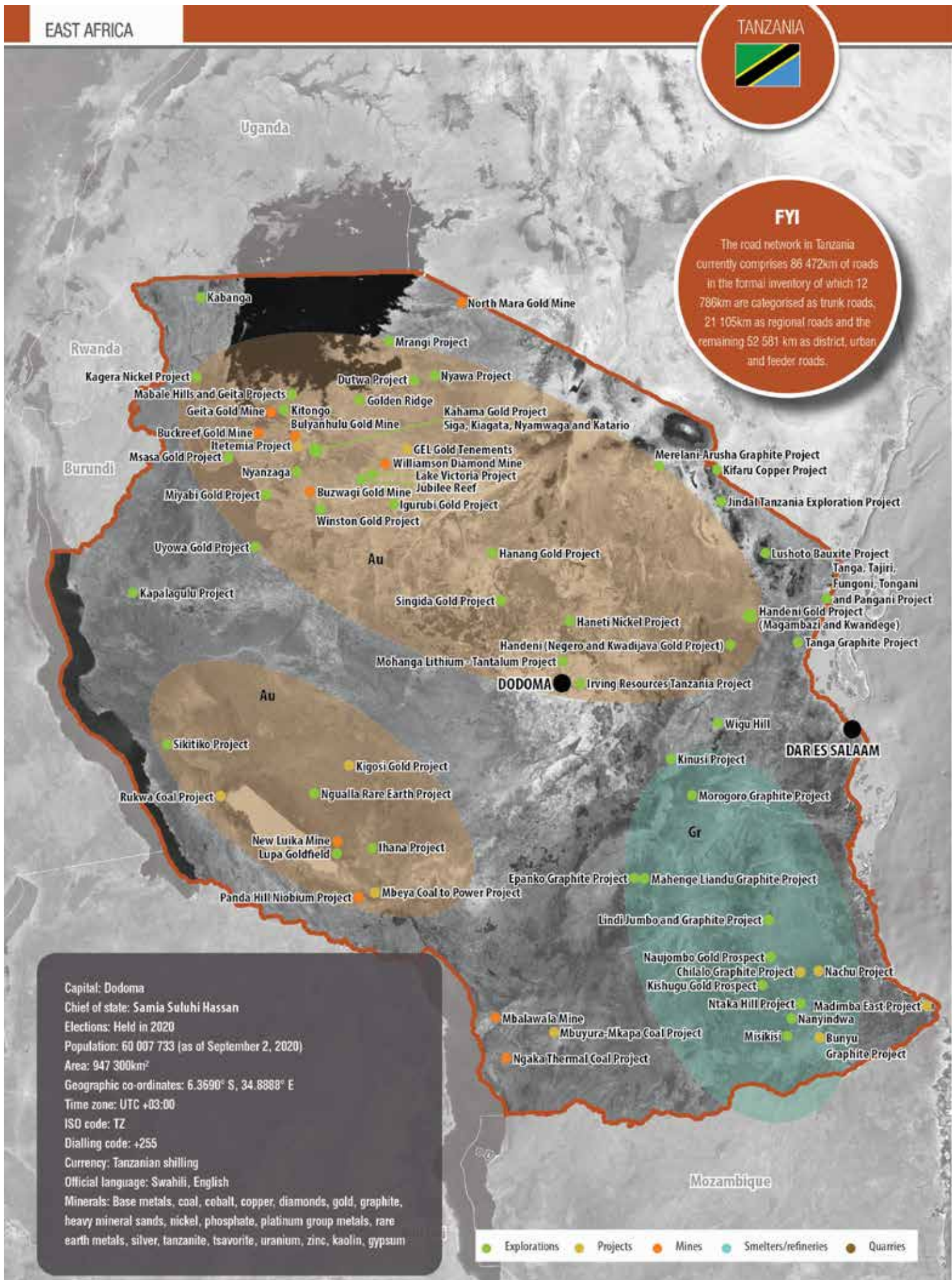
The 2018 Local Content Regulations oblige contractors, sub-contractors, or allied entities and holders, to amongst other things:

- Be at least 5% owned by an "indigenous Tanzanian company" to be eligible for the grant of a mining license;
- Submit for approval by the Commission, a five-year local content plan, which must ensure that first priority is given to employing qualified Tanzanians and to procuring services provided and goods manufactured within Tanzania;
- Meet minimum quotas for recruitment and training as well as the procurement of local goods and services within prescribed time periods;
- Maintain a bank account and conduct business exclusively with an indigenous Tanzanian bank;
- Only retain the services of Tanzanian financial institutions, insurance companies, brokerage firms, and legal practitioners.



FYI

The road network in Tanzania currently comprises 86 472km of roads in the formal inventory of which 12 786km are categorised as trunk roads, 21 105km as regional roads and the remaining 52 581 km as district, urban and feeder roads.



Capital: Dodoma
 Chief of state: Samia Suluhu Hassan
 Elections: Held in 2020
 Population: 60 007 733 (as of September 2, 2020)
 Area: 947 300km²
 Geographic co-ordinates: 6.3690° S, 34.8888° E
 Time zone: UTC +03:00
 ISO code: TZ
 Dialling code: +255
 Currency: Tanzanian shilling
 Official language: Swahili, English
 Minerals: Base metals, coal, cobalt, copper, diamonds, gold, graphite, heavy mineral sands, nickel, phosphate, platinum group metals, rare earth metals, silver, tanzanite, tsavorite, uranium, zinc, kaolin, gypsum

- Explorations
- Projects
- Mines
- Smelters/refineries
- Quarries

Even under the Magufuli Administration some of the stricter requirements were significantly softened in February 2019. For example, the Mining (Local Content) (Amendments) Regulations, 2019 reduced the ownership component for local content from 51% to 20% for the suppliers of goods and services (including banks and financial institutions). The Mining (Minerals and Mineral Concentrate Trading) Regulations of 2019, which provides that licensees may export or import minerals subject to obtaining an export or import permit issued by an authorised person was relaxed as was the restrictions on the repatriation of funds and earnings from the disposal or dealings of minerals which may now be repatriated to foreign institutions if the licensee meets the requirements imposed under the Foreign Exchange Act.

Apart from the obvious consequences which the legislative changes had for mining and oil and gas companies, the laws also had a wider impact on Tanzania's economic development. On the Fraser Institute's *Annual Survey of Mining Companies' Investment Attractiveness Index* Tanzania fell from 64 of the 104 jurisdictions surveyed in 2016, to last in 2019 and 75th out of 77 jurisdictions in 2020.

Consequent upon the global economic shock caused by the Covid-19 pandemic the real gross domestic product (GDP) growth rate fell from 5.8% in 2019 to an estimated 2% in 2020, and per capita growth turned negative for the first time in more than 25 years.

What can be done?

To address the harm inflicted on the investment environment the Hassan administration should follow a two-pronged approach.

First, the government should amend the Unconscionable Terms Act which threatens licensees' security of tenure in the country. Security of tenure is of paramount importance to mining companies and investors given the capital-intensive nature of mining and the long lead times between exploration and production.

To ensure that the government does not compound the general trust deficit (the principal driver of the Magufuli administration's populist mineral law reform programme), it should follow a well-balanced approach that seeks to give effect to mining companies' right to mine as well as the country's right to benefit from Tanzania's mineral wealth.

The OECD Development Centre's *Guiding Principles for Durable Extractive Contracts* (Guiding Principles), in this regard, proposes a useful framework which host governments and investors may consider when they negotiate "enduring, sustainable and mutually beneficial extractive contracts".

By following the recommendations provided in the Guiding Principles, the government should amend the Unconscionable Terms Act to create a framework which allows for the negotiation of durable extractive contracts that are sufficiently flexible.

Second, the government should either amend or remove the provisions of the Permanent Sovereignty Act, the Mining Act (as amended) and the Regulations published under the Mining Act which (1) impose overly harsh obligations on licensees, (2) allow for legal processes that are unfair and opaque, (3) and vest too much discretion in government officials, especially the Mining Commission.

Salient examples of such provisions include those which:

- Oblige licensees to transfer raw minerals to Government Mineral Warehouses. The loss of control over won raw minerals is a material infringement of licensees' property rights. The government's objectives could be achieved by empowering the Miners Resident Officers to control access to the licensees' storage facilities and to monitor the delivery and removal of won raw minerals.
- Vest a lien over all the material, substance, product, and associated products extracted from mining operations and mineral processing in the government. The lien arguably amounts to a deprivation of property, contrary to section 24 of the Constitution of the United Republic of Tanzania. This provision should be removed.
- Ban access to foreign courts and international arbitral bodies. To address the government's concerns, the law could be amended to allow parties to refer disputes to African dispute resolution centers such as the Arbitration Foundation of Southern Africa or the Mauritius International Arbitration Centre. In the alternative, the law could allow international arbitration before the EAC Court of Justice (which is based in Arusha), and which is already an option under the EAC Treaty.
- Impose fiscal obligations on licensees, including royalties, corporate tax, employment tax, withholding tax, custom duties, and the government's carried interest. In 2018, PwC released a report which indicated that miners in Tanzania only received 27% of the revenue and from the mining operations. The remaining 73% is paid over to the government. This is significant when compared with Australia and Namibia where mines respectively received 61% and 54%. The basket of fiscal obligations should be reconsidered to ensure that mines are financially viable.
- Regulate local content. In particular, the government should amend the minimum requirements to ensure that they accord with the situation on the ground. For example, as most goods are not manufactured in Tanzania, licensees are unable to comply with the current local content requirements.
- Stipulate the Mining Commission's powers. The powers afforded to the Commission are too wide and should be clearly defined. From an African perspective, the best point of reference would be Ghana's Minerals Commission (GMC).

Ultimately, President Hassan should seek to establish a stable and predictable regulatory environment. Predictability, as a component of certainty, is established where investors recognise that rules are implemented in a specific way and achieve their objectives in a foreseeable manner. This promotes investor confidence.

(Prepared in collaboration with Ernst Müller (Associate, Herbert Smith Freehills) ■

WATER STEWARDSHIP CRITICAL

By Leon Louw

The preservation, protection, and management of water – which is an invaluable resource to humanity and the environment – needs to be a top priority for all responsible water users. South Africa has a shortage of clean, fresh water which poses a major societal and economic risk, which could worsen in years to come if not managed judiciously by all water users.



Mines are heavily dependent on water at virtually every stage of the mining process from pit to plant.

Mines are heavily dependent on water at virtually every stage of the mining process from pit to plant. However, there is an ever-increasing demand for mining companies to contribute towards water security, both in their operations and the communities where they operate.

To meet these critical demands, investment company Menar's coal mining subsidiary Kangra, located in Saul Mkhizeville in Mpumalanga, makes use of a wide range of technologies, processes, and policies to reduce water requirements across its mining operations, and judiciously manage this all-important natural resource at all times.

Regional dynamics

Kangra's Savmore/Maquasa coal mining operation mine is located in a high-water yielding area, with the Heyshope dam near to the mine. "The dam is essential in the provision of potable water in the region. Water faces many threats of pollution in the region. Pollution from fertilisers used in the forestry and agriculture sector, wastewater treatment plants and mining," explains Kangra environmental specialist Niketiwe Dlamini.

She points out that over-abstraction from streams and boreholes and excessive losses from leaking pipes threaten to

dry up the area's resources. Dlamini however points out that Kangra only uses about 15% of the 830 000 m³ of water per annum that it is authorised to use.

Water management strategy

Kangra utilises a closed water reticulation system, which ensures that no contaminated water is released from the site, and instead is channelled and collected in pollution control dams (PCDs). She explains that this water is in turn used for dust suppression within the mine's boundary and in the processing plant. "Potable water is only used for consumption by employees," Dlamini notes.

Moreover, Dlamini highlights that the Menar Group has a team of environmental specialists who form an integral part of the project's team, and who are responsible for developing mines and ensuring compliance at its current operations.

The environmental specialists are involved from conception to execution of all mining projects to make sure all environmental concerns are considered at every stage. Kangra's operations are fully licensed, each with an approved Environmental Management Programme and Water Use License, which are audited internally and externally annually.

Monitoring of Kangra sites is conducted by independent specialists and samples are analysed in South African National





The preservation, protection, and management of water – which is an invaluable resource to humanity and the environment – needs to be a top priority for all responsible water users.

Standards (SANS) accredited laboratories. Furthermore, Kangra's Savmore/Maquasa established operations as well as its new and emerging operations Pit C and the Twyfelhoek operations have all respectively received Water Use Licences (WUL), issued by the Department of Water and Sanitation in terms of the National Water Act. WULs come with very strict legal requirements that employees and contractors are contractually and legally bound to follow at all times.

Flow meters are installed at all locations where water is extracted or moved between facilities at operations. The volumes are recorded to, firstly, measure compliance with the

WUL conditions and, secondly, monitor the company in terms of its water use.

Inflow from ground and rainwater into the opencast pits is also used to supplement the water requirements at the company's operations, be it for dust suppression or processing requirements. The inflow water is pumped to the PCDs. This reduces the need to source water from outside the mine boundary and thus aids in preserving surrounding water resources.

Kangra is currently looking at the feasibility of establishing a 3 ML/day water treatment plant at the Savmore/Maquasa operations. The purpose of this water treatment plant would be to re-introduce clean water to the natural system. "This proposed water treatment plant will also be part of Kangra's Acid Mine Drainage Strategy, which intends to collect decant from old workings and treat such water before it enters natural water systems," Dlamini notes. This project is still in the design and licensing phase; therefore, no date has been set for its implementation.

Furthermore, at Kangra's operations, it has in place a comprehensive water stewardship programme aimed at ensuring efficient water use through the avoidance of water wastage. Such as monitoring tap and pipe leaks, which can waste many litres of water unnecessarily.

Fostering friendly relations

Kangra has a very good relationship with the Inkomati-Usuthu Catchment Management Agency (IUCMA), which serves as the Mpumalanga Department of Water and Sanitation and is the authority responsible for the rewarding of water use licenses to mines in the region.

The IUCMA has established a water user's forum, which Kangra is part of and actively participates in. Dlamini says that this forum has created a platform that allows water users to share



Solar panels at a water pump – one of the Kangra water management projects.

All images: Menar



Kangra's Donkerhoek water project.

their water management performance. Quarterly Kangra shares the operations' water quality performance with members of the forum by way of presentations made at the forum meetings. "In the process of being open, honest, and straightforward about our operations, it has helped in fostering a good working relationship with the IUCMA," she adds.

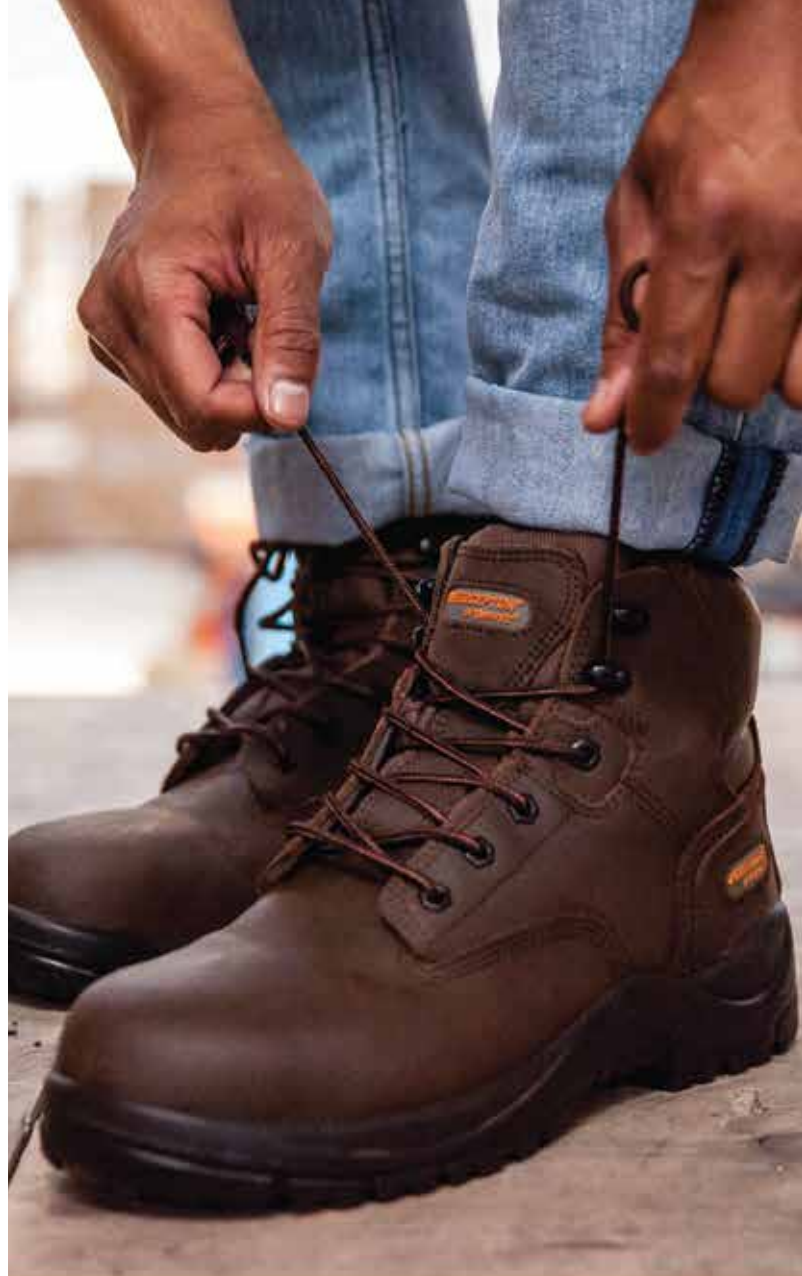
Supporting community

Dlamini points out that as responsible water stewards, Kangra acknowledges mining operations have an impact on the water resource and that others depend on the resource upstream. Therefore, to improve the lives of the local community Kangra has drilled several boreholes for the local community to provide access to potable water and is also currently establishing another project for the local Twyfelhoek Community, where it will supply piped water and JoJo tanks for the local community to easily access potable water.

Kangra has also assisted the local Kransbank community with water from water storage tanks, however, not all families were connected to these water storage tanks. To address this situation Kangra has, at a cost of around R900 000, extended the water supply lines by 5km from the nearby spring and provided additional water tanks for eight families.

"This has enhanced the quality of life for these families as they now receive fresh water at their doorsteps, therefore no longer needing to walk many kilometres to access a clean water source," states Kangra Community Liaison Officer Simo Yende.

"Kangra is committed to continuing to support access to potable water for local communities and to sustainable management of water use," Dlamini concludes. ■



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ENHANCING WATER SUSTAINABILITY

Supplied by AECI WATER

The growing focus on the identification and use of alternative water sources to bridge South Africa's forecasted 17% gap in drinking water supply by 2030, has driven water treatment specialist AECI WATER, a division of JSE-listed AECI to help take the country's water-intensive mining industry 'off the potable water grid'.

This will enhance water sustainability in the mining industry, says AECI WATER executive, Dean Mulqueeny.

This focus complements the United Nation's Sustainable Development Goal 6, which aims to ensure the availability and sustainable management of clean water and sanitation for all by 2030, he adds.

Project Purpose: Water for all

Through its enabling philosophy, called Project Purpose, AECI WATER aims to increase access to drinking water for all, reduce potable water use for non-drinking purposes and enhance the quality of water and/or effluent discharge, while driving and improving other water-related environmental and societal benefits. One of AECI WATER's five-year targets is to reduce and/or replace more than two-billion litres of potable water used in the mining industry's process streams.



AECI Water treatment plant at Platinum mine in the North-West province. Finalising Phase 2 for treating and reusing a portion of its excess underground fissure water to reduce potable water consumption results in significant cost savings but also contributes to the continued sustainability of mining operations and the community.

"This target will be achieved by helping miners enhance their water use efficiencies and reduce their consumption at an operational level. This is realised through compliance with water discharge quality regulations to protect the environment and identifying and increasing the use and reuse of abundant and legacy water sources, as well as by applying appropriate water qualities rather than potable water for specific applications."

The rising cost of potable water and compliance with effluent discharge regulations are placing more pressure on the water-intensive mining industry, in addition to stakeholders calling for greater commitment to reducing their impact on the environment.

"Through AECI WATER's significant experience in all aspects of mine water and its established network of mining clients, it is ideally positioned to identify potentially viable water optimisation, reduction and reuse projects," explains AECI WATER industry development head, Dawie Theron.

Reducing potable water consumption

Notably, when AECI WATER partnered with a platinum mining client in the Northwest province to treat and reuse a portion of its excess underground fissure water, it significantly reduced the operation's potable water consumption.

Proprietary process treatment equipment and chemicals were used to desalinate the fissure water to a quality comparable with potable water and SANS241 standards.

In Phase 1, AECI WATER successfully replaced 400 million litres of potable water a year, while Phase 2, to be commissioned later this year, will replace a projected 1.0-billion litres of potable water a year.

"These successes not only generated significant water cost savings but also contributed to the continued sustainability of mining operations as municipal 'water outages' were commonplace," states Theron.

AECI WATER has also realised significant water reuse success at a large deep-level gold mine, saving the operation about 1.2-billion litres of potable water last year, which contributed to a net cost saving of R20.2-million.

The mine was continually hit by steep price increases for the potable water supplied by the local municipality, with a large quantity of its total potable water consumption used by the operation's various large cooling systems.

While the mine had an abundance of inexpensive process water, Theron highlights that the alternative water supply had a high concentration of dissolved salts and was a generally inferior quality compared with the municipal water supply.

"The mine was concerned about the inherent risks this water posed to the integrity of its equipment, which outweighed the potential saving on the current potable water cost," he says.

AECI WATER recommended the use of its proprietary ScaleTrol® PDC chemical technology, which is specifically designed for application in 'stressed' water conditions to facilitate the safe use of mine process water in high temperature cooling systems.

After successful lab-scale trials of the treatment programme, a small plant-scale trial was initiated.

"Based on the excellent results achieved in all the agreed key performance indicators, the decision was made to extend the treatment programme to all the remaining cooling systems."

Other Purpose Projects underway

Various other Purpose projects at different stages of maturity are underway in the mining sector, with two notable projects in the gold industry close to completion.

"The first project involves a deep-level gold mine. AECI WATER will extract water from the mine's existing process water reticulation and deploy proprietary process equipment and chemicals to treat the water to drinking water quality for process use and human consumption," advises Theron.

Phase 1 of the project promises to deliver potable water savings of no less than 370 million litres per year and a net cost saving of 20%. Phase 2 will aim to deliver a further saving of 1.2-billion litres of potable water a year.

The second project comprises water reuse at a gold processing plant. AECI WATER aims to extract water from a dam adjacent to the

plant and treat it to a quality better than that of drinking water for primary use in various plant processes.

The solution will deliver a potable water saving of 384 million litres per year and a net cost saving of no less than 10%.

"The bigger operational benefit, however, is rooted in significant projected improvements in gold recoveries, owing to the potential reduction in fouling associated with using exceptional-quality water in the gold extraction processes," highlights Theron.

The mines will also benefit from a significant contribution to their corporate water savings and environmental impact reduction goals.

AECI WATER mining executive Philip Croucamp says: "Our goal is to help ensure mining companies improve on the financial and sustainability goals, whilst their communities prosper."

By investing in water re-use and recycling solutions, increasing water efficiency, total water management, utility water management and zero liquid discharge, AECI WATER guarantees that mining companies will de-risk their operations, achieve water independence, uphold the health and safety of employees, and achieve regulatory compliance.

AECI WATER aims to provide the right quality of water for each mining application, without burdening the existing limited municipal infrastructure and communities while also protecting water resources and the environment.

Every project undertaken by AECI WATER in the mining sector considers sustainability with the perspective of achieving environmental and societal stewardship, notes Croucamp.

South Africa's National Water Resources Strategy 2 estimates that the mining sector consumes about 5% of the country's available water, while more than three-million South Africans do not have access to a basic water supply, and more than 14-million people do not have access to safe sanitation.

"While aiming to reduce the water intensity of the mining sector and increase its re-use of existing water sources to solve water challenges on mines, in collaboration with the bigger AECI we also pursue partnerships with neighbouring communities to address their water challenges and provide fresh drinking water," concludes Croucamp. ■

"Our goal is to help ensure mining companies improve on the financial and sustainability goals, whilst their communities prosper."

Philip Croucamp, AECI Water Executive Mining

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WATER

MONITORING TAILINGS DAMS

Edited by Leon Louw

As the time approaches rapidly for mining companies to start reporting on the safety and monitoring of their tailing storage facilities (TSF), several proof-of-concept studies are being undertaken that range from physical site monitoring to a range of remote sensing methods. Satellite monitoring is one of the more time- and cost-effective options that are being considered for continuous monitoring of both active and historic sites.

According to Sonja Goosen, managing director of Pinkmatter Solutions, satellite-based monitoring can be performed for the full life cycle of tailing storage facilities (TSF), from construction, through construction and utilisation to post-closure. “The combination of optical and synthetic aperture radar (SAR) methods allows a TSF to be continuously monitored, based on the risk potential that has been assigned to the specific site.

Pinkmatter Solutions has developed the FarEarth Change Monitor platform, that utilises both of these satellite sensor types, making it truly sensor agnostic, and making it a web-based platform that allows users to both view and interrogate satellite data to make informed decisions on time sensitive issues, such as the evaluation of TSF safety or risk detection mitigation. The advantages of using satellite platforms include, amongst others, the uninhibited access to anywhere in the world and near fully automated systems. “The reduction of travel and of the number of staff required to conduct a survey has cost benefits. It also nearly eliminates the need to physically move around potentially dangerous mine workings and unsafe areas on and around a TSF,” adds Goosen.

Real time observation

Satellite imagery or SAR data is used to supplement or validate ground data being generated. Ground investigations range from site investigations performed at set intervals such as monthly or quarterly. Instruments are also installed in the TSF, that feed measurement data either in real-time or is collected. The type of data collected includes, pond elevation, piezometric pressures, inclinometer readings and weather conditions. The installation of fibre optic cables (FOC) has allowed real-time observation of tailing facility monitoring up the second, capable of detecting sub-millimetre scale movement. The real-time data is relayed via satellite uplinks or directly to surveillance centres to alert of any critical changes detected. FOC is valuable for catastrophic failure warnings where there are no precursor indicators of potential failure.

“High resolution satellite imagery is used during the planning phase to locate the most suitable site to place a TSF, by generating digital elevation models (DEM) that inform the engineer of conditions of the terrain setting and regional hydrology that would influence the life of the TSF. This is combined with geological

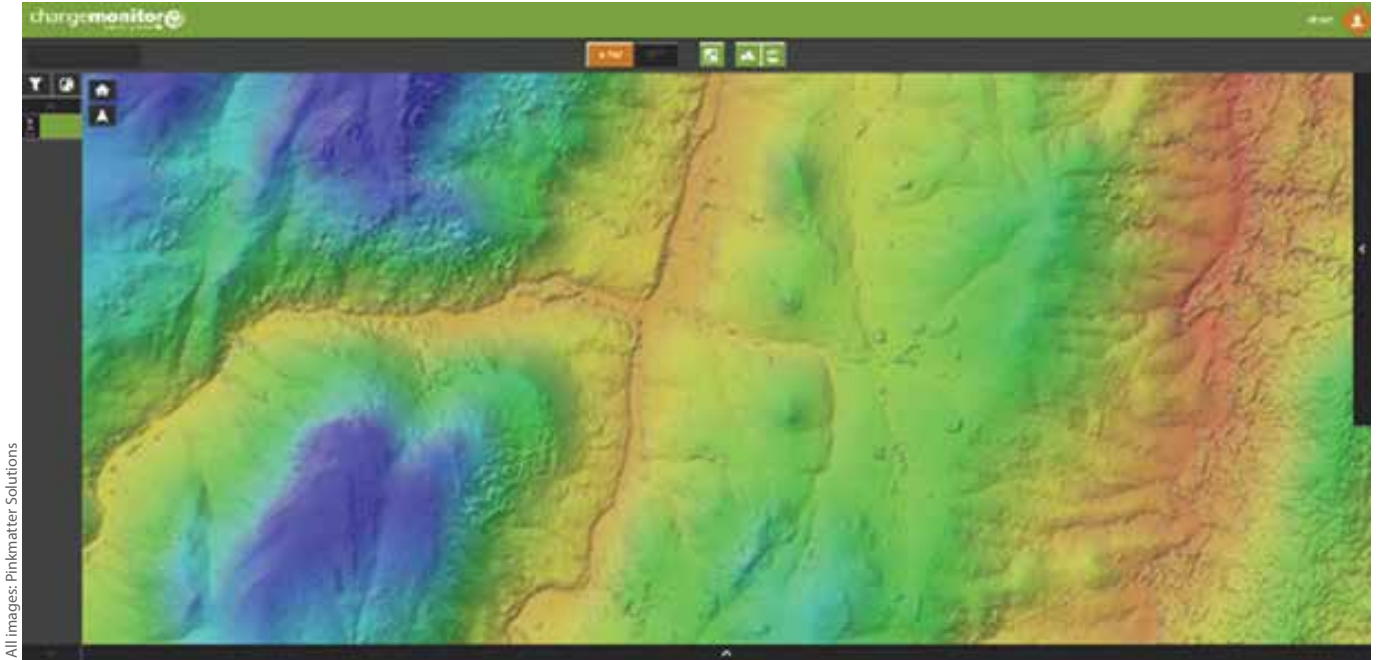
data, such as the lithology and local and regional structures, such as faulting and potential seismic activity,” says Dr Nicolaas C. Steenkamp (Earth Observation Manager) at Pinkmatter Solutions. Once construction commences on the TSF, the use of processed imagery volume products, example, FarEarth Change Monitor, prove their application value.

The survey and engineering departments use the volume products as part of the monthly quality assurance (QA) process and checking the as-built surveys. A Geographical Information System (GIS) integrated platform allows these departments to track the overall construction progress of the dam and water reclaim facilities and evaluate the conformance to design line and grade of the dam.

Surface water accumulation monitoring, both deposited tailing and meteoric water, on a TSF is a critical function from both an operation and safety point and form part of the pool management requirement. The monitoring is performed by regularly scheduled optical satellite image acquisitions. The automated output can be programmed to generate a warning at the monitoring centre if the surface water reaches a dangerous areal extent, continues Steenkamp.

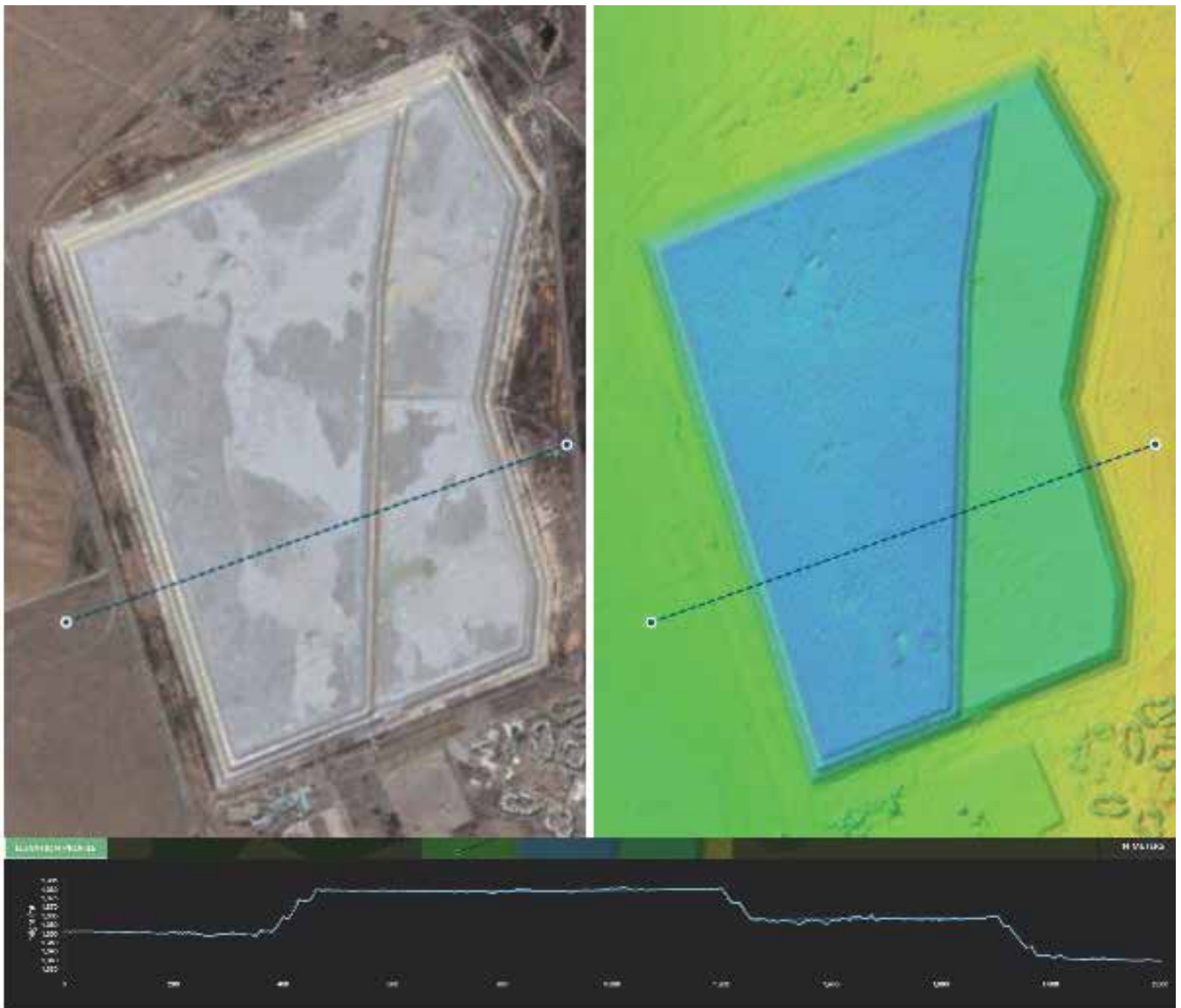
Mine survey departments and the engineer of record also need to be aware of the volume changes of a TSF of time. The best volume estimations are derived from models where a baseline DEM is used to produce high accuracy elevation models and volume change calculations. The FarEarth Change Monitor system receives and automatically orthorectifies the images using precision ground control points (GCPs). Photogrammetry methods applied from stereo high resolution optical images, produce volume products that are compatible with results from LiDAR surveys, if the previously mentioned criteria are met.

After the TSF has reached its designed capacity, the closure phase will commence with the removal of infrastructure that is no longer required. Stabilisation of the TSF until the start of the next phase, that may entail keeping it in a ready state for later reprocessing or final site rehabilitation. In the case of later reprocessing, satellite imagery is used to monitor the stability of the TSF and risk factors such as the effect of unusual extreme weather conditions or due to illegal removal of material. Once reprocessing commences, a reconciliation of the volumes of



All images: Pinkmatter Solutions

Digital surface model derived from stereo high-resolution Pleiades imagery, displayed in FarEarth Change Monitor.



Optical image (left) and elevation coloured (right) image of a TSF both indicating a profile line. The graph (bottom) indicates the LiDAR versus the optical volume estimate results (FarEarth Change Monitor).

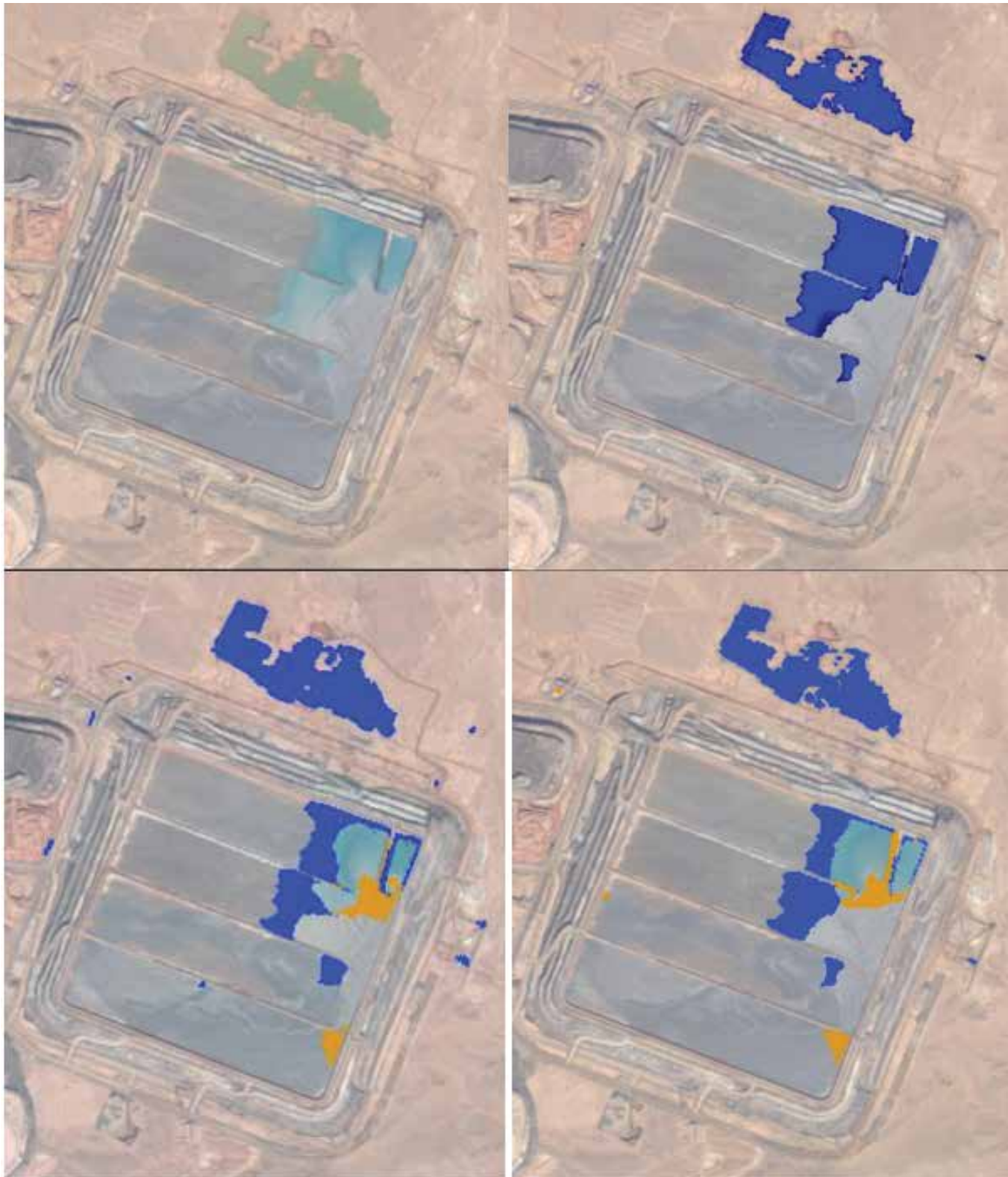
material removed and re-deposited can be performed over the duration of the operation. Volume calculations can also be done for historic TSFs, fine residue dumps (RFD) or rock dumps, reducing the risk and cost associated with manual surveys.

Final rehabilitation phase

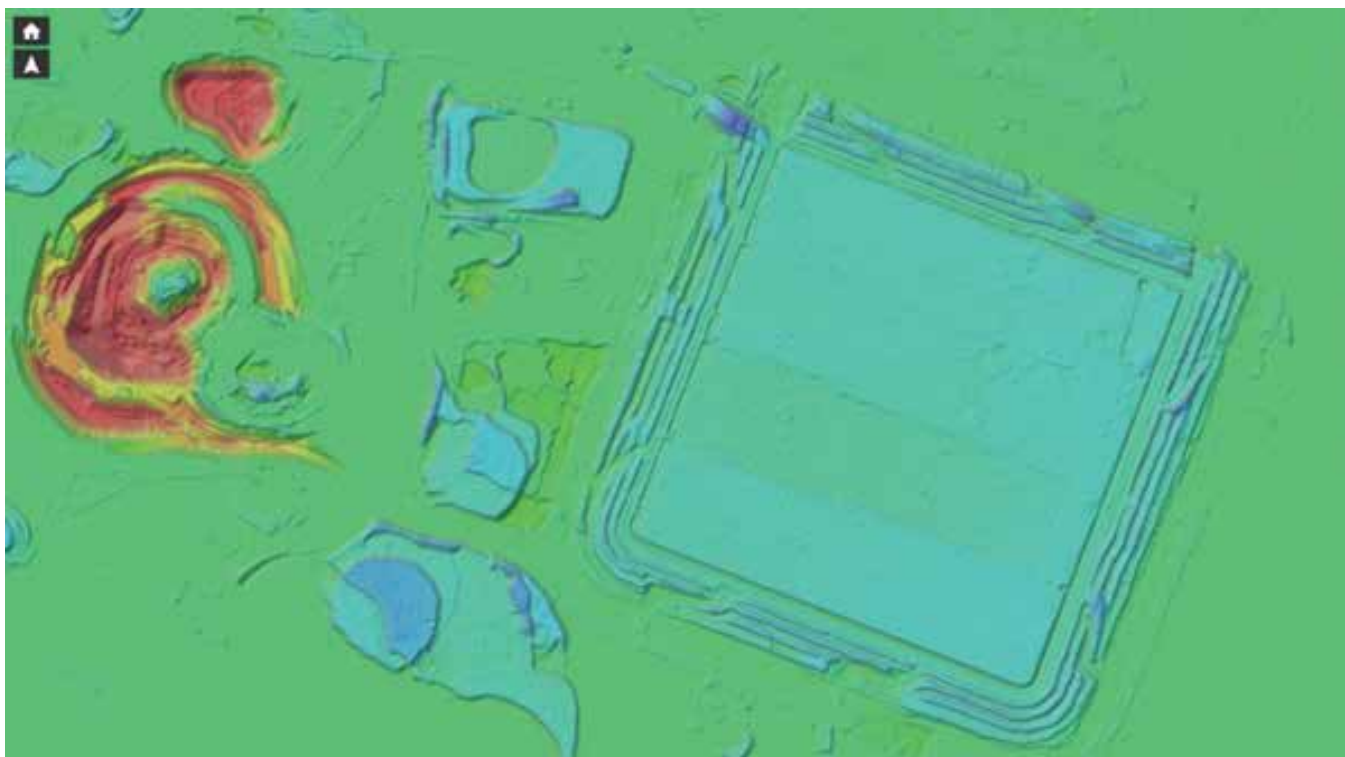
During the final rehabilitation phase of the TSF, satellite imagery is used to monitor the establishment of vegetation and stabilisation

of the TSF over the short term. Long term monitoring entails vegetation and surface water monitoring and site security. Normalised difference vegetation index (NDVI) gives a good indication of plant health of the vegetation established on an around a TSF.

Failure risk management is done by SAR, says Goosen, as it can monitor a site both day and night and is not affected by



Optical image of surface water on a TSF and reclamation pond (top left), the surface water highlighted for as single time stamp (top right). The change in observable surface water between two observation periods, cool colours indicate gains and hot colours indicate gains (bottom left) and over a time series (bottom right). All images generated in FarEarth Change Monitor.



Volume gains are indicated in cool colours and losses in hot colours. All image processing performed in FarEarth Change Monitor.

weather conditions such as cloud cover. SAR data has a horizontal resolution of about 3 metres on commercial platforms and 20 metres on public domain but is capable of detecting vertical changes of less than 5 millimetres. “The application is however limited by the presence of deep-water bodies in proximity to the TSF, dense vegetation on top of the TSF, for example as part of stabilisation or older sites and very dynamic sites where some active mining is undertaken,” says Steenkamp.

This is mitigated by the installation of corner reflectors that assist in detecting movement on the TSF. Once a sufficient baseline has been established for the TSF, it is possible to create more accurate surface movement monitoring and modelling, utilising Interferometry SAR (InSAR) or where corner reflectors have been installed.

The output generated on the FarEarth Change Monitor is graphic and highly intuitive to the user, where a heatmap approach is used to delineate areas of movement. Areas with movement in excess of the tolerance or time is indicated in hot colours such as red, with cooler colours indicating acceptable subsidence over time, such as the indicated settlement rate of the tailings material. The results can then be viewed by the user online via the web-based platform. It is also possible to generate a report that can be downloaded from a secure FTP site. Other relevant data such as the inverse velocity graph would then be included, according to Steenkamp.

It is also possible to use SAR data to establish the wetting of the tailing material. As over-wetting of TSF is the leading cause of failures, being able to detect increased wetting over time or rapid increases in wetting in certain areas of the TSF, can be utilised as an early warning proxy.

Surface Movement Monitoring (SMM) can also be undertaken for the larger mine lease area, where potential mining induced subsidence due to underground mining or dewatering of underground compartments or placement in dolomitic areas that is prone to the development of karst landscapes. This is especially relevant in areas such as the Witwatersrand in South Africa.

“As more satellite constellations are launched in the coming years, it will become possible to move from near real-time monitoring to real-time monitoring of TSF sites along with increased processing power to process imagery, and with the aid of Deep Learning, or Neural Networks, identify rapidly developing risks and send alerts to the relevant response teams,” concludes Goosen.

Sonja Goosen is the managing director of Pinkmatter Solutions – established in 2002 in Pretoria – and is supported by Dr Nicolaas C. Steenkamp, who also is a registered professional geologist with several years’ experience in TSF projects. Both have presented at international conferences on the topic.

Pinkmatter Solutions also offers automated services for the processing and visualisation of earth observation imagery, including very high-resolution elevation models, encroachment detection, feature counts, vegetation analysis as well as flood and fire monitoring aimed at the mining sector.

The FarEarth Change Monitor web-based platform offers on-the-fly analysis of multi-source earth observation data aimed at non-GIS specialists and managers that need to make informed, time sensitive decisions, based on extracting value from satellite imagery. ■

DR LERATO KHUMALO – ASPIRING TO HELP REDUCE SA’S CARBON FOOTPRINT

Edited by Leon Louw

Exxaro Resources’ climate change specialist, Dr Lerato Khumalo, was recently elected as vice-chair for the Industry Task Team on Climate Change (ITTCC).

The voluntary, non-profit association comprises several local energy-intensive companies across different business sectors, including Exxaro, Sasol and Anglo American, collaborating to reduce South Africa’s carbon footprint. The task team works with government departments, trade associations and social partners to develop practical solutions for climate change mitigation, supporting the country’s gradual transition into a lower carbon, resource-efficient economy.

An expert in her field, Khumalo recently completed her Ph.D. in Chemical Technology at the University of Pretoria, focusing on the characterisation of atmospheric pollutants found in areas near opencast coal mining and other industrial activities. As part of her thesis, she spent 18 months collecting atmospheric samples

from the Highveld and Waterberg areas to determine which techniques could be applied to characterise these atmospheric samples arising from coal mining and other industrial activities.

She began her career as an environmental specialist at a consultancy firm while completing her Master’s degree. She saw a gap in the market for professionals with qualifications and experience in the environmental management and sustainability space and made it her mission to make a difference. When she was offered a position as Group Air Quality and Climate Change Specialist at Exxaro, she was excited for the chance to bring impactful sustainability solutions to life. During the same year, the mining company was pioneering renewable energy investing, with its now 100% acquisition of wind-power company Cennergi.

Since then, Khumalo has shifted her focus to strategy and business transformation, which she believes are critical given global climate change concerns and how these affect businesses and society. “It is a challenging role, but it comes with so much opportunity to add value. I contribute to how Exxaro deals with climate change issues and integrates them into the business. “Our Strategy and Business Transformation Team also measures progress in this area and collaborates with different departments to ensure the entire organisation is aligned to Exxaro’s strategic objectives,” Khumalo explains.

She also enjoys engaging with prominent government and industry stakeholders and policymakers to advise on climate policy implementation. Her opinion holds weight – she was part of the committee that reviewed the Climate Change Bill in 2019 and 2020.

Khumalo believes that environmental, social and governance (or ESG) issues are connected to every element of a business and should be integrated into all departments and operations.

With her help, the resources company has laid a foundation for this integration. “You cannot isolate ESG issues – they are linked to your competitiveness and investor attractiveness. We have to ask ourselves how can we integrate these issues to achieve the



Dr Lerato Khumalo.

Exxaro

Sustainable Development Goals, contributing to national and global climate change efforts, and building business resilience?”

“This goes beyond Exxaro’s operations and filters into mining communities too. We have taken a holistic approach to ensure that we are also integrating our communities in our sustainability efforts, ensuring that our activities positively impact a country with existing socio-economic challenges, many of them stemming from neglect of sustainability issues,” she adds.

When asked what she loves most about her job, Khumalo says, “The world needs people who are adaptable and can rise to challenges. We all have a role to play to add value, contribute and educate others. I love seeing the results that are connected to Exxaro’s energy efficiency, climate change mitigation and adaptation and educational awareness efforts because these make a real difference in society, not just the business. I am proud to work for an organisation that puts its people at the heart of everything it does and puts its money where its mouth is.”

When asked about her appointment as vice-chair for the ITCC she says that it is an honour to be part of the task team that is part of South Africa’s efforts to address and respond to climate change impacts and the transition to a low-carbon economy. “I look forward to adding value and working with the team to start the critical conversations our governments, businesses and citizens need to have to make this a reality.”

First up on Dr Khumalo’s agenda? Addressing the key challenges of our country’s just transition and those that relate to the Presidential Climate Change Coordinating Commission (PCCCC) – a crucial national advisory body in this space.

Both the ITCC and Exxaro conduct targeted work to educate communities on environmental challenges. Dr Khumalo believes that this is essential if we are to take personal responsibility and work together to drive positive change. “Educational awareness campaigns for employees and societies are vital to empower citizens with the knowledge they need to understand these pressing issues and the role that each one of us can play to mitigate climate change.”

Khumalo has an inspirational message for businesses and citizens that care about climate change. “It’s never too late – we still have room to make a difference. We are not only doing this for ourselves but for future generations, and it’s up to each individual to commit to being better.” ■

“ I look forward to adding value and working with the team to start the critical conversations our governments, businesses and citizens need to have to make this a reality. ”



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COMPLIANCE IS KEY

Compliance requirements for mining will become more important as Covid-19 continues to shake up the industry, writes **Janine Espin**, managing director at Economic Development Solutions (EDS).

Planning and preparation are essential in undertaking new or extending old mining projects, regardless of size. Whether large-scale or artisanal, the need for mines to be compliant and ethical, as they go through the lengthy processes required in prospecting rights applications, is highlighted by the implications for the environment, economy, and communities in which the mines operate.

Compliance necessitates meeting several regulatory requirements, such as Social Labour Plans (SLPs), Carbon Tax compliance and a range of other environmental considerations. This is where choosing the right compliance partner can be instrumental in finding the balance between mitigating adverse impacts on community and the environment while ensuring the sustainability and profitability of the mining project itself.

Environmental, socio-economic, and legal considerations

When applying for mining rights on a piece of land, there are a number of steps to follow and regulatory requirements to be met. From an environmental perspective, an Environmental Impact Assessment (EIA) needs to be conducted, as well as the investigation of the potential impact of mining activities in surrounding communities. Environmentally speaking, the impact of mining cannot be understated. From earth tremors, to dust, noise and water pollution, the potential adverse impacts of mining activities are well documented.

This makes it important for mining organisations to show how they plan to minimise harm and risk during and after mining operations. Provision needs to be made for carbon tax compliance while from a socio-economic perspective, it is necessary for



Janine Espin, managing director at Economic Development Solutions (EDS).

mining organisations to present a SLP to show how mining operations will contribute to the economic development of the local community throughout the lifecycle of the mine, as well as planning for the rehabilitation of the land once operations have ceased. These compliance requirements cannot be met in isolation, because environmental, socio-economic, and legal factors are all inextricably intertwined, which necessitates a holistic approach.

Tightly intertwined requirements

An SLP is a mandatory component of a mining grant, and this plan is usually valid for three to five years and is transferred to the new owner if the mine is sold. The SLP makes provision for, among other things, housing and skills development for mine workers and employees. It also provides for social and economic upliftment programmes for the communities surrounding the mines or the labour-sending areas and must deal with mine closure and environmental rehabilitation. This plan must also include arrangements for labour transition when the mine reaches end of life, through upskilling so that employees have the tools to navigate the job market.

“An SLP is a mandatory component of a mining grant, and this plan is usually valid for three to five years and is transferred to the new owner if the mine is sold.”

While the current framework for SLPs does not include provision for carbon tax compliance, it would be beneficial to tie these compliances together. Non-compliance with the EIA or SLP can result in the audit of an organisation's mining right, which can then be revoked. Covid-19 has also added another layer of compliance from a health and safety perspective, for new and existing mines. Mining is a high-risk activity specifically in underground mining operations that involve working in close conditions with other people. Therefore, keeping workers safe means meeting Personal Protective Equipment (PPE) requirements and offering the vaccination when it becomes available to the population.

Choosing the right compliance partner

Given the intertwined nature of the compliance requirements for the mining industry, taking a holistic approach is advisable. To achieve this, companies must find a trusted partner to whom the tasks can be safely outsourced and not just a compliance specialist company that will just tick the boxes. In addition, the compliance partner should be interested in the bigger picture – bringing community, environmental and economic considerations together to ensure that the right objectives are met. The partner will therefore need to have a deep understanding of the business side of mining, while keeping in mind the human element to reach a middle ground for all stakeholders and communities involved. Compliance Specialists must have a tight grasp on all compliance workstreams – environmental, socio-economic, and legal – using smart technology to manage and monitor compliance. Furthermore, this ensures that mining profitability does not come at the undue expense of the surrounding communities or the environment. ■

MINING'S ROLE IN ENERGY TRANSITION

The mining industry will play a critical role in the transition to cleaner energy in South Africa, writes **Mxolisi Mgojo**, CEO of Exxaro.

Climate change is one of the most pressing challenges of our age, how we choose to address it today will have a lasting impact on businesses, the environment, future generations, and society forever. Developing countries like South Africa are particularly vulnerable to the global phenomenon, often suffering the most from the devastating impact of climate change through droughts, storms, floods, and rising sea levels. Yet, these regions have historically contributed the least to global emissions.

President Ramaphosa recently illuminated this irony in his speech for US President Biden's Leaders Summit on Climate, where 40 world leaders committed to working together to tackle the climate crisis and support the most vulnerable. "Without effective adaptation responses, climate change has the potential to reverse the developmental gains of many countries on our continent and push millions of people further into poverty and unemployment," Ramaphosa explained. He called on developed economies, which historically bear the greatest responsibility for emissions, to support developing economies to mitigate and adapt to climate change. "The move towards a low-carbon future cannot happen overnight. We need to work together to create a climate-resilient society, ensuring that as we transition, it is based on a just transition that assures that the most vulnerable do not get left behind."

As Exxaro, we agree with President Ramaphosa's sentiments and fully support the work of the Presidential Climate Change Coordinating Commission (PCCCC) to reduce our country's emissions in the context of overcoming poverty, inequality, and underdevelopment. It is promising to see global climate action intensifying, with the US targeting to reduce its emissions by 50-52% by 2030 and more countries committing to join the clean energy revolution.

We believe the local mining sector has a pivotal role in our country's transition to a low-carbon economy. As such, we are ramping up our organisation-wide efforts to achieve carbon neutrality by 2050. We plan to minimise risks and maximise clean-energy opportunities to reach this crucial milestone. In doing so, we also hope to pave the way for others in our industry to follow suit.

Making strategic decisions and seizing sustainable opportunities

Although Exxaro is currently predominantly a coal producer, we are also a diversified resources company and have been since our creation in 2006. More than a decade ago, we realised the necessity of a clean energy transition when climate change considerations were on the rise and coal exports to Europe; a former significant coal customer, began declining. The German government started discussing the idea of moving away from coal as far back as 2003, and we realised a renewable-energy revolution was about to emerge.



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As South Africans, we pride ourselves on being fast followers if we aren't creators, so we needed to adapt quickly. In 2010, Exxaro entered the renewable energy market by establishing Cennergi, a 50/50 joint venture with Tata Power. Today, Cennergi is wholly owned by Exxaro and operates two wind farms in the Eastern Cape that feed 239 megawatts of renewable energy into the national grid – making us amongst the first fossil fuels companies to become a renewable energy solutions provider.

In 2019, we aligned our governance, risk management and strategic processes with the TCFD recommendations to guide our Climate Change Response strategy. To solidify our goal to be carbon neutral, we are currently balancing our business's financial performance with South Africa's energy needs and climate-change-related social and environmental responsibilities. This includes reprioritising our coal reserves to minimise stranded assets, selling non-core coal operations, and stopping further investments in new thermal coal mine developments. We are also maximising our asset portfolio through renewable energy solutions, investigating low-carbon technologies for our operations, and considering afforestation and reforestation initiatives for carbon capture and storage.

“ This includes reprioritising our coal reserves to minimise stranded assets, selling non-core coal operations, and stopping further investments in new thermal coal mine developments. ”

Prioritising existing communities and developing new economies

We recognise that transforming our business in response to new energy needs opens a unique opportunity to build a resilient and sustainable future for our people and the communities around us. This transition is critical, especially for the communities dependent on our business to provide jobs and other opportunities. Therefore, our most poignant question right now is, how do we effectively transition on the ground without leaving our communities behind? Our journey goes far beyond merely moving from coal to renewables – we also need to ensure that we become a catalyst for new economic activity across our host communities.

In 2019, I was invited by the Vatican to discuss how mining could be used as a common good for society. Since then, we have looked beyond our social labour plans and community development plans to determine how we could drive sustainable growth while transforming society and our communities. We are now looking at a diversity of projects holistically, packaging them together for large-scale impact, utilising our land and mines to create an entirely new agriculture value chain. We will be approaching the impact investment funds and support the financing of these projects.

We have always invested in the communities we operate in, even after our mines in the area close, but now we are focusing on solar photovoltaic (PV) microgrids as clean energy sources for these community members too. Our climate change journey revolves around the environment and business resilience while ensuring



Exxaro

Mxolisi Mgojo, CEO of Exxaro.

we can create new economies that can support the renewable energy strategy we are embarking on.

Harnessing renewable and distributed energy

We don't know the future of coal, so while we are still producing it, we need to ensure that we aren't contributing to further environmental damage. As we continue to supply the country's power stations, we must get the best out of our coal assets focusing on high-value coal with a low impurity content.

In the meantime, we have a team investigating minerals that can support a clean future, not only for Exxaro but also for the rest of the country. We are also in the process of de-carbonising our mines; first up is Grootegeluk, with an 84-megawatt PV plant in Lephalale that is likely to become one of the largest PV facilities in South Africa. In doing so, we found that we will save 12-15% on electricity costs, reducing the mine's carbon footprint by 30-35% and Exxaro's overall carbon footprint by 15%.

We are also engaging with other mining companies, offering them assistance to start de-carbonising their mines and collaborating with industry players like Eskom to support each other by reducing operational costs. Distributed energy is a new growth area for Exxaro, with expansion plans for the rest of the continent.

Ultimately, dealing with climate change is about driving impactful investments and creating new energy opportunities for communities in terms of clean renewables. We can't do this on our own – ongoing partnerships with government, business, labour, and civil society are critical.

South African mining companies can continue their catalytic role in the economy towards a low carbon future. We hope others will join us to power better lives and lay the foundations for a more sustainable and equitable South Africa. ■

COPPER AND TIN IN SURPLUS, NICKEL IN DEFICIT

According to the *World Metal Statistics Report* for May, copper and tin were in surplus during January to March 2021 while nickel moved into deficit.

The copper market recorded a surplus of 2.2 kilotons (kt) in January to March 2021, which follows a deficit of 954kt in the whole of 2020. Reported stocks at the end of March 2021 were 141kt higher than at the end of December 2020.

Net deliveries into the LME warehouses were 38kt and Comex stocks decreased by 4.4kt. Shanghai stocks rose by 113.3kt during the first quarter of the year. Demand is measured on an apparent basis and it is likely that the full effects of national lockdowns will have distorted the trade statistics. No allowance is made in the consumption calculation for unreported stock changes, particularly in the Chinese government stockpile.

World mine production in January to March 2021 was 5.16 million tonnes (t) which was 2.3% higher than the first three months of 2020. Global refined production for January to March 2021 was 5.91 million tonnes (Mt) up 2% compared with the previous year with significant increases recorded in China (up 199kt) and in India (up 33 kt).

Global demand in January to March 2021 was 5.91Mt compared with 5.71Mt for the first three months of 2020. Chinese apparent demand for the period January to March 2021 was 3.19Mt which was 11.6% higher than the comparable period in 2020. Reported output of semi manufactures rose by 18.5%. EU28 production rose by 4.6% and demand was 24kt lower than the comparable 2020 total.

In March 2021, refined copper production was 1994.9kt and demand was 2019.5kt.

Nickel market

The nickel market was in deficit during January to March 2021 with apparent demand exceeding production by 18.5kt. In the whole of 2020, the calculated surplus was 95.4kt. Reported stocks held in the LME at the end of March 2021 were 11.2kt higher than at the end of the previous year. Refined production in January to March 2021 totalled 585.9kt and demand was 604.4kt.

Mine production during January to March 2021 was 567.7kt, 44.3kt above the comparable 2020 total. Chinese smelter/refinery output fell by 2.8kt compared with 2020 and apparent demand was 311.1 kt, 43kt higher than in the previous year. In Indonesia, production in the first quarter of 2021 was 198kt which is 40%

higher than in January to March 2020 and demand almost doubled to 83kt.

World apparent demand was 79kt higher than the previous year. No allowance is made in the consumption calculation for unreported stock changes. Demand is measured on an apparent basis and it is likely that the full effects of national lockdowns have not been fully reflected in the trade statistics.

In March 2021, nickel smelter/refinery production was 197.3kt and demand was 211.2kt.

Tin market

The tin market recorded a surplus of 2.2kt during January to March 2021. Chinese demand is calculated on an apparent basis using reported stocks on the Shanghai exchange. Global reported stocks were 3.5 kt. higher than at the end of 2020. Demand is measured on an apparent basis and it is likely that the full effects of national lockdowns have not been fully reflected in the trade statistics.

Global reported production of refined metal was up by 21kt, compared with the January to March 2020 total. Apparent demand in China was 39% higher than the equivalent period of the previous year.

Global tin demand during January to March 2021 was 105.2kt which was 12% higher than the comparable period of 2020. Japanese demand was 7.2kt which was 27% above the comparable total for January to March 2020.

In March 2021, refined production was 35.8kt and consumption was 37.2kt. ■

“ The nickel market was in deficit during January to March 2021 with apparent demand exceeding production by 18.5kt. In the whole of 2020, the calculated surplus was 95.4kt. ”

KANSANSHI TAKES DELIVERY OF CYBERMINE SIMULATORS

First Quantum Minerals (FQM), a Canadian-based mining and metals company, has outfitted its Zambian, Kansanshi copper-gold mine with two of ThoroughTec's latest generation Cybermine 5 Full-Mission simulators – and they could not be happier.

In 2017, FQM undertook to revamp their Mobile Equipment Operator training program and part of this included the utilisation of simulators. According to Ian McIntosh, training and development manager at FQM, the company looked at simulators and realised their unique potential to prepare its operators for emergency scenarios and situations. Having had experience with simulation before, McIntosh knew the benefits the company and staff could all reap.

FQM conducted a thorough review of the market and after comparing all leading suppliers in terms of cost, features, potential for customisation, and support, it was clear that ThoroughTec Simulation, from South Africa, was the standout supplier to meet their needs.

FQM's CYBERMINE 5th Generation Simulator System incorporates two ruggedised, containerised base units and three modular cabs, the Caterpillar 785-C, Hitachi EH3500 and Liebherr 9350.

The simulators will be utilised heavily to train new recruits from the local community as well as refresher training for existing operators; every six months in the case of Hitachi truck drivers and once a year for the Caterpillar 785-C and Liebherr 9350 operators. "Having the simulators to handle the bulk of the training requirement, saves us from removing machines from production and considering the number of operators we have it adds up quickly. We also have the ability to better prepare our operators for potential equipment failures – the 'what if' scenarios," says McIntosh.

"Going back to the catalyst of purchasing the simulators. When we started the process, I revamped the whole training system, including the processes and procedures on site. I looked at the Airline industry for inspiration, and if you look at their training methods, they put a huge emphasis on simulator training for their pilots. The airline industry has a program called Upset, Prevention and Response (UPRT) which takes pilots through emergency scenarios over-and-over again until they do it the right way and it almost becomes muscle memory. I wanted to mimic that in



ThoroughTec

Operator on the CYBERMINE Liebherr 9350 Simulator.

our simulator training process." ThoroughTec's simulators allow operators to experience and practice responding to emergencies such as brake failures and vehicle fires, something that is impossible to do any other way!

Kansanshi Mine operates six trolley-assist lines on the pit ramps, with significant operational benefits including reduced fuel consumption, increased engine life and greater up-ramp speed, from 11kmph to 23kmph. To ensure that their truck drivers are proficient in the use of the trolley lines and thereby achieve their haulage-boosting potential, Kansanshi opted to include a custom Own Mine World in their simulator development. This 'digital-twin' of their mine site and operations gives trainee truck drivers the ability to practise using the pantograph system on their trucks, engaging and disengaging the trolley-assist lines at the ideal location and angle; and thereby avoiding mishap and inefficiency.

Another feature McIntosh saw and requested, following a tour of ThoroughTec's factory, was the ability to network two or more simulator units – a common practice in the military simulation space. "I wanted the simulators to interplay, to train operators in teamwork and to provide them with a better understanding of how their actions affect the other operator," notes McIntosh.



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DEPTH OF ENGINEERING CAPACITY UNDERPINS MINING

Engineering remains the backbone of mining, and is a focus that Murray & Roberts Cementation continues to prioritise through its extensive capabilities in engineering services.

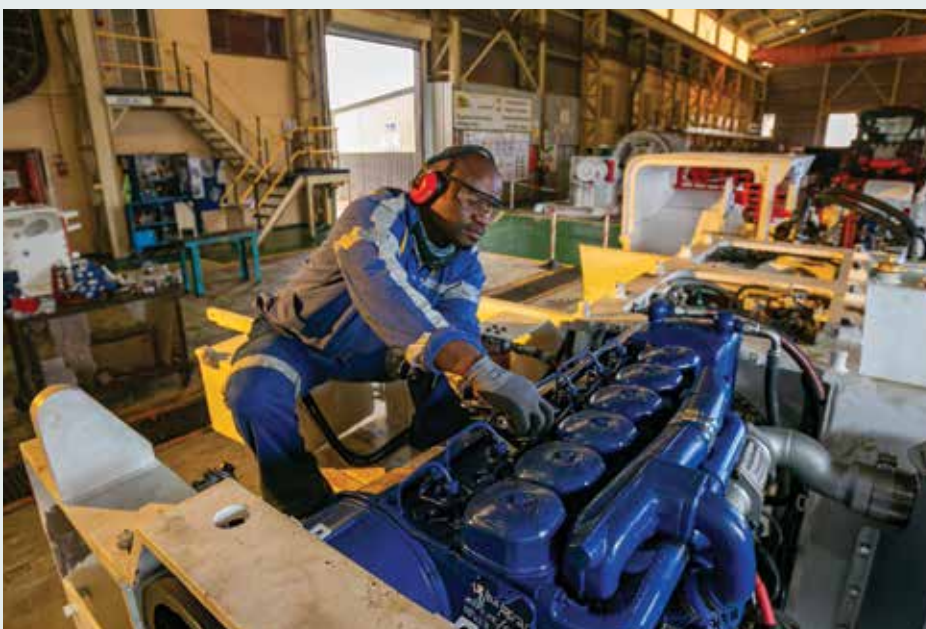
“More than ever, our customers are looking to us for engineering excellence that will underpin their safety, productivity and profitability,” says Herculius Harmse, engineering services executive at Murray & Roberts Cementation. “This means retaining a formidable base of local expertise, a well-resourced engineering facility and a range of specialised offerings.”

Located at the company’s 57 hectare Bentley Park premises near Carletonville, south-west of Johannesburg, is some 9 690m² of covered workshop space – constantly busy with a variety of engineering activities. The engineering personnel numbers almost 70 permanent, qualified technical staff, with more contractors brought in as work requires, says Harmse. The workshops link with the Murray & Roberts Training Academy, situated on the same site, to further develop hands-on artisan and technical skills.

“Key at our Bentley Park facility is our rebuild and refurbishment workshop for trackless mining equipment,” he says. “We can completely refurbish equipment such as load haul dumpers, drill rigs and utility vehicles from a range of original equipment manufacturers (OEMs).”

This work is conducted on equipment in Murray & Roberts Cementation’s own large fleet, as well as on behalf of mining customers. During 2020, over 30 full rebuilds were conducted for customers, complete with on-site commissioning.

“Our long history in the sector gives us a depth of knowledge and systems that comply with the necessary ISO certifications, as well as the stringent specifications of OEMs,” he says. “We work closely with OEMs to ensure quality assurance and quality control in line with customers’ expectations and codes of practice.”



The rebuild of a load-haul-dumper underway at the Bentley Park rebuild workshops.



All images by Murray & Roberts

Fitting of engine frame and components before assembly commences on a 5.5 t load-haul-dumper.

The capability includes a fabrication facility for light, medium and heavy steel structures. The company’s fabrication and boilermaking expertise is applied in a number of applications, allowing complete new frames for LHDs and drill rigs to be built from scratch.

“This local refurbishment and fabrication capability is part of our wider contribution to the skills base of the South African economy, which we must nurture in pursuit of inclusive economic growth,” says Harmse. “This local content is today a more formalised requirement in the Mining Charter, but we have been working this way for many decades.”

Murray & Roberts Cementation’s specialised rigging team also plays a vital role in heavy rigging and installations, especially with regard to winders and winder ropes. Providing a scarce skill-set to mines in various countries, the team tackles the roping up of new winders, replacements, tensioning, servicing and remedial rope repairs among its tasks.

“In response to our own needs – as well as those of our mining customers – we are also active in container conversions for specialised purposes,” he says. “We convert these 6 metre or 12 metre containers into change-houses, laundries, offices, pumping stations or storage facilities, to name just a few uses.”

The technical capability at Bentley Park covers the full scope of trades and skills involved in producing these structures – from metal work and racking to electrical wiring and plumbing.

“Our in-house capacity and experience in delivering this range of engineering services ensures customers of a cost-effective solution and rapid response times, while not compromising on quality,” he concludes.

NEW SPIRAL FOR RETREATING ULTRA-FINES

Multotec, manufacturer of spiral concentrators has released its UX7 spiral which will allow customers to recover more of their valuable ultra-fine material so it does not go to waste in the discard.

Multotec has taken another innovative step to help customers recover more of their valuable ultra-fine material so that it does not go to waste in the discard.

As a leading designer and manufacturer of spiral concentrators, Multotec has released its UX7 spiral which focuses on recovering material in the particle size range of 75 microns and smaller. Refentse Molehe, process engineer at Multotec, says the success of the Multotec UX7 is based on extensive in-house test work, which has led to improvements and around 13% better recovery.

"Much of the testing was conducted on chrome, manganese and iron ore, but the UX7 spiral can be as easily applied to copper,



Multotec UX7 spiral testing was conducted on chrome, manganese and iron ore but can also be applied in copper, platinum and other metals.

platinum and other metals," says Molehe. "This is an exciting development for the sector, as we have seen growing interest from our customers in gaining financial value from material which has traditionally ended up in tailings storage facilities."

She notes that efforts to improve the recovery of ultra-fines have used a range of technologies, but spirals have always been regarded as a highly reliable and energy efficient solution. Multotec's continuous improvement of its spiral technology to suit customer needs now opens the door for customers to cost effectively re-treat their tailings dams to recover valuable ultra-fine material.

"In addition to its ability to recover ultra-fines, the Multotec UX7 spiral benefits from the various advantages shared by spiral concentrators," she says. "These include the lower environmental risk and cost due to the absence of chemicals, and the low maintenance of this technology as a result of having no moving parts."

Multotec's decades of on-the-ground experience in mineral processing – and its depth of expertise in a range of related disciplines – equip the company to provide a customised, full flow sheet solution. Molehe emphasises that each application of the Multotec UX7 spiral will be based on an in-depth understanding of the customer's operating conditions, fine-tuned by extensive testing of material to ensure the optimal result.

"Once we can confirm that the UX7 spiral is the appropriate solution for the customer's operation, then we build in the throughput and capacity requirements and accordingly design the flowsheet to accommodate the specifications to be achieved," she concludes.



Multotec's new UX7 spiral for retreating ultra-fines.

ROSOND'S PROUD RECORD

Drilling solutions provider Rosond has had great success in training an all-female crew deployed at Kumba Iron Ore in the Northern Cape. This particular class was facilitated personally by Head of Training and Development Carlo Claassens. "The enthusiasm shown by these individuals was brilliant to witness. It certainly is one of the highlights of my career," he says.

Rosond has supplied its latest-generation drill rigs to the Anglo American operation. "With the advances in technology and considering how much safer these new machines, we will certainly continue to develop many more female employees in the coming months," reveals Claassens. In terms of the training requirement for any new technology introduced, Rosond carefully drafts operational procedures in conjunction with the manufacturer and tests these in a controlled environment.

The procedures are then refined following input and analysis from various departments. Training manuals and assessments are drafted and approved by the manufacturer before employee training on any new equipment commences. All assessments are drafted to allow for a formative, summative and practical assessment.

Claassens established the training department at Rosond in 2010 after a seven-year stint in the production environment. His primary role is to ensure that employees are trained in all relevant health and safety aspects. This includes all client-related mandatory training as well as operational training pertaining to the fleet of machines to be used on a specific project.

Custom documents are drafted in consultation with the client to ensure its needs are met in terms of what they expect from a training perspective. Each project comes with its own challenges, risks, and hazards, and therefore it is best to tailor training for a specific project without jeopardising the quality of the training.

Claassens' role includes designing and developing training material to be used for new novice employees through to management roles. Rosond currently has four training centres in Postmasburg in the Northern Cape, Rustenburg in the Northwest, Thabazimbi in Limpopo, and Carletonville. Apart from personally facilitating in many of these training centres as well as on projects in Botswana and Mozambique, he oversees a team of ten full-time trainers managing these centres.

INTRODUCING 'CLIMATE-SMART' MINING ON THE ROAD TO INDUSTRY 4.0

By Eduardo Aparicio, Local Business Area Manager, Motion, South Africa, ABB

Reducing our carbon footprint to mitigate the impact of climate change, as outlined in international treaties like the Paris Agreement, and accelerating the journey to the all-electric mine, is a business priority for many mining companies and their customers.

This is an important focus in South Africa, where mining continues to be a mainstay of the economy and a major employer.

There are three major trends fundamentally transforming the mining industry into what can be termed 'climate-smart' mining. Firstly, there is the shift from diesel to electrification as a main power source. Secondly, digitalisation not only increases productivity, but allows for ease of maintenance. Thirdly, customers can reduce their total cost of ownership by standardising on high-efficiency motors and drives.

This means that assets are deployed optimally in a sustainable manner that reduces the overall environmental impact.

Of course, it is not exactly certain how all these trends are likely to play out over the next five to 15 years. What we do know, however, is that the future is invariably shaped by the innovations of today, which are transformed into the advances of tomorrow. Every company that operates in or serves the mining sector can participate in shaping this future – and can begin to have an immediate impact. Let us all join forces as we co-develop and collaborate to set these new 'smart' standards for mining.

The switch to remote services accelerated in 2020 due to the Covid-19 pandemic. This also resulted in a more rapid uptake

of Industry 4.0 solutions in the mining industry in terms of automating operations for optimised productivity, reducing equipment downtime and costs, carrying out predictive rather than preventative maintenance and enhancing safety for mine personnel to introduce a 'zero harm' culture.

Connected mines will result in a wealth of digitalised data from equipment, assets, and applications. By the time this data reaches operators, it will already have been analysed, and can be accessed easily and interacted with on any number of smart devices. Such a connected process results in rapid, smart and informed decision-making that will have a major impact on the bottom line.

Mining is one of the key industries where our drives, motors, generators, mechanical power transmission products and integrated digital powertrain solutions stand to play a major role in ushering in this new connected era. It is an example of the leading role we as a global innovator play in transforming both society and industry to achieve a more productive and sustainable future for all. Therefore, I am very excited to join ABB Southern Africa as Local Business Area Manager in its Motion business unit. This means I get to be part of the South African mining industry's incredible ongoing transformation.

Assisting major South African industries such as mining to adopt the latest technology on the country's path towards energy



Eduardo Aparicio, Local Business Area Manager, Motion, South Africa, ABB.

efficiency, reduced emissions and, ultimately, carbon neutrality is my main goal in my new position. This has been an important focus for me throughout my career in Spain and Mexico. As we all know, South Africa faces power constraints, coupled with lagging economic growth and development. Here I also see electrification and automation and power and water as critical business development areas for us as a business.

In Mexico, for example, a career highlight for me was overseeing the establishment of a new Energy business unit that merged Power and Water to focus on the Oil and Gas industry. This is a sector where we enjoy a global footprint, with clients as far afield as Europe and the US. It is a burgeoning sector in Africa, especially with the latest oil and gas discoveries, presenting tremendous opportunities throughout the continent.

As a business, we succeed by adding value, which is a combination of our innovation, expertise and experience. Dealing with customer requirements is much more than offering technical solutions but depends on understanding a customer's business and how best to optimise it. Our customers are our true assets, because if we help them to succeed, then we succeed in turn. But it goes even further, as we have both a commitment and a drive to make the South African mining industry succeed and benchmark itself against the best in the world.

With South Africa contributing the bulk of our revenue on the continent, my plan is to maintain this strong foothold, while continuing to expand into the rest of the continent, where mining especially is an important driver for growth and socioeconomic development. The mining industry has always demanded the latest technology, and our solutions have been tried-and-tested in major markets such as North America and Europe.

As our recent White Paper entitled 'Achieving the Paris Agreement: The vital role of high-efficiency motors and drives in reducing energy consumption' states, the technology to dramatically improve energy efficiency is available right now. For example, high-efficiency motors and drives are well established and time-tested. I aim to increase the uptake of such technology especially in mining, as well as to educate the market about the importance of our long-term sustainability goals as a future-orientated business.

Of course, the benefits of greater energy efficiency go well beyond the fight against climate change. They contribute broadly to environmental conservation, cleaner air and water, better public health, energy independence and stronger economic growth and development. Nowhere is this more critically important than in the South African mining industry, which is taking significant strides towards a 'climate-smart' future. ■

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TEREX HAULERS EXCEL IN RUSSIA



All images: Terex

Operators like working with the TA400 as these machines can tackle the tough terrain in the mine, allowing for a smooth and easy ride.

A fleet of 14 Terex Trucks TA400 articulated haulers is excelling in tough conditions at a gold-copper mine in eastern Russia, delivering effective and cost-efficient production.

Surrounded by picturesque countryside, the Malmyzh mine in the far-east of Russia seems an idyllic place. But this first impression can be deceptive: operating conditions at the gold-copper mine can be tough. The ground contains lots of clay and the soil in the mine can get very heavy, dense, and sticky, especially in spring and autumn when rain is pouring down.

In these conditions, having the right equipment is key. That's why Russian mining contractor Sovremenniy Gorniy Tekhnologii (SGT) selected 14 Terex Trucks TA400 articulated haulers for the opencast operation in the Malmyzh mine. Since June last year, the trucks have been delivering heavy-duty, efficient performance, working around the clock in two 12-hour shifts every day.

Terex Trucks has designed its TA400 for the toughest jobsites. Delivering great manoeuvrability and traction, the hauler gets



A fleet of 14 Terex Trucks TA400 articulated haulers deliver effective and cost-efficient production.



A fleet of 14 Terex Trucks TA400 articulated haulers is excelling in tough conditions at a gold-copper mine in eastern Russia.

the job done efficiently, even in slippery or muddy conditions. As the hauler's modulating transmission retarder is coupled with an efficient exhaust brake and fully enclosed oil-cooled multidisc brakes, operators benefit from optimum control and increased safety. The TA400 hauler's fully adaptable drivetrain is designed to maintain traction and speed on the toughest terrains, delivering outstanding productivity at all times.

"Given the rough terrain in the mine, articulated haulers are the only machines that can deal with these conditions," says Vyacheslav Zyryanov, general director at SGT. "Our operators love working with the TA400 because it can handle any clay and dirt, even if it's very deep. Still, driving these big machines is always smooth and easy."

Comfort behind the wheel

Located in Khabarovsk Krai in the far-east of Russia, Malmyzh is one of the largest copper-gold projects in the world. Discovered in 2006, the deposit's commercial reserves are estimated at 5.156 million tons of copper and 278 tons of gold. Currently, a modern mining and processing plant is being built at the site, which will process up to 35 million tons of ore per year.

Adverse weather conditions make operating in the mine challenging at times: in winter, the temperature can drop to up to -25°C, whereas the summers are usually very hot with temperatures climbing to 30°C or higher.

The TA400's spacious cab protects operators in the mine from any weather: its sealing elements have installed pressurised properties, which helps keep the in-cab temperature stable and minimises particle ingress. The high performance and easily adjusted heating, ventilation, and air conditioning (HVAC) system ensures a stable temperature. Acoustic insulation helps to minimise noise levels inside the cab and its ergonomic design ensures operators are comfortable when behind the wheel.

Cost-efficient production

With a maximum payload of 38 tonnes (41.9 tons), the TA400 is the biggest articulated hauler Terex Trucks manufactures.

This durable machine boasts a heaped capacity of 23.0 m³ (30.3 yd³) and is powered by a fuel-efficient Scania DC13 engine that develops gross power of 331 kW (444 hp) and a maximum torque of 2,255 Nm (1,663 lbf ft). The TA400 is designed to keep service time and costs to a minimum: its Allison HD4560 transmission boasts high performance oil and up to 6000 hours between service intervals.

“We’re operating in a tough business environment, so cost-effective production is crucial for us,” says Vyacheslav. “That’s the reason why we’ve been working with Terex Trucks haulers for the last ten years. For us, these machines have the lowest cost of ownership and operation and we know we can rely on their efficient performance.”

Sovremenniye Gorniye Tekhnologii is one of the biggest mining contractors in Russia and the Commonwealth of Independent States (CIS). The company carries out a wide range of mining works including drilling, exploding, excavation, transportation, and processing. Starting out in a couple of mines in 2009, SGT handles jobs in all types of mines across Russia and CIS today.

Dedicated support

Another benefit of the TA400 is that the machines are easy to service – the axle, gears and engine are all easy to access, so service and maintenance work is straightforward, without needing special diagnostic equipment. In Russia, Terex Trucks dealer Mining Eurasia offers dedicated on-site maintenance and support services.

“We’ve been working with Mining Eurasia since we purchased our first Terex Truck hauler,” adds Vyacheslav. “If anything needs to be fixed, the team reacts immediately. It doesn’t matter if they can handle it themselves or need support from the team in Motherwell, Scotland – any issue always gets resolved on time.”

AMERICAS' FIRST METSO OUTOTEC TRUCK BODY

Metso Outotec’s unique truck body is designed to maximise the availability and performance of haul trucks while reducing the costs for service and maintenance. The ground-breaking innovation that combines the benefits of rubber and a high-strength steel structure was launched in 2019 and is well-received by customers.

Recently, one of the world’s largest copper mines decided to invest in a Metso Outotec Truck Body. It is the first order globally for a truck with loading capacity of 360 tons and the first in the Americas. The customer is looking to increase payload of its trucks while also reducing maintenance.

“We will supply a truck body with lower weight and major volume capacity compared to the OEM body. We can prove with objective calculation the benefits the customer is going to receive, such as fuel savings, less maintenance, more uptime, the possibility to increase payload on each hauling, as well as improving the truck body’s life. All these benefits are answering to growing demand for environmental efficiency,” says **Alfredo Rios**, business support manager, Loading and Hauling, Americas, Metso Outotec. The Truck Body is part of Metso Outotec’s Planet Positive offering.

Key benefits of Metso Outotec Truck Body:

- Up to 30% lighter than a conventional steel-lined truck body.
- Lower fuel consumption per hauled tonne, less CO₂ emissions.
- The rubber lining lasts up to 300% longer than conventional steel lining, drastically reducing the need for maintenance.
- Modular design makes the lining easier to install and maintain.
- Noise cut in half; vibrations reduced by up to 97%, which significantly improves the working environment for truck drivers.
- Available for all common truck models. ■

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OUTSOURCING CRITICAL FOR BUSINESS

By Gean Botha, Managing Director at Programmed Process Outsourcing, a Workforce Holdings Company

As companies attempt to recover after a rough 2020, their main objective is to do more, with less.

Budgets are stretched, human resources are stressed and the toll of working through a pandemic is evident in the workforce.

During these challenging times, businesses need to think critically about their core, revenue-generation functions and look to streamlining everything else. The most effective way to cut costs is not to spend less but rather to increase efficiencies. Rather than expecting internal resources to do more – which will only result in decreased overall productivity – it is a far smarter move to introduce Business Process Outsourcing (BPO) into the equation.

The best of both worlds

While outsourcing in the digital sphere usually involves handing over management of certain processes to an external third party to perform offsite, this is not the case with the outsourcing of processes necessary to support the business. Companies choose to outsource when they decide that another, more specialised organisation can handle a business task more effectively than they can internally. The burning question is which business processes can or should be outsourced?

Non-core functions that are essential to the running of the business are ideal for outsourcing. Business processes ideal for outsourcing include palletising, finishing, bagging, assembly, health and safety, picking, packing, inventory control, dispatching, cycle counts and payroll.

While there can be some concern for companies handing over their business processes to another company, it is important to bear in mind that this relationship will be governed by a Service Level Agreement (SLA) moving forward. This will clearly define the roles, responsibilities, and expectations of outsourcing relationship. Furthermore, the BPO model is based on maximised output with minimised input, which means it is the BPO provider's core function to help other companies increase their output which is ultimately a win-win for everyone.

The current need for BPO

In tough times, the first thing companies need to do is look at cash flow to preserve funds and eliminate capital expenditure. By outsourcing processes that are essential for operations, companies can take cost-effective steps to ensure business continuity. This is especially important with so much uncertainty on the horizon.

Outsourcing business processes provides organisations with various benefits. It is possible to save money, resources, and valuable production time, leaving the organisation's employees free to focus

on their specialties. The business is also able to take advantage of the outsourcing company's niche focus, which is streamlining essential business processes for other companies. While such processes are essential, organisations have learned that the need is not full-time. While such processes are essential, organisations have learnt that they need to be agile and have variability in these processes in order to meet fluctuating demand from their clients.

Organisations that choose to outsource their business processes gain the expertise to drive business efficiencies across the entire operational chain. Other benefits include cost reductions through process improvements and re-engineering to bring administrative and production costs under control. Costs move from fixed to flexible, by paying only for a service as it is needed. With certain day-to-day operations taken care of, the business' management team will have the capacity to spend more time on growing the business. Outsourcing non-core business processes will also give teams the time and resources to focus on revenue generating activities, such as driving sales, developing new products, and refining services, all of which leads to enhanced customer service and satisfaction.

Makes good business sense

More importantly, outsourcing is an important risk mitigation strategy when it comes to addressing labour risk in a fluctuating market, as well as issues of health and safety. As the business world adjusts to the new reality of Covid-19, being able to outsource these risks is an incredibly important survival tactic that companies can use. BPO providers have the right levels of insurance to make business continuity more realistic and affordable. ■



Gean Botha, managing director at Programmed Process Outsourcing.

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"RHAM EQUIPMENT recently launches the first battery operated LHD"



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+ Safety Improvement + Efficiency Improvement

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+ Efficiency Improvement

Boulder Detection⁴ ▲ 1.0%

+ Safety Improvement + Efficiency Improvement



1 Mines can improve production by up to six percent by adjusting the crusher gap and powder factor. Results based on a study of crushed material conveyed by belt at a Chilean mine and a study of blasting results at an American mine.

3 According to a case study at a Kazakh copper mine, on average, a shovel fills 90% of a truck's available capacity. Load volume monitoring can decrease the remaining 10% of lost carrying capacity over time.

2 According to several studies at various copper mines in the US, Chile, and Kazakhstan, missing GET components can cause more than five days of crusher downtime per year.

4 According to case studies of both a Peruvian and Kazakh copper mine, brief crusher delays caused by oversized material can add up to multiple days of lost production per year.