

# African Mining Market

africanminingmarket.com

Issue 2 | April - June 2022



*Integrated Solutions for Productivity and Safety*



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Q&A ON AXXIS TITANIUM™ & SILVER P12

“ Tinus Brits, BME’s Global Product Manager AXXIS™, responds to questions on AXXIS TITANIUM & SILVER™ ”

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**Publisher**

Aaron Walsh  
aaron@africanminingmarket.com

**Editor**

Daniel Phiri  
editorial@africanminingmarket.com

**Online Editor**

Laurence M. Stevens  
laurence@africanminingmarket.com

Paul Jacobs

paul@africanminingmarket.com

**Marketing & Advertising**

Charles Mthethwa  
charles@africanminingmarket.com

**Sales Executives**

Amanda Shezi  
amanda@africanminingmarket.com

Nathan Silenga

nathans@africanminingmarket.com

Eric Shwana

eric@africanminingmarket.com

**Advertising Material**

Henry Ndlovu  
advertising@africanminingmarket.com

**Head Office**

15 Forest Rd, Bramley, Waverley Office  
Park, Johannesburg  
South Africa  
t +27 (0) 87 898 8824  
f +27 (0) 86 660 4754  
info@africanminingmarket.com  
https://africanminingmarket.com

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# Welcome to the April - June Issue

**Welcome to our 2nd edition of 2022.**

In this issue the African Mining Market team present you with an issue scheduled for distribution at the Mining Indaba 2022, and contains some exciting news/ reporting on Gold Exploration, Drill & Blasting, Energy, Underground Mining, General Insight, etc.

This year the African Mining Market magazine will have extra circulation at several Media Partnered exhibitions, some of which are: – Mining Indaba (May 2022), MMEC 2022 (June), Junior Indaba 2022 (June), African Mining Summit 2022 (September), Joburg Indaba 2022 (October), plus many more.

**2022 Marketing Opportunities**

If you are only starting to look at marketing in 2022, The African Mining Market provides a creative medium to communicate effectively with your target audience.

E-mail us at [advertising@africanminingmarket.com](mailto:advertising@africanminingmarket.com), and a media kit with feature list, pricing and all relevant information about the publication will be e-mailed to you. Alternatively, please give us a call on +27 (0) 87 898 8824.

Electronic advertising is also available on the website, social channels and on the weekly eNewsletter, which is distributed to over 116, 000 readers:

Finally, our third edition of 2022 will focus on Bulk Handling & Tunnelling, Crushing & Milling, Consulting Engineers, Drones, Conveyors & Components, etc., and we welcome any editorial contributions for this issue.

**The African Mining Market Team**

## July/ September

Bulk Handling & Tunnelling, Crushing & Milling, Consulting Engineers,  
Drones, Conveyors & Components, Oil & Gas.

**Booking deadline 20th June, 2022 | Artwork & Editorial deadline 27th June, 2022**



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# Obtaining a Mining Licence in one of Africa's leading producers' of Gold "Ghana"

Every company seeking to enter the mining industry in Ghana requires a mining licence. The mining industry in Ghana accounts for 5% of the country's GDP and minerals make up 37% of total exports of which gold contributes over 90% of the total mineral exports.

Ghana is one of the leading producers of gold in Africa and the seventh leading producer in the world. Some major operating mines in Ghana are AngloGold Ashanti (Ghana) Ltd., AngloGold Ashanti (Iduapriem) Ltd., Goldfields Ghana Ltd., Newmont Ghana Gold Ltd., Chirano Gold Mine among others. Ghana has 20 large-scale mining companies producing gold, diamonds, bauxite, and manganese, and, there are also over 300 registered small-scale mining groups and 90 mine support service companies.

## What is the key legislation regulating mining in Ghana?

The key legislation regulating mining in Ghana is the 1992 Constitution of Ghana, the Minerals and Mining Act, 2006 (Act 703), as amended by the Minerals and Mining (Amendment) Act, 2015 (Act 900), the Minerals and Mining (Amendment) Act, 2019 (Act 995), and the Minerals Commission Act,

1993 (Act 450). It should be noted that there are other subsidiary legislations that regulate different aspects of the mining sector.

## Who is responsible for issuing a mining licence in Ghana?

The agency that has the mandate and is responsible for issuing a mining licence is the Minerals Commission, Ghana. In addition to granting of licence, the commission undertakes the coordination and implementation of policies related to mining in Ghana.

## What are the types of mining licences in Ghana?

There are various types of Mineral Rights and Licences available in Ghana.

They include;

1. Reconnaissance Licence (RL):  
Regional exploration and does not include drilling and excavation.



2. Prospecting Licence (PL):  
Search for minerals and evaluation.

3. Mining Lease (ML):  
Extraction of minerals.

4. Restricted Mining Lease (RML):  
Building and industrial materials.

5. Small Scale Mining Licence:  
Extraction of minerals. This type is reserved for Ghanaians only.

Each mineral right and licence has a distinct defined area and duration but are all renewable.

### Obtaining gold mining concession

Entities who want to venture into the mining business need a site where they can mine gold. The minerals commission has a database of possible mining sites that individuals and entities can legally acquire and mine. Private individuals are encouraged to use their own trusted resources and technology to ensure that the sites that they want to acquire have the required amount of minerals that they want to mine.

### Documents required to apply for a mining licence in Ghana:

- Completed application form. The form is available for download on the Minerals Commission website.
- Certified copies of documents of incorporation that show the applicant is a body incorporated under the Companies Act, 2019 (Act 992) or the Incorporated Private Partnership Act, 1962 (Act 152) or under any other enactment in force.
- Certified copies of the company's regulations for the companies in the old system and Constitution for companies in the new system. Also, add details of shareholding and directors.
- Specify the size, the number of cadastral blocks, and the cadastral coordinates delineating the area being applied for (site plan).
- Particulars of the qualifications and experience of the technical team in charge of the reconnaissance operations.
- Work program describing the scope and type of the work to be conducted, including the expenditure on reconnaissance.
- Particulars of the financial resources available to the applicant for the proposal reconnaissance operations.
- Provide evidence of payment of the applicable fees.
- Cadastral search report
- In the case of conversion from reconnaissance to prospecting license, a certified copy of the reconnaissance license is required.

In case of conversion to mining lease, a certified copy of reconnaissance and prospecting licence are required.



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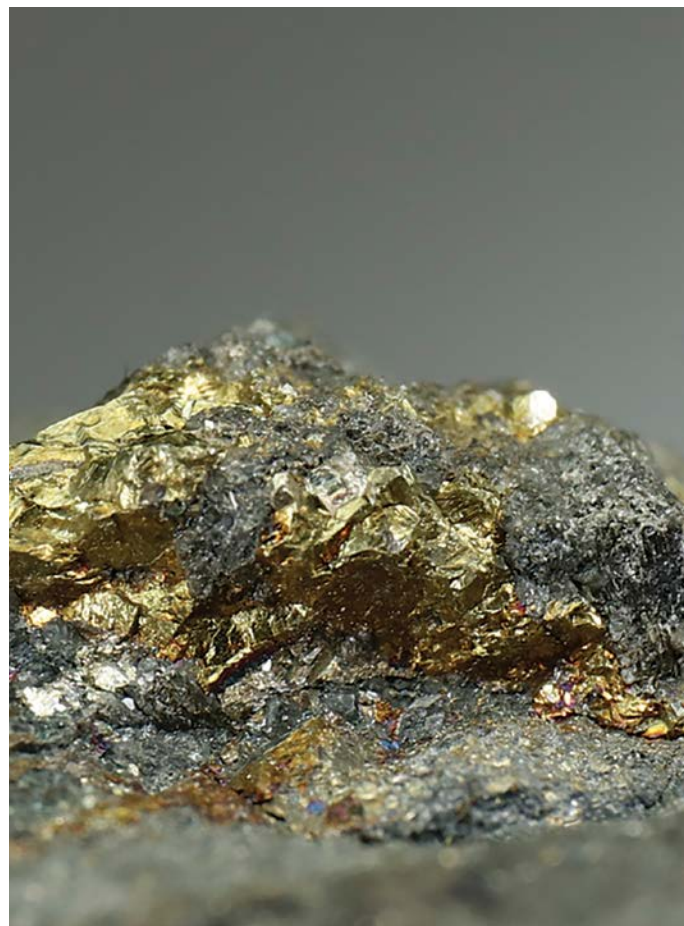
+27 (0)11 907-1355  
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# Photogeology as a tool for Prospecting for Gold



**P**rospecting or exploration is a search for precious metal deposits such as gold. Mineral exploration or prospecting is the process of searching for evidence of any mineralisation hosted in the surrounding rocks. The general principle works by extracting pieces of geological information from several places and extrapolating this over the larger area to develop a geological picture. Gold is very widely disseminated throughout nature and may be found in any geological formation from the oldest rocks to deposits that are still being formed. It is more likely to be found in the oldest rocks and in those places where the earth crust has undergone the most extensive changes such as elevations, folding, tilting, faults, fissuring and volcanic action, with resulting changes in the composition and texture of the rocks.

## Select Target Area

The first stage is to select the area from which you intend to conduct exploration. Technology is key in project and exploration of new deposits. This is followed by satellite remote sensing; geological mapping and seismic techniques can be used at this stage. In turn, this is followed by detailed geophysical studies and later, a detailed drilling, sampling, assaying and mineralogical study. Gold deposits are sought with many techniques. Commonly more than one method is employed. With these methods, the geologist is looking for anomalies. Perhaps, the most important technique used is photogeology.

## Photogeology

Photogeology is a very important for gold deposit exploration. It gives complete information from high-altitude photography and or satellite photography. In general, photogeology involves the interpretation of an area's geology from analysis of landforms, drainage and vegetation. Basically, there

are four types of information, fracture and trace analysis, fracture identification, seep detection and channel change study. When a fracture is observed in cross section, it seems to be vertical or near vertical breaks in the bedrock. Gold particles can be deposited into fractures. Other important information is the called lithological mapping, which involves the interpretation of surface features so that can be obtained a more exact map.

Images are recorded either on films or digitally. Films used include black & white, true colour, and Infra-red. In colour photos, the red areas indicate live vegetation. This makes them useful for locating outcrops in highly vegetated areas. Also least affected by fog and is effective in cloudy environments. This is also good for determining moisture content of soils. The typical aerial photos are those which are taken with the camera lens vertical since oblique photos could exaggerate the reef.

Aerial photographs are usually taken from an aircraft flying at altitudes between 800 and 9000 metres depending upon the amount of detail required. Photographs may be taken at different angles varying from vertical to low oblique (excluding horizon) to high oblique (including horizon), but for geological purposes vertical photographs are by far the most important. The scale of the photographs depends upon the terrain clearance and focal length of the camera used.



## Au-Isomer

### INDUSTRIAL GAMMA-ACTIVATION ASSAY FACILITY FOR GOLD ANALYSIS in GOLD-BEARING ORES



Sample Container

LINAC



Main technical characteristics	Value
Gold detection limit	0,04ppm
Measurement accuracy for ore with Au content 1 ppm	8%
10 ppm	4%
Performance for samples with Au content $\geq 1$ ppm	70 samples /h
Sample volume	300 ml
Sample particle size should be not more than	3 mm
Energy of electrons at linear accelerator output	7–9 MeV
Maximum power of the electron beam	10 kW
Radiation background on surface of safety barrier	$\leq 1 \mu\text{Sv/h}$
Facility height with a crane for radiation shield assembly	4.1 m
Facility area	(4x7) m
Facility weight with shielding	118 t
Maximum power consumption	70 kW

In cooperation with



## XRF Conveyor Analyzer CON-X



On-line XRF conveyor analyzer CON-X is used to identify and measure the concentration of the elements and minerals in ores and materials on a conveyor belt. The analyzer detects elements from Al (Z=13) to U (Z=92).

Parameters	Value
Detector type	SDD detector
Energy resolution at 5,9keV (Mn-K $\alpha$ )	160
Radiation source	X-ray tube (Mo, Rh, Ag etc.)
Concentration range with measurement time 600s for Al, Si, P	from 8 to 80%
for S, Cl, K, Ca	from 2 to 95%
for Sc, Ti, V, Cr, Mn, Fe, etc	from 0.02 to 99%
Analyser dimensions, mm	890x275x240
Weight without fixing elements, kg	45
Enclosure protection	IP65
Operational temperature range, °C	-20... +45

**Baltic Scientific Instruments**  
Ramulu str. 3, Riga  
LV - 1005  
Latvia

**Phone: +371 67383947**  
E-mail: [office@bsi.lv](mailto:office@bsi.lv)  
[www.bsi.lv](http://www.bsi.lv)



# Drilling and Blasting

**D**rill and blast mining is the most commonly used mining excavation method in the world. Drill and Blast mining is extremely popular for numerous reasons, such as its cost, simplicity, and effectiveness. Blasting is a process of reducing a solid body, such as rock, to fragments by using an explosive. Conventional blasting operations include drilling holes, placing a charge and detonator in each hole, detonating the charge, and clearing away the broken material.

Upon detonation, the chemical energy in the explosive is liberated, and the compact explosive becomes transformed into a glowing gas with an enormous pressure. In a densely packed hole this pressure can exceed 100,000 atmospheres. The high pressure shatters the area adjacent to the drill hole and exposes the rock beyond to very high stresses and strains that cause cracks to form. Under the influence of the gas pressure, the cracks extend, and the rock in front of the drill hole yields and moves forward. If the distance of the hole to the closest surface is not too great, the rock in front of the hole will break.

### Surveying the Location

Before drill and blast can begin, the proposed site needs to be inspected, and certain decisions need to be made with regards to the hole size/diameter, the type of drill or drills that will be required. These decisions will be based on the findings of the initial site survey.

The site survey will analyse the nature of the proposed mining operation, the nature of the rock, soil, ground, and/or mineral in question, and will impact the road going forward with regard to the blast hole drilling processes.

### Research

Once the surveying processes have provided the surveyors with the raw data, they will turn this data over to researchers, who will then do the necessary research in order to plan effective and safe drilling patterns.

### Drilling Plans

Once the researchers have determined the most effective, efficient, and safest way to proceed, the project manager will take over and draw up the necessary drilling plans.

### Breaking up the rock

Once the blast holes have been drilled they will be packed with explosives. What kind, and the amount of explosives used will have been determined based on the research conducted; just like the size and depth of the blast hole was determined based on the research. The explosives will then be remote detonated in order to break up the rock.

### The Clean Up

Once blasting is over in underground mining, the tunnel will be cleared of debris, and the tunnel will be suitably reinforced and in open mine blasting, the rock will be excavated and hauled.







# BOTSE

DRILL & BLAST

## DRILL & BLAST

### Surface Operations

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## ABOUT US

Botse (Pty) Ltd was established in January 2020. We work with Surface Mines and Quarries to develop the best rock drilling and breaking solutions for optimum results. From these partnerships, Botse endeavors to provide a fast, reliable, safe and efficient service delivery, which offers predictable outcomes, whilst reducing operating costs.

**Botse PTY (Ltd) is a level 2 BEE contributor.**

Our priorities are to take absolute accountability for results, to focus sharply on achieving targets and turning around poor performance, and to maintain excellent, 'zero compromise' safety standards.

**We provide the best solutions for your business!**

## OUR SERVICES



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BLAST HOLES**



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SERVICES**



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SERVICES**



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**Email:** [steyn@botse.co.za](mailto:steyn@botse.co.za)

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BME -

Q&amp;A

# on AXXIS Titanium and Silver™

Responses from: Tinus Brits, BME's Global Product Manager – AXXIS™

**Q BME will be exhibiting at the 2022 Investing in African Mining Indaba in Cape Town. How will your offerings help mines address the key strategic demands under discussion there?**

**A** Sustainability and safety will be high on the Indaba's agenda, and BME will be there to support the industry's efforts toward a low-carbon future and zero harm. Our portfolio of services, products and equipment underpin quality blasting, making mines continuously more efficient. Good fragmentation, for instance, reduces energy costs and cuts the carbon footprint.

A special focus this year will be on AXXIS Titanium™, the latest generation of our world-class electronic initiation system. This innovation allows even larger blasts, raising mine efficiency by reducing mine stoppages. With the upgraded chip in our detonators, we are also raising the safety bar by facilitating inherently safe logging and testing before blasts.

**Q BME recently launched AXXIS Titanium™ - the latest generation of its AXXIS™ electronic blast detonation system. What makes it so advanced?**

**A** With AXXIS Titanium™, we have further improved the safety levels that this equipment can bring to a mine and have applied even better manufacturing quality to avoid defects. The new system optimises mines' blasting performance through the increased blast duration per detonator, more



Tinus Brits, BME's Global Product Manager – AXXIS™

units per blasting box and precise firing accuracy. We have also raised the bar in terms of the robustness of the wire, the easy-to-use interface and the integration – which will save time while improving data generation and reporting functions.

**Q Can you elaborate on the safety enhancements?**

**A** Building on the achievements of our AXXIS GII™ model, AXXIS Titanium™ includes further refinements in safety by incorporating a Swiss-designed application-specific integrated circuit (ASIC) chip in our BME detonators. Among the added benefits is that the ASIC gives the system more internal safety gates against stray current and lightning, enhancing safety levels and allowing for inherently safe logging and testing.

Our use of dual capacitors and dual voltage is a unique innovation which allows us to conduct low-voltage logging to avoid any chance of detonation. Blasts can only be initiated by a robust, encrypted blast command, ensuring that detonators all receive their respective commands and fire as planned. This means that the detonator will only react if it receives the correct, encrypted firing sequence from the blasting equipment, not from any other source.



AXXIS Titanium™ has enhanced safety features



**Q Accuracy of detonator timing can be affected by electro-magnetic pulses; how does AXXIS Titanium™ address this challenge?**

**A** AXXIS Titanium™ has been developed to be resistant to electro-magnetic pulses (EMPs) caused by the blast, as these pulses can affect the accuracy of detonators or even cause them to fail. We have conducted extensive testing at the Council for Scientific and Industrial Research (CSIR), and these showed that our detonators can withstand a significant EMP without any impact on their timing.

The confined spaces that are common in underground blasting makes detonators particularly susceptible to re-setting and misfiring due to voltages from EMP, as well as from dynamic pressures. By over-moulding all our components on the electronic board, we protect the detonators against dynamic pressures, and isolate components from any induced ground currents – such as electrostatic discharge and lightning strikes.

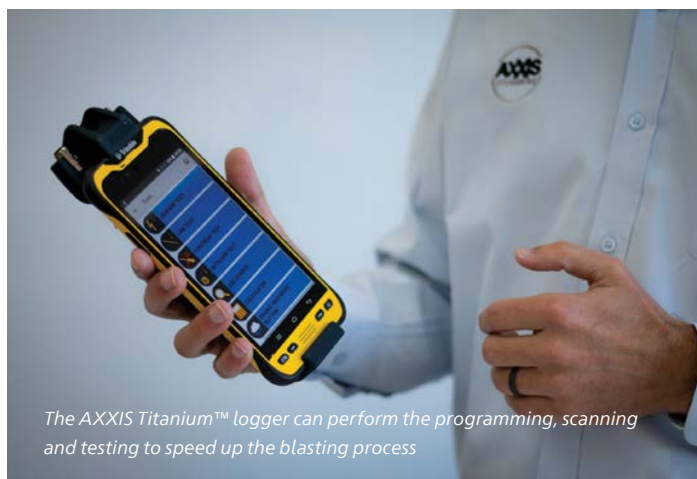
**Q Many opencast mines want to conduct larger blasts so that there is less frequent disruption of pit operations. Where does AXXIS Titanium™ contribute on this score?**

**A** In addition to improving safety, the ASIC chip boasts more memory and processing speed. This means easier timing and centralised programming – if the timing needs to be changed after being conducted on the bench. By incorporating dual capacitors, we also achieve lower power consumption so that more detonators can be initiated per blast. AXXIS Titanium™ can now initiate 1,000 detonators per blasting box, doubling the capacity of the previous generation. The new system also allows up to 20 blasting boxes to be linked and synchronised through hard wiring, so that 20,000 electronic detonators can be initiated in a single blast.

Another important factor in facilitating large blasts is the blast duration. AXXIS Titanium™ boasts an ultra-low energy micro-chip which extends the firing time to a maximum of 35 seconds; it is also less susceptible to leakage and cable resistance. Over the years, AXXIS™ has been used in some of the largest mining blasts on record. AXXIS Titanium™ will continue pushing the boundaries – delivering safety and efficiency in increasingly large blasts.

**Q How does BME make life easier for blasters on the mine?**

**A** Among the key features of AXXIS Titanium™ is its ease of use, speed and testability. On-bench logging is a one-step process, and it is simple to check for faults and to apply corrections on the blast pattern. Everything is now built into the logger – which can perform the programming, scanning and testing. Users



*The AXXIS Titanium™ logger can perform the programming, scanning and testing to speed up the blasting process*

obviously want to fire a blast as quickly as possible, and our system speeds that up; once detonators have been programmed, the controller can be started up from the view site and blasted within two minutes. The speed of the ASIC chip on the system's board halves the programming time.

**Q Can quality blasting contribute to mines' sustainability efforts?**

**A** When a blast is well designed and executed, it generates a level of rock fragmentation that makes loading, hauling, crushing and milling more efficient. In this way, quality blasts reduce energy consumption in downstream processes, thereby reducing carbon emissions from electricity generation. To ensure we achieve these results, the accuracy of our detonation delays has been further fine-tuned, reaching a 0,02% firing accuracy. This helps mines improve their carbon footprints as they pursue their sustainability targets. BME's technology innovation is closely aligned with the Omnia Group's ongoing focus on sustainability, which prioritises zero harm and positive impact to build a better future.

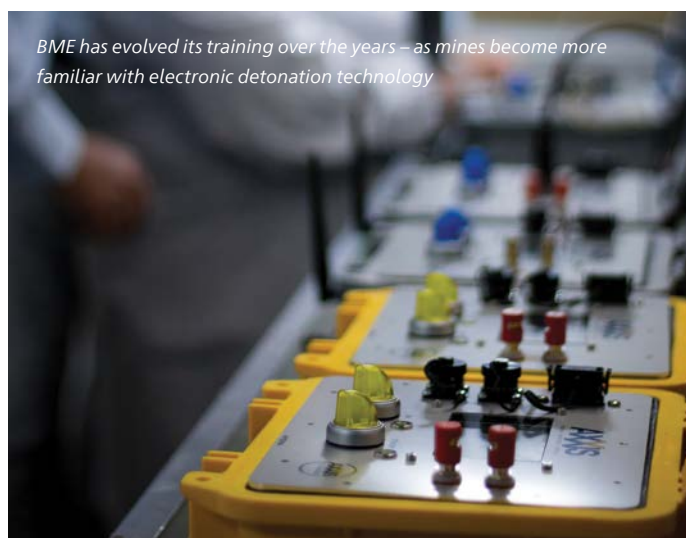
Accurate blast design and initiation also allows mines to ensure they are operating within regulatory limits regarding vibration control. Commands from the operator are written into the detonator's non-volatile memory, so that it cannot be over-written or deleted. This is very useful for post-blast analysis if required.

**Q What training support does BME offer mines in the application of AXXIS Titanium™?**

**A** BME offers all the necessary training for customers to use the new system and has evolved its training over the years – as mines become more familiar with electronic detonation technology. We have also adapted our training methods in response to the Covid-19 pandemic, which restricted our physical access to mine sites. We offer both virtual training sessions online and practical sessions on the bench. Blasting teams on mines can now do most of the introductory training online, whereas we do the more practical and site-specific training at the mine.

**Q What about smaller mines and quarries, who might not need to conduct large blasts?**

**A** BME has evolved a 'slimmed down' version of AXXIS Titanium™ for smaller mining operations and quarries as well as customers in construction and demolition – called AXXIS Silver™. This offering has the same microchip, safety features and ease of use; like AXXIS Titanium™, it also integrates with BME's other innovative solutions such as its BLASTMAP™ blast planning software, XPLOG™ platform and cloud-based storage for post-blast analysis.



*BME has evolved its training over the years – as mines become more familiar with electronic detonation technology*



# Mining Indaba 2022 to host inaugural Junior ESG Awards

**T**he brand-new Mining Indaba inaugural awards highlight junior mining companies that excel in making a significant positive ESG impact.

A new event calling for junior mining companies with a positive ESG impact is coming to the Mining Indaba conference agenda this year. The awards are an opportunity to put a junior mining company in the spotlight and reward them for excelling within the ESG space.

## The categories include:

- Energy Efficiency
- Responsible Water
- Protection of Biodiversity
- Technology Modernization
- Community Support
- Enhanced Labour Standards

- Health and Safety
- Equality and Diversity

Applications are open for junior mining companies with a market cap and/or asset value below USD 300 million. This is a brilliant opportunity for junior mining companies to be put in the spotlight in front of some of the biggest companies and investors in the mining industry.

Applications are free and open until 17th April 2022. Applicants are assessed by a panel of independent judges comprising of ESG advisors, managers, and analysts. For all nominations, judges will want to see evidence-based results and the future strategy.

Winners are announced on 11 May onsite at Investing in African Mining Indaba (Mining Indaba). For more information on the Junior ESG Awards and to apply, [click here](#).





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# Assmang sets its sights on new safety milestones for Black Rock Mine Operations after a world-class fatality free 13 years and 10 million shifts

**A**ssmang's Black Rock Mine Operations has embarked on its new journey of achieving fresh safety milestones after recording 10 million fatality free shifts in the past 13 years as the mine expanded output by nearly half in a multi-billion-rand investment. Assmang, which is jointly owned by African Rainbow Minerals (ARM) and Assore, reached the 10-million fatality free shifts milestone on 30 March 2022, at the Black Rock mining complex near Hotazel, Northern Cape.

The Gloria and Nchwaning shafts and two processing plants at the Black Rock complex, which employs 6,000 people, consisting of 4,400 permanent employees and 1,600 contractors, undertook a modernisation and refurbishment project over a 10-year period with high-risk activities that were carefully managed.

"Achieving 10 million fatality free shifts does not mean that we have arrived and can now start being complacent," says Andre Joubert, CEO of ARM Ferrous and deputy chair of Assmang.

"Instead, it is the beginning of new ways of working and ensuring teams do proper change management for any new processes and systems that are being introduced. We will continue with our basic four steps to safety, ensuring that critical controls are well implemented and closely inspected. No job is more important than safety at Black Rock Mine Operations," he says.

The modernisation and refurbishment project at Black Rock Expansion Project happened during the remarkable journey without compromising safety, which illustrates the intense focus on working practices, adherence to safety programmes and policies, and steadfastly working towards Zero Harm. The transition towards modernisation introduces new risks in the complex, which must be closely managed and controlled.

The milestone highlights the collaboration and unity of purpose between management, the National Union of Mineworkers, Solidarity, contractors and the Department of Mineral Resources and Energy's Safety Inspectorate in achieving this notable safety performance.







"This is an exceptional milestone for our operation and demonstrates what can be accomplished through commitment and collaboration. It was reached by doing the basics properly and safely, day-by-day, and taking the necessary action and precautions to ensure compliance with all safety and health protocols," says Wilhemina Ngcobo, the Senior General Manager of Black Rock Mine.

"All team members are actively encouraged to come forth with ideas and search for ways to do things safer, better, and more cost-effectively. This continuous improvement in behaviour ensures we strive for excellence and deliver sustainable production now and in the future," she says.

"Safety is entrenched in everything that we do and remains a priority. We remain committed to achieving our next milestone. The fundamentals of good communication will continue to be practiced and teams will be encouraged to ensure that they remain with their 'brother's keeper' principle," she adds.

The mine produces four million tonnes a year of saleable manganese ore. The decade-long, multi-billion-rand project has grown run-of-mine production to a forecast 5.1 million tonnes in 2022, up by 42% from 3.6 million tonnes in 2011.

**The project comprised of at least 12 sub-projects that entailed:**

1. Stripping, upgrading, and reequipping the Nchwaning 2 vertical shaft, and installing a new rock winder and new man winder.
2. In total 5 winders were licenced with the DMRE
3. The Nchwaning Surface Processing Plant was refurbished.
4. A brand-new stockyard, stacker- reclaimer and train loading facility, as well as a new rail balloon was built.
5. A new rail link was built to enhance the operational efficiency of Transnet to speed up the loading ore.
6. An additional 17 underground storage silos, measuring 25 metres high and 7 metres in diameter were excavated and equipped.
7. Extensive underground excavations, requiring life-of mine support and additional grouting to allow the contractors and mine staff to continue to work in a safe environment.
8. Extensive underground infrastructure, conveyor belts, tips, rock breakers, all fully compliant with all fire protection regulations were installed to accommodate the increase in production volumes.
9. A new ventilation shaft was sunk and equipped at Gloria with zero lost time injuries



10. A massive new underground crushing and screening plant were installed at the Gloria mine.
11. The old conveyor belt system in the Gloria decline shaft was stripped and re-installed as well as a new surface ore handling system.
12. The old processing plant at Gloria was de-commissioned and a new Processing Plant built and commissioned.

The model used for the safe and timeous execution of these projects was to appoint a dedicated Owner's Team and to involve specialist engineering, procurement, and construction management (EPCM) consultants. The main EPCM consultants for these projects were DRA, Worley Parsons and Irritron.

Other companies that made significant contributions to the success of these projects, include- Murray and Roberts, Advent One, Burger and Company, TDS Construction, Olivier Construction, Group 5 Projects, Tau Dipolka Mining and BCQS Quantity Surveyors.

"These tasks were executed in challenging circumstances which included the logistics associated with an underground brownfields project of this magnitude, poor ground conditions which required additional primary and secondary support before construction access could be granted and abnormally huge underground excavations that had to be created," says Joubert.

This project included the manufacture, fabrication, and installation of almost 11,000 tons of steel and the laying of almost 350 km of electric cable.



# Africa can adopt renewable energy on a massive scale and save billions along the way

By Kenneth Engblom, Vice President, Wartsila Energy, Europe and Africa

## Africa's energy future at a crossroad

When it comes to building the future of energy in Africa, the decisions facing the continent's leaders today are nothing less than of historical importance. More than anything else, energy systems are the very fabric of business and society. Countries across Africa want to make good on their objective of building huge amounts of new generation capacity to anticipate on vast increases in energy demand and set the continent on the path of growth and development it deserves. Africa knows where it needs to go. The big question is how. And more specifically: what is the most cost-effective energy mix that can be built to deliver all the new electricity capacity that is needed? Wind, solar, gas turbines, coal, gas engines. . . numerous options are available, but there is only one sweet spot.

For the past decade and more, world-class engineers and analysts at Wärtsilä have tapped into their deep bench of experience in the African energy sector to answer these very questions, country by country. We have mobilized state-of-the-science, technology-neutral energy modelling techniques, and took all local technical constraints, all technologies, and natural resources into account. Multiple energy mix scenarios have been developed and compared. We ran the models rigorously and the numbers have spoken. They reveal cost differences of mind-boggling magnitude between the various energy strategies possible.

## Billions of dollars are at stake

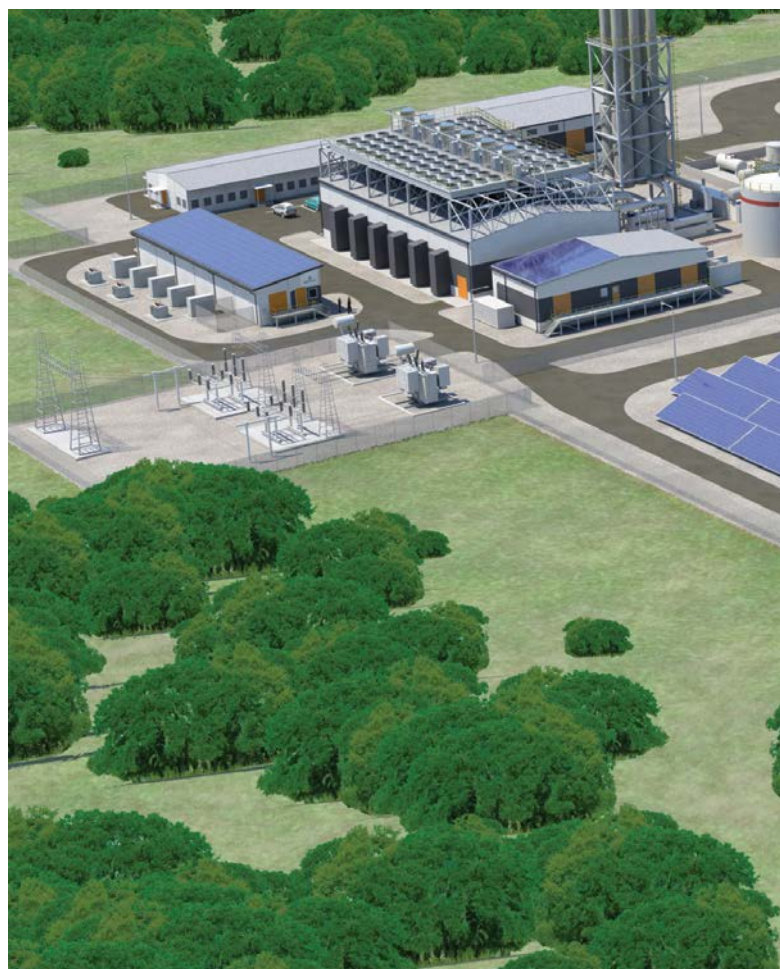
When it comes to the choice of energy technologies, keeping an open mind, free from preconceptions, is paramount. Technologies that can be right for Europe considering its existing infrastructure, population density, or natural resources, can be wrong for others. Each country, each region, must find its own optimal way to building its energy system. Many African countries have however one important point in common: maybe more than anywhere else, the models indicate that the best path to building the most cost-optimal energy system is to maximize the use of renewable energy. One fact must be established once and for all.

The cost of renewable energy equipment has decreased very rapidly in recent years, and when this equipment runs on Africa's massive solar and wind resources, what you have is a cost per KW/h produced that beats all other electricity technologies hands down. If you add to this the fact that most electricity grids on the continent are relatively underdeveloped, favouring renewable energy over traditional power generation like coal or gas turbine power plants becomes a no-brainer. Although relatively ambitious renewable energy targets have been set by governments across the continent, it does not always go far enough. Contrary to what some industry and political leaders

may believe, maximizing the amount of renewable energy that can be built in the system is by far the cheapest strategy available, while at the same time ensuring a stable, reliable network. In Africa, renewables must become the new baseload. And yes, renewables are intermittent. But combining them to flexible power generation capacities will guarantee the stability of the grid and save billions of dollars along the way.

## The intermittency of renewables: an issue we can cope with

It would be misguided to consider the intermittency of renewables as a showstopper. It is not, provided they are paired up with highly flexible forms of







*Kenneth Engblom, Vice President, Wartsila Energy, Europe and Africa*

electricity generation like gas engine power plants. To maintain a balanced system, flexible back-up and peak power must be available to ramp up production at the same rate that wind or solar production fluctuates, but also to match the fluctuating energy demand within the day. The systems must be able to respond to huge daily variations in a matter of seconds or minutes.

Gas engine power plants are the only source of backup generation that is designed to do just that. They will keep the system safe, while allowing the grid to accommodate huge amounts of cheap renewable energy. For Senegal alone, to take only one example, the studies reveal a \$480 Million difference in total system cost over the next 15 years between a system incorporating lots of renewables combined to flexible gas engines, and a system built around inflexible thermal generation and minimal renewable capacity.

### **Renewables and flexible gas: the two pillars of a winning energy strategy**

Renewables and flexible gas are the two pillars of a winning energy strategy for Africa. Similar studies conducted on other African countries indicate that this energy mix strategy will provide efficiencies worth billions of dollars continent-wide over the next few decades.

Highly ambitious renewable energy objectives in Africa are not only achievable, but they are also the soundest and cheapest strategy for the successful electrification of the continent. Making the smart strategy decisions will lead to more resilient electricity systems and offer vastly superior whole-system efficiencies.





# The Energy Strategy

With companies running out of ways to take costs out of their operations and with increasing concerns about greenhouse gas emissions, energy barriers are no longer sufficient to justify the status quo. Mining organisations are being called upon to innovate and change how they think and act with regard to their energy consumption. According to Deloitte's report on energy "The Bottom Line", in order to drive value across the triple bottom line of financial, environmental, and social performance, and to strengthen the mine's strategic positioning, companies must increasingly approach energy management with a concerted effort. This means managing their energy-related projects as a portfolio, dedicating time and resources to them, and approaching energy management as an integrated corporate initiative.

While it requires a big shift in mindset to drive value across the triple bottom line through energy management, it does not necessarily take a big capital

investment. The following strategies can be adopted.

## Measurement of Processes

Begin with measurement processes and a framework. Energy management starts with measuring consumption across different sites and fuel types; creating a baseline for energy costs across the entire system, and importantly, having an integrated framework through which actions can be taken. This allows energy management to be developed into a dedicated top-down management discipline.

## Use of Analytics

Use analytics to identify efficiency opportunities. Advanced analytics applications now allow investigative teams to interrogate big data in a way



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that wasn't possible before. With the right approach, mining companies can use analytics and big data to target opportunities to deliver the same or greater amount of higher quality material, with lower emissions, decreased costs, improved productivity, and enhanced safety.

**Change Approach to Energy**

Mining companies mostly approach energy management from the supply side, meaning they automatically look for cheaper, cleaner, and more reliable fuel sources. However, some of the biggest opportunities in energy management lie in adjusting operations to reshape demand. Examples include using an algorithm to control the speed and sequence of material movement so that trucks use the least amount of diesel fuel possible or shifting energy intensive practices to the daytime when the sun is shining and when a solar array would be producing electricity at its maximum capacity.

#### **Opportunities to Optimize**

Identify opportunities to optimise the energy asset portfolio. Companies now offer asset ownership and/or specialised infrastructure support at competitive prices. More and more mining organisations are considering these types of ancillary offerings to gain access to low-cost capital and better manage their investments in electricity generation assets and energy-related infrastructure.

**Involve Leadership**

Companies need to put in place the capabilities to optimise the energy footprint, break down silos to share ideas and create a culture of energy awareness. Leadership commitment is essential. If top executives start talking about energy as being important, people throughout the organisation will start paying attention to it.





# Addressing the Rising Cost of Energy in Mining

Energy represents a tremendous improvement opportunity for mining companies since savings derived from more proactive energy management are inextricably linked to profitability. The mining sector operates on a massive scale, and accordingly, it is a massive energy consumer.

According to the Deloitte “Bottom Line” report, Energy is one of the biggest expenses for mining companies, constituting approximately 30% of total cash operating costs. This would include not just what the mine draws from the grid, but also the diesel, LNG and CNG it consumes as well as the explosives that are used. After all, explosives comprise energy that is put into the system and can be optimised. Most organisations do not manage this as a portfolio and don’t have full visibility into what is such a significant cost driver for the system.



Although much of the sector has in the last financial year experienced lower energy expenses (\$/t) due to depressed oil and natural gas prices, through the same period many mining companies showed an increase in energy intensity (GJ/t), thus effectively wasting the opportunity to create a more sustainable footprint while prices were low. This could be particularly problematic considering that energy costs are rising partly due to the war in Ukraine and is generally poised to account for an even bigger share of mining input costs in the future, even if energy prices remain flat.

Based on Deloitte’s findings, companies can reduce their energy consumption by 15-20% in existing mines through an effective energy management program, and up to 50% for new mines by rethinking the mine design with energy management in mind.

In the sector, energy consumption and intensity in mining and mineral processing is rising at around 6% per annum, largely due to the declining grade of ore bodies and the rising amount of waste that must be removed to access them. The Mining Association of Canada acknowledges that energy intensity is increasing for its members since underground mines must develop new production zones at much greater depth, which requires extra energy for ventilation, pumping, cooling, hoisting, and sustaining the infrastructure. And these conditions are being echoed in South Africa as well.

Increasing energy intensity alone should provide sufficient reason for mining companies to think carefully about how they manage energy, and many have begun to do that. At the very least, mining companies are examining their supply side energy procurement practices in an attempt to obtain better terms and are tasking their operational groups with looking at more efficient

technologies in high-consumption areas such as hauling and comminution. Some of the more progressive organisations are moving toward greater electrification and are exploring renewable power options, such as solar arrays combined with diesel generation. The scope of these efforts, however, is often narrow, as is the lens through which mining companies view the business case for producing and consuming energy more cleanly and efficiently.







# A Review of Angola's Oil and Gas Sector

In 2020, Angola produced, on average, 1.3 million barrels of oil daily being the second largest oil producer in Africa. Angola's challenge is to reverse this downward spiral and try to boost the most important sector of its economy.

According to an Oil and Gas Law review extract published by Lexology, "Capital expenditure and investment in the industry declined to US\$3 billion in 2021, against US\$15 billion in 2014." The Angolan government has since released a strategic plan for the exploration of hydrocarbons between 2020 and 2025 with the approval of new tax incentives to boost the oil industry.

The state of emergency imposed by the covid-19 pandemic had a huge impact on worldwide oil and gas operations, leading to the suspension of drilling activities and substantial limitations on production activities in general. The pandemic has affected all spheres of the Angolan economy, especially the oil and gas sector, both through the decline in prices of commodities and the decrease in the consumption of oil derivatives, but also through the difficulties caused in the mobilisation of resources for the renewal of activities. The Angolan government, in particular its Minister of Mineral Resources, Petroleum and Gas (MIREMPET) of Angola, tried to mitigate the effects of the pandemic in the oil and gas sector, revealing key strategic decisions and efforts on the short-, medium- and long-term outlook for the post-pandemic period.

Since early 2020 until now, the extractive industries have materialised and expedited their reforms with the consolidation of the role of the National Agency of Petroleum, Gas and Biofuels (ANPG) as National Concessionaire (Granting Authority), and the execution of Sonangol EP's Renewal Program. MIREMPET and ANPG have pursued an effort to promote, internationally, the Concession Award Strategy for the 2019–2025 period, with the start of several public tenders for oil and gas blocks in both the Benguela and Namibe basins.

Furthermore, investment to increase the national oil refining capacity is also planned, with new refineries expected to start operations by 2025. The midstream sector is key for Angola, which has led to the development of landmark projects essential to incrementing Angola's refining capacity. An agreement for the construction of the Cabinda Refinery was reached, the bidding was launched for the Soyo Refinery and the review of the technical and financial feasibility studies is underway for the public tender pertaining to the construction of the Lobito Refinery.

The Angolan Health Ministry adopted further measures, such as the creation of medical-sanitary installations intended to serve the oil and gas industry and the training of emergency teams to deal with suspected and positive covid-19 cases. These actions aimed to guarantee the health of personnel and the continuation of operations, principally of production, with the minimum possible number of cases.



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# BEKA Schröder's Solar Lighting Highmast Solution for Steelpoort Community

**B**EKA Schröder is proud to have supplied the LED solar lighting highmast solution for the Steelpoort community in the Limpopo Province. With this new lighting installation, the community benefits from security lighting even during loadshedding.

The SOLARFLOOD has been installed on three newly erected highmasts in Steelpoort. The masts have been strategically located in high pedestrian traffic areas, such as schools, community centres, clinics and taverns, which ensures safer transit of the community especially during times affected by loadshedding.

The SOLARFLOOD is a South-African designed and manufactured solar lighting highmast solution for outdoor open area and rural applications and provides a high performing, robust option for off-grid solar lighting requirements.

Combined with the OMNISTAR-MINI luminaire, the SOLARFLOOD provides a reliable lighting solution with a high Ingress Protection level (IP 66) that withstands high ambient temperatures. The OMNISTAR-MINI range is a sustainable off-grid performer with a superior lumen/watt ratio. BEKA Schröder's high-performing optics allow for mounting of up to 20m, providing high-quality light where it is needed.

The photovoltaic energy conversion is optimized by highly efficient Monocrystalline solar module technology. This, in conjunction with our Maximum Power Point Tracking (MPPT) charging system and our lithium battery technology, provides a state-of-the-art quality system, offering the required system



autonomy and providing a long-lasting solution to operate in any of our very challenging African environmental conditions.

BEKA Schröder locally develops and manufactures sustainable LED lighting products, designed and suitable for local conditions.

We are very proud to be associated with Two Rivers Platinum and Braigan Energy, a division of Braigan Group, in providing a solar LED lighting solution for this project.

#### For further enquiries, contact:

Johan van Deventer  
Phone: +27 (0)11 238 0056  
E-mail: [pta@beka-schreder.co.za](mailto:pta@beka-schreder.co.za)







# SOLARFLOOD

## LED solar lighting highmast solution

Our solar lighting highmast solution for **outdoor open area and rural applications** provides you with a **high performing, robust option** for your **off-grid solar lighting requirements**. The photovoltaic energy conversion is optimized by highly efficient Monocrystalline solar module technology. This, in conjunction with our Maximum Power Point Tracking (MPPT) charging system and our lithium battery technology, provides a state of the art quality system, offering the required system autonomy and providing **a long lasting solution to operate in any of our very challenging African environmental conditions**.



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# Your ESG Strategy is Critical to Getting Investment

Investors and lenders are increasingly focussed on ESG factors when making investment decisions, which means that in many cases, to access capital, miners will need to demonstrate commitment to ESG concerns.

## Investors

concerned about ESG can obtain information from a number of sources in addition to disclosures made under the regulations and codes discussed above. Many larger investors will have in-house specialists in this area, but there are also indices and ratings agencies (such as FTSE4Good, DJSI, Sustainalytics, MSCI) which rank companies according to their actual or perceived ESG strengths. In addition, a number of institutional investors have publicly committed to taking ESG into account when making investment decisions - for example, the Dutch pension fund ABP has stated that "responsible investment is central to our investment philosophy" and similarly Blackrock has stated that "we have integrated ESG considerations across our investment research, portfolio construction and stewardship processes".

Further, Andreas Utermann, CEO of Allianz Global Investors has stated that "a more holistic approach to 'growth' needs to evolve, looking to capture societal and environmental benefits and costs".

ESG stands for Environmental, Social, and Governance (ESG), and has been rapidly evolving in recent times. Establishing and maintaining a unique framework for ESG is critical to maintaining your corporate reputation as a result of streamlining your organisation's efforts with regards environment, community, and governance. ESG cover the following:

- **Environment:** biodiversity, ecosystem services, water management, mine waste / tailings, air, noise, energy, climate change (carbon footprint, greenhouse gas), hazardous substances, mine closure.
- **Social:** human rights, land use, resettlement, vulnerable people, gender, labour practices, worker/community health & safety, security, artisanal miners, mine closure / after use.
- **Governance:** legal compliance, ethics, anti-bribery, and corruption (ABC), transparency.

According to PwC, It's ESG is about creating a tangible, practical plan that achieves real results. Success is not about climate change, diversity, and disclosures alone. It's about embedding these principles and more across your business from investment to sustainable innovation; and bringing together your best people and smartest technology so you can see more, go deeper and act swiftly.

## Investors and Funding

Very few transactions are done without a review of ESG matters. Responsible investment and buying are a reality and investors, lenders and customers now want to see and be kept informed that ESG issues are in hand. The need to demonstrate a track record of good ESG performance will only increase; and failure to act positively will ultimately reduce access to investors and funding and/or increase the cost of funding.

## Transparency

Mining needs to infuse ESG metrics right through all areas of the mining operation in order to create maximum transparency. With the right combination of data and disclosures, you can be confident in both clearer reporting and greater trust, not just for now, but for the long term.

## ESG Benefits

There are several benefits associated with having a compelling ESG strategy.

The benefits include the following:

- A track record of performance and strong stakeholder relationships that give you access to resources, funding, clients and faster development schedules.
- Meaningful 'bottom line' savings from areas such as reduced energy costs, better use of water, and more effective and efficient management of many other resources.
- The ability to attract and retain the best people in the industry. Make the whole team proud and want to work for you.







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# Managing and disposing of processing waste safely and effectively

**Implementing a Dry Stack Tailings (DST) solution provides a safe and sustainable alternative to the storage of tailings in impoundments.**

The recent commissioning of a Dry Stack Tailings (DST) system supplied by TAKRAF to a Brazilian mine highlights the advanced expertise and unique positioning of the company to offer a complete end-to-end solution for safe and environmentally friendly mine waste management.

While the dry stacking concept is not new, with references as early as 1909 in Australia, technological advances have made DST an increasingly important alternative to conventional methods for handling mine waste, enabling mining companies to significantly decrease their risk profile.

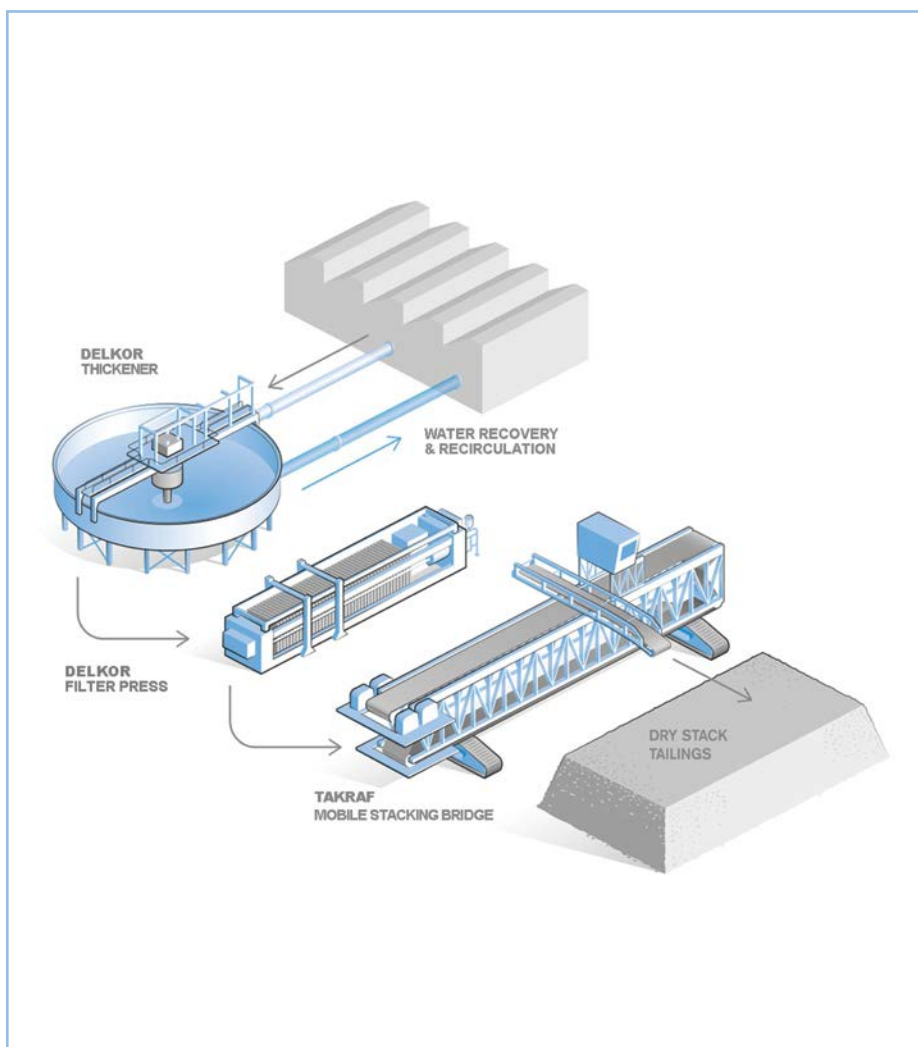
Currently, the most widely utilized method of disposing tailings (waste material from the mineral extraction process) is to pump the tailings slurry to a dedicated impoundment area (pond or dam) to allow sedimentation to occur and solids to settle out. Part of the water is then recovered and re-used in the process. However, the risks and challenges associated with this method,

combined with evolving mining conditions, mean that the safe and effective handling and deposit of tailings, whilst also considering the environment, is of ever-greater importance. Challenges include the considerable space requirement when storing tailings in impoundments, while the catastrophic tailings dam failures, which have occurred, resulting in significant loss of life and environmental damage, are a stark reminder of the risks.

Exacerbating the situation are current mining conditions, which utilize advanced mineral processing technologies to allow lower grade ores to be processed. This results in a much larger quantity of tailings that need to be safely stored. This ever-increasing tonnage of generated tailings makes a conventional deposit in dams an increasingly significant burden curtailing the expansion and development of mine operations and further highlights the potential of DST as a viable and beneficial alternative.







requirements, as well providing the client with a single point of responsibility during implementation. This approach has resulted in clients not only procuring equipment for tailings treatment, but also in contracting TAKRAF to carry out conceptual studies and economic trade-offs for DST systems. All this culminated in a recent DST system order being placed in January 2019.

### DST system designed for Brazilian Mining Company

The order, placed by Mineração Usiminas, one of the Usiminas companies, and one of the largest steel producers in the Americas, comprised basic and detailed engineering, manufacturing, supply, transportation, and site assembly supervision of equipment to process iron ore tailings. The system is designed as a fully integrated dewatering process via thickening and filtration and includes the following main equipment:

- 1 x flocculant plant
- 1 x coagulant plant
- 1 x DELKOR high-rate thickener: 35 m-diameter, 680 t/h (nominal); 748 t/h (design)
- 1 x 300 m<sup>2</sup> slurry tank with agitator
- 4 x double stage centrifugal slurry pumps
- 4 x DELKOR filter press overhead beam (FP OH): 2 m x 2 m plates, each 170 t/h (nominal) and 187 t/h (design), capacity for 215 chambers
- 4 x compressors with tanks (process and instrument air)
- 4 x TAKRAF belt feeders: 2.0 m width, 31 m length with transfer chutes

### Advantages of DST

With DST, the moisture content in the tailings is reduced by a mechanized and controlled process to the point that it can be safely transported, deposited, and stacked as solid cake-form tailings. This yields several advantages over other surface-tailings storage options, including:

- Significant safety improvement with the risk of catastrophic dam failure and tailings run-out being eliminated.
- Transformation of tailings into a stable landform, and facilitation of rehabilitation and eventual closure.
- Smaller tailings footprint and can be employed in undulating or steep terrain.
- Suitability to areas of high seismic activity and areas where there is limited construction material to develop a conventional retention impoundment.
- Reduced requirements for make-up water in plants, principally achieved by recycling process water, and near elimination of water losses through seepage and/or evaporation.

As tailings processing is complex, a detailed understanding of and expertise in the different steps specific to the commodity and project location are required. All equipment needs to be designed and/or adapted to specific project requirements and to be integrated seamlessly into the overall system. As a result, TAKRAF adopts a comprehensive and holistic approach to the design of its DST systems, combining its proven expertise in dewatering (DELKOR) and materials handling (TAKRAF) with a dedicated team of mining, materials handling, and processing specialists. This two-fold approach – bottom-up, equipment supply, and top-down, planning a long-term sustainable system – enables TAKRAF to develop solutions that best suit a client's specific

Mineração Usiminas implemented the DST system to enable the filtering and stacking of tailings as the deposit area of the existing tailings dam reached full capacity. The process dewateres the tailings slurry in a single stream – a two-stage process using a DELKOR high-rate thickener followed by the filtration of thickener underflow using DELKOR overhead filter presses. The next process step allows further water recovery through the filter press, designed to achieve a moisture content level of about 14% (dry basis). Particular attention has been given to the redressing of the slurry using reagents to improve maximum recovery. The result is a dry filter cake that can be effectively handled and deposited.

In line with TAKRAF's approach to supply site-specific solutions, the tailings material was extensively tested prior to the selection of the equipment. For example, the DELKOR filter presses, designed with a collaboration partner as an overhead beam type, are best suited for the operational conditions. The design of such machines enables them to process large volumes of material, yet are robust and maintenance-friendly, since they provide easy access to the filter plates and filter cloths.

"Sustainable water management, together with safety, are increasingly important topics for mining operations and all stakeholders around the world; especially in areas where water conservation is critical and/or tailings failure risks are significant as has unfortunately been the case in Brazil. The Mineração Usiminas project is testimony that implementing a full DST solution, in line with the overall mine development plan, is the most environmentally-friendly and beneficial approach for all stakeholders," noted Thiago Machado, Head of DELKOR products at TAKRAF Brazil.



# Leading the way for integrated Solutions for Productivity and Safety – Probe Mining Group of Companies

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**A**s escalating challenges erode profits, the pressure is on for mining organisations to achieve new levels of performance, efficiency and productivity, while maintaining safe and sustainable operations.

Digital technology, with advances in sensor, monitoring, networking and real-time predictive applications, is creating a new environment and is making improved engineering efficiency, construction productivity and better safety outcomes a reality in integrated mining operations. Working together, these technologies can result in next-level performance enhancements throughout the value chain, says Probe Mining Group of Companies CEO Gert J. Roselt.

Through consolidating the mining-orientated offerings within the Probe Group, the Probe Mining Group of Companies has now evolved to offer a comprehensive, strategic array of best-of-breed technologies, products and end-to-end Digital Mine Operation Solutions that can significantly improve the design of digital mines and data analysis. Our integrated offering incorporates Operation Level 9 collision avoidance systems, the design and manufacture of safety solutions, air quality and gas monitoring, renewable energy, industrial solutions, air power, and other specialised solutions. We further provide auto electrical field services, batteries, spares & parts for off-highway vehicles (OHV) spares related to Komatsu drive systems, OEM harness manufacturing and Electrical Vehicle conversions. With some of the most prestigious clients, the Probe Mining Group of Companies has over 50 years of experience in serving the South Africa and Sub-Saharan African mining industry.

Roselt says visionary mining leaders have realised it's time to transform how operations are conducted, rather than simply searching for incremental improvements. "We capitalise on the potential of technologies, including the Internet of Things (IoT), big data and cloud computing to transform operations, better positioning mines to be able to address resource challenges and environmental pressures moving forward. Our investment in new technologies delivers secure and out-of-the-box solutions, including uptime and remote monitoring, for more efficient and accurate exploration of operations. Our intelligent systems combine technology, people and processes to enable feedback loops, defining an organisation's competitiveness and ability to change the industry landscape."

**According to Roselt, integrated Solutions for Productivity and Safety, have delivered multiple benefits for mining clients, including:**

- Highly safe, sustainable and productive operations
- More innovative, future-proof operational models
- Reduced downtime through taking corrective action in advance
- Improved resource and asset use and availability
- Improved mining fleet use and control
- Real-time visibility resulting in enhanced efficiency
- Increased employee productivity
- Reduced cost of ownership

Professional installation and rigorous maintenance are essential to ensure customers experience minimum downtime. Complemented by a Field Services Division, Probe Mining Group of companies offers a fully integrated management solution, including on-site technical testing and implementation of equipment monitoring systems and charging facilities. The team further views environmental practices as a central component of all planning and development - as providing social, environmental, and economic sustainability guidance. With this in mind, we are proud partners of the #MandelaMining Precinct on The Real-Time Information Management Systems (RTIMS) research programme. "This RTIMS programme aims to improve data sourcing, transmission, storage, dissemination, information management tools, practices, and procedures for mines," says Roselt.

All Probe Mining solutions i.e.: Automotive Solutions, Integrated Mining Technology Solutions, Industrial Technology Solutions, Renewable Energy Solutions, have proven to be world class leaders. We consistently add best-of-breed brands and solutions to mining, automotive, air, power, and our energy solutions portfolio. "We are intent on continuing to grow the organisation through providing tailored solutions to the market and finding ways to solve customer challenges." The Probe Mining Group of Companies Head Office is situated in Germiston, Johannesburg with operations in over 20 locations across South Africa and Sub-Saharan Africa.





1 - 2 JUNE 2022

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## FOR EXPLORERS, DEVELOPERS &amp; INVESTORS IN JUNIOR MINING

**Resources 4 Africa** is pleased to announce the 8<sup>th</sup> edition of its annual Junior Indaba taking place on **1<sup>st</sup> and 2<sup>nd</sup> June 2022** as both an in-person and an online event.

A popular meeting place for junior miners, the Junior Indaba is enjoyed by all for its incisive, informative and frank discussions tackling the challenges and opportunities for exploration and junior mining companies in South Africa and elsewhere in Africa.

Topics that will be discussed include:

- Global economic and geopolitical environment and impact on junior mining
- Outlook for commodities: how are **commodity prices** faring in 2022 and what will this mean for juniors?
- What **sources of finance** are available and how can juniors access these?
- How do we **revive exploration in South Africa** and reach the 5% target of global exploration spend in 5 years?
- How can **government policy and regulation** be reformed to promote junior mining and exploration?
- What lessons can be learned from **successful junior miners** who are already operating in SA and beyond?
- What are the **opportunities for juniors in the energy transition** and demand for strategic metals?

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The 2022 Junior Indaba, for explorers, developers and investors in junior mining, is brought to you by Resources 4 Africa, the organisers of the Joburg Indaba.

# Future Smart Mining™ by Anglo American



**F**uture Smart Mining – a term coined by Anglo American integrates Technology, digitalisation and sustainability to work hand in hand to achieve a desired goal.

These are the step-change innovations that will transform the nature of mining – how we source, mine, process, move and market our products – and how our stakeholders experience our business. It is about transforming our physical and societal footprint.

Anglo on its website says, “We envisage a much-reduced environmental footprint from new ways of mining, including by using several precision mining technologies and data analytics, while our collaborative approach to regional economic development and our ambitious global stretch goals, aimed at delivering improvements to areas such as health and education, are at the heart of how we will create truly sustainable and thriving communities.”

There are four concepts that constitute Future Smart Mining namely, Concentrating the Mine™, Intelligent Mine, Modern Mine, and Water-Less Mine.

Concentrating the Mine™ is looking to address the need for increased precision in mining, with minimal energy, water, and capital intensity. Anglo American says, “We are applying technologies that more precisely target the desired metals or minerals, delivering greater than 30% reductions in the use of water, energy, and capital intensity, and producing less waste in the process, in line with our overall trajectory towards carbon neutral mining. This includes coarse particle recovery, bulk sorting, and ultrafine recovery.”

The Intelligent Mine is one in which vast quantities of quality data are transformed into predictive intelligence, leading to a safe, fully integrated, systemised, and self-learning operations. The aim is to remove the uncertainty and variability that characterises mining today. “We are re-imagining the mining value chain with the power of data, from discovery to marketing.”

“We are building a digital ecosystem that underpins a digital way of working, operations are being digitised through sensors and other instrumentation, and artificial intelligence is being used to accelerate a range of processes, beginning with ore body characterisation.”

The Modern Mine is a mine where everybody is safe. This is to ensure that everyone can go back home to their loved ones. This requires implementation of robotics in part. “Swarm robotics will be the next generation of mining and will ultimately mean the removal of people from safety risk exposure, while upskilling employees in new technologies and approaches.”

Water-Less Mine. With 75% of mine assets located in water constrained areas, there must be a plan to reduce dependence on water and associated tailings facilities. Though water is needed, a move towards full recovery recycling is sustainable. Through an integrated system of technologies including Coarse Particle Recovery, Novel Leaching and Hydraulic Dry Stack, freshwater usage is reduced, moving to closed loop and ultimately dry-processing in all mine operations, and thereby eliminating the need for wet tailings and instead creating stable, dry, economically viable land.



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# A Rich Variety of Minerals

South Africa's mining sector is rich in a variety of minerals. In addition to diamonds and gold, the country also contains reserves of iron ore, platinum, manganese, chromium, copper, uranium, silver, beryllium, and titanium. While it holds some of the world's richest resources more than a century after its establishment, the industry carries a legacy from the past. Government has put in place several structural changes to ensure broad based participation in the mining sector.

Despite a complete overhaul of the mineral regulatory regime in 2004 from a system of private ownership of minerals to a system of State custodianship, the mining industry remains a pressure point in the South African political climate. Mining still contributes a significant amount to South Africa's gross domestic product. The mining industry has been identified as key to driving long term growth, exports, and job growth.

The Broad-Based Socio-Economic Empowerment Charter for the South African Mining and Minerals Industry, 2018 (2018 Mining Charter) was published by the Minister of Mineral Resources in 2018 after extensive public consultation with the various stakeholders including the mining industry represented by the Minerals Council South Africa, government, affected communities and trade unions representing the mine workers.

In terms of the Charter, a new mining right must have a minimum of 30% black economic empowerment (BEE) shareholding distributed as follows:

- At least 5% non-transferable carried interest to qualifying employees.

- At least 5% non-transferable carried interest or "equity equivalent benefit" to host communities.
- At least 20% effective ownership in the form of shares to a BEE entrepreneur, 5% of which must preferably be for women.

South Africa is the world's largest producer of platinum and chromium, which are mined at centres such as Rustenburg and Steelpoort in the northeast and are becoming increasingly significant economically. Vast deposits of platinum-group and chromium minerals are located mainly to the north of Pretoria.

Northern Cape province contains most of the major deposits of iron ore and manganese, and titanium-bearing sands are common on the eastern seaboard. In addition, the country produces uranium, palladium, nickel, copper, antimony, vanadium, fluorspar, and limestone. Diamond mining, historically concentrated around Kimberley, now occurs in a variety of localities.

To conduct mining operations in South Africa one needs to obtain a mining permit from the Department of Mineral Resources. Mining permits are not transferable. They are aimed at controlling prospecting and mining, having regard to considerations for health and safety, environmental management, and the responsible extraction of minerals.

All mining permits in South Africa are issued by the minister of Mineral Resources when and if all the requirements have been met.





# Mining in Mozambique

Mozambique has commercially important deposits of coal (high quality coking coal and thermal coal), graphite, iron ore, titanium, apatite, marble, bentonite, bauxite, kaolin, copper, gold, rubies, and tantalum. Mozambique holds some of the world's largest untapped coal deposits. Vale of Brazil has made major investments in their coking coal mine. Vale, through its participation in the Northern Corridor Development (CDN) consortium, has refurbished the Nacala rail line, which runs through parts of Malawi to the deep-water Port of Nacala. Opportunities for the provision of coal mining equipment and railway logistics and equipment exist. Given the expectation that mining costs in South Africa will rise considerably over the coming years, Mozambique could gain a regional competitive advantage. Two large investment projects focused on the mining and processing of heavy sands deposits are moving forward. The Moma Heavy Sands (Kenmare Resources) and Corridor Sands (BHP Billiton) projects together will require more than USD1 billion in investment.

Mozambique's mineral potential is largely untapped. Gold deposits in Niassa, Tete, and Manica Provinces have attracted domestic and international investor interest in recent years. Gold mining has been slow to develop as most of its activities are done by informal artisanal miners. However, increasing regulation of gold mining may lead to larger scale production, as the Government begins to require miners to formalize their legal status. Xtract Resources acquired a gold mining concession with estimated reserves of 2.97mnoz. Gold industry production is forecasted to grow 1.1%. Syrah Resources (Australia) made its

first shipment of graphite from its Balama project in the second half of 2017 and formally inaugurated the project in April 2018. The Balama project has a production capacity of 350,000 tons per annum, which represents a 40% share of the worldwide graphite market. Syrah will export the majority of this production to the Chinese and U.S. markets. Mustang Resources Ltd. has announced the fast-tracking of its Caula Graphite and Vanadium Project in northern Mozambique. Total graphite deposits are estimated at 700,000 tons from 5.4 metric tons of ore, with an associated vanadium content of the ore estimated at up to 1.02%. Baobab Resources (Australia) is developing a pig iron project in Tete Province to supply iron and steel for regional infrastructure projects.

Gemfields (UK) owns a 75% stake in Montepuez Ruby Mining Limitada, which commenced operations in February 2012, and represents a \$130 million investment in developing northern Mozambican ruby deposits in a concession area of 2600 square kilometers. Gemfields estimates that their existing concession contains an estimated 467,000 carats worth of rubies in both primary and secondary mineralization. On July 16, 2018, Fura Gems Inc. (Canada) announced its acquisition of nine ruby assets in northern Mozambique from Mustang Resources Ltd. (Australia) and Regius Resources Group Ltd. (UK). Fura has announced its intention to invest upwards of USD19 million in these projects over 3 years in a program of drilling, bulk sampling, and production mining.



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# Opportunity for Africa to fill the commodity gap

**F**orecasts suggest that the global economy is facing a 'commodity gap' in the near future as the demand for battery minerals could outstrip supply; could Africa be the continent to fill that gap?

There is certainly good reason to see Africa making a valuable contribution to future supplies of mined commodities from lithium, cobalt, nickel and graphite to manganese, iron, copper, chrome, uranium and aluminium, according to SRK director and principal consultant Andrew van Zyl. While there are considerable resources of these minerals available in Africa and even currently being mined, there remain challenges which prevent their economic extraction – and which are regularly raised and discussed at the Investing in African Mining Indaba in Cape Town.

"One of the reasons why the gold sector thrives in many parts of Africa, for example, is because it needs relatively little in the way of national or state-managed infrastructure," said Van Zyl. "For better or worse, a gold mine can operate quite effectively as an 'island' of activity and prosperity – providing most of its own inputs to mine and process ore, and to transport the very compact end-product."

By contrast, many of the commodities that are now growing in demand are bulk minerals that need extensive road, rail and harbour infrastructure – so they can be transported efficiently and shipped to customers from functioning ports. Planning and developing such facilities require more than capital, he argued. They rely on far-sighted government policies being implemented by well-resourced state bodies – combined with collaboration from the private sector and international funding agencies. They also call for close working relationships between neighbouring countries, with the necessary shared vision and practical protocols to allow railways, powerlines and goods of all descriptions to pass over borders with minimal effort and at the lowest possible cost. Further, with the African Free Trade Agreement having come into effect, this should also expedite matters. "The start of trading under the African Continental Free Trade Area (AfCFTA) agreement on 1 January 2021 marks the dawn of a new era in Africa's development journey. Over time, the

AfCFTA will eliminate import tariffs on 97% of goods traded on the continent, as well as address non-tariff barriers," says SRK Consulting ESG Partner Darryll Kilian.

There is little question that the minerals of the future are to be abundantly found in Africa, said Ivan Doku, principal resource geologist at SRK Consulting and country manager for SRK Ghana.

"There is still plenty of opportunity for exploration and mining of battery minerals in West Africa, as we have recently been discovering in Ghana," said Doku. "The country is becoming a very interesting place to explore right now, having not been historically associated with battery minerals. A significant lithium deposit is currently being investigated – the only one so far in West Africa."

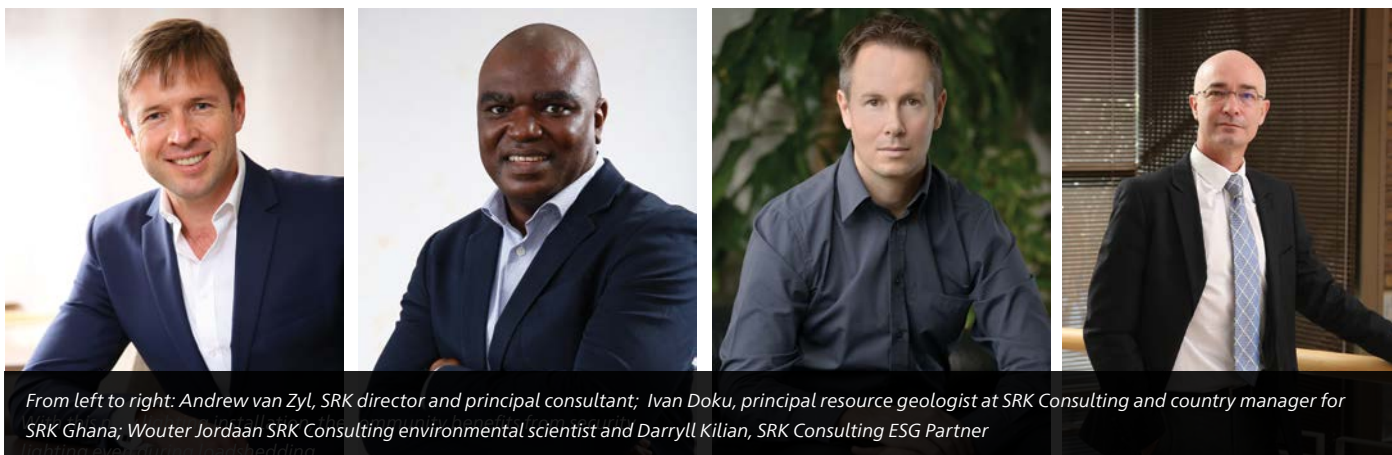
He said deposits like these had attracted considerable foreign interest, and it was likely that more prospective investors would be looking at the region as more data on this project was published.

Van Zyl highlighted that the condition for – and impacts from – large, bulk mineral projects extended not just to physical infrastructure but to communities. Mines with larger footprints and longer supply chains upstream and downstream also affected a wider natural and human environment.

"For these projects to be sustainable in terms of environmental, social and governance (ESG) considerations, developers need to navigate complex terrain related to regulatory compliance and social licence to operate," he said. "This assumes a level of certainty in the expectations of the host country, as well as a high level of scientific and engineering skill being available to help mines identify and mitigate the related risks."

He said Africa was gradually developing the capacity to deliver on these requirements, and the continent needed to share the professional expertise that was available across its borders and from the global community.





From left to right: Andrew van Zyl, SRK director and principal consultant; Ivan Doku, principal resource geologist at SRK Consulting and country manager for SRK Ghana; Wouter Jordaan SRK Consulting environmental scientist and Darryll Kilian, SRK Consulting ESG Partner

"It is important to remember that Africa has made great strides in a range of facets, and we are successfully producing a large range of minerals, including bulk commodities," said Van Zyl. "This is something that few developed economies have achieved and, while SRK is focusing on further improvement in Africa, it is also contributing its expertise to other developed economies that are struggling to establish mining industries."

SRK Consulting environmental scientist Wouter Jordaan further noted that SRK's business model is set around collaboration between its global consulting practices to ensure that the needs of its clients are met. As an example, SRK has embarked on a strategic approach of servicing its Chinese clients in Africa,

particularly in the Democratic Republic of Congo and Zambia, from its offices in Lubumbashi, Beijing and Johannesburg.

SRK Consulting's longer-term vision is aimed at establishing a dedicated resource from China in its Lubumbashi office. This provides the opportunity to engage with clients at head office and mine level, thereby providing the relevant expertise required at each level. To strengthen these links, the SRK South Africa, DRC and China team will be attending the Mining Indaba in May and DRC Mining Week in June. The collaborative effort will also look at infrastructure projects within the region.

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# Botswana's Potential of Becoming a Major Player in Battery Manganese

**A**lthough Botswana is primarily known as a diamond producer, it has the potential to seize upon the growing demand for battery minerals. Demand for clean energy and the minerals that support it is growing exponentially. Regions rich in these minerals represent an opportunity for investors and mining companies alike. Mining-friendly and highly developed Botswana is one such region.

Manganese has a long history in steel production, with the steel industry currently consuming 90% of global manganese output. Given that the global market for steel is expected to reach US\$9.63 billion by 2027, manganese's position as a critical resource is secure for the foreseeable future. Yet there's another use for the mineral, one that has gained increasing prevalence in recent years.

It is no secret that the global push for electrification and clean energy has reached a fever pitch. In the European Union, for instance, the government plans to ban the sale of petrol and diesel vehicles by 2035 as part of a push to

be completely climate-neutral by 2050. By then, it's projected that up to 700 million electric vehicles (EVs) will be on the roads globally.

Alongside the proliferation of connected devices and electronics such as smartphones, this has resulted in a considerable surge in demand for battery metals. Botswana is well-positioned to address this demand, with well-established infrastructure, rich mineral resources and a mining-friendly regulatory climate.

## A premier mining destination

Since the 1970s, mining has been a cornerstone of Botswana's economy, representing one-third of the country's annual government revenue and one quarter of its annual GDP. Mining legislation in the region has been described as predictable, competitive and stable. In 2020, the Fraser Institute ranked Botswana as the best country in Africa for mining.







Botswana's licensing process has been described as transparent and predictable by companies operating in the region. The obligations imposed on license holders are both reasonable and stable and the timeframe for decision-making is quite brief, at 60 days for prospecting licenses and 20 days for large-scale mining licenses. Botswana also has legislation in place to protect against arbitrary cancellation of mining rights.

Other factors that make Botswana an attractive region for mining companies include a lack of free participation, no beneficiation requirements for mining companies, very high rates of literacy and education and low operating costs.

Botswana is also home to extensive predeveloped mining infrastructure, with over 80 known operating mines. Mines and facilities throughout the region are linked by the Trans-Kalahari Highway. In 2019, construction began on a US\$9.5 billion railway which will run along the same route.

#### **What resources does Botswana produce?**

Diamonds are Botswana's chief mineral export by far. Revenue from diamond mines has played a considerable role in developing Botswana's infrastructure

and economy. To date, the country is one of the chief producers of diamonds in the world, second only to Russia.

Other staples of Botswana's mining sector include copper, gold, nickel, coal and soda ash.

Botswana is notably home to two of the largest diamond mines in the world. The first, Jwaneng, is an open pit mine approximately 160 miles southwest of Gaborone. Owned by Debswana, a joint partnership between Anglo American subsidiary De Beers and the Government of Botswana, the mine has been in production since 1982 and accounts for approximately 70% of the company's mining revenues.

The second, Orapa, is also owned and operated by the same joint partnership that owns Jwaneng. Approximately 150 miles west of Francistown in central Botswana, Orapa has been producing since 1971.

Selkirk is another noteworthy mine in the region, situated in Botswana's Northeast district. Recently acquired by Premium Nickel Resources, it has one of the largest nickel reserves in the country, as well as copper, cobalt and

platinum-group metals. Recent years have also seen a surge of activity in the Kalahari Copper Belt in the northwest of the country. In June 2021, Khoemacau Copper Mining delivered its first copper concentrates and is anticipating that its Phase 2 Expansion will have add production of 130,000 tonnes of copper and 5 million ounces of silver in concentrate per annum.

Neighboring Khoemacau, Sandfire Resources is developing the Motheo copper mine, anticipated to produce 30,000 tonnes of copper and over 1 million ounces of silver in concentrate per annum.

### The problems with Botswana's reliance on diamonds

Although Botswana's diamond industry has historically been an economic powerhouse for the country, it has in recent years begun to wane. Although Botswana has largely managed to keep its diamond industry ethical, diamond mines across the country have faced reduced demand and declining prices. This has only been further exacerbated by the pandemic, which has fundamentally upended the diamond industry.

Alongside these challenges, Botswana also faces aging mines and issues with both power and water.

### Why battery metals might be Botswana's best path forward

Manganese plays a pivotal role in battery production as a key ingredient of alkaline, lithium-ion and zinc-manganese batteries. Manganese is a component of nickel-manganese-cobalt cathodes used in the majority of electric vehicle batteries produced today. Given the price and sustainability issues associated with cobalt in particular — which is predominantly produced in the Democratic Republic of Congo — many in the battery materials supply chain are looking at manganese-rich cathodes as a significant new cathode formulation.

Although manganese is both plentiful and evenly divided between regions, issues with supply and demand may still loom just over the horizon. The manganese used in electronics requires a highly specialized mining or refinement process. As expressed by CPM Group's Andrew Zemek, this means that it is much harder to come by, a problem only exacerbated by an overt focus on other battery metals above manganese.

"There is no shortage of sulphate but there is a shortage of capacity for high-purity sulphate, which is the critical difference, as most of the sulphate being used today is (being used for) agriculture-related applications.

As it turns out, Botswana is home to multiple high-grade deposits of manganese that is perfectly suited for use in batteries and electronics. A cluster of these deposits was recently discovered by Canadian exploration company Giyani Metals. Known collectively as the K.Hill project, the deposits are ideally situated, close to both land and maritime infrastructure within Botswana's Kanye Basin.

Giyani is currently completing a feasibility study over the K.Hill project to produce around 120,000 tonnes per annum of high purity manganese sulphate for the EV battery market. With demand for high purity manganese sulphate expected to rise tenfold by the end of the decade, and 90% of current supply coming from China, new entrants such as Giyani are in high demand for major automotive companies looking to diversify their supply chains and lock in sustainably produced raw materials.

Multiple exploration companies are focusing efforts within the Kalahari Copper Belt. One of the largest projects, known simply as the Kalahari Copper Belt project, simultaneously seeks to delineate new mineral resources and expand two copper-silver mines already in the area. The plentiful supply of resources in the area and stable mining industry in Botswana contributed to this increased interest.

Another notable project is Galane Gold's Mupane mine located in Northeastern Botswana. Since 2005, the mine has produced over 700,000 ounces of gold. The company has recently announced it has entered into definitive agreements to sell Mupane to Hawks Mining Company.

Lastly, Cobre has multiple projects in Botswana: the Kitlanya East and West copper projects and the Okavango and Ngami copper projects. According to the Cobre's website, several compelling target areas in the Kitlanya East project are in proximity to and with similar setting to Sandfire's T3 and A4 deposits.

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# Reynolds appoints new man in Africa

Reynolds Contamination Control (RCC) has appointed Anton van Deventer as its regional representative in Africa. It's a major step forward for the Lincolnshire-based company as it looks to expand its overseas operations and develop its support network around the globe. Over the last few years South African-based Anton has been heavily involved in sectors ranging from mining, paper and pulp to fuels and chemicals, power generation and general industrial. His experience includes 18 years with US giant Pall Corporation - a global supplier of filtration, separation and purification products. He is currently the only engineer in the Africa-Middle East region with the skill, experience and know-how to service, repair and calibrate Pall portable cleanliness monitors and purification equipment.

"We're delighted to welcome Anton to the team," said Wayne Hubball, Technical Director at RCC. "As well as every relevant electrical and mechanical qualification, he has vast experience with online oil and fuel monitoring and cleanliness monitoring."

"One of his main strengths is understanding customer needs - and we are confident that's something that will quickly and seamlessly translate through to our product offering - allowing RCC to provide the correct solution to meet customer requirements every time."

And that RCC product offering is something Anton is already convinced will find a ready market across Africa.

"The RCC Link offers some of the best technology available to the market today," he said, "especially with the integration of PAMAS ISO11171 calibrated online particle counters and Oil Advantage Water and Oil Life sensors."

"And that's vital as we aim keep pace with the constantly evolving and developing sensors market. It's against this background that RCC can justifiably claim The Link is the most advanced cloud-based monitoring system currently available. "I'm really looking forward to representing RCC's interests and I'll be doing all I can to ensure the company's technology gets the exposure it deserves and grow the African market for RCC products."



Anton van Deventer



TO FIND OUT MORE CONTACT  
**ANTON VAN DEVENTER**  
 Reynolds Contamination Control South Africa  
 Email: [antonvan@reynoldsgcc.co.uk](mailto:antonvan@reynoldsgcc.co.uk)  
 M.+27 (082) 847 6178  
**WAYNE HUBBALL**  
 Reynolds Contamination Control UK  
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# WiMSA - Empowering the women of South Africa by forging sustainable career paths in mining

**W**omen in Mining South Africa (WiMSA) is a non-profit organisation formed in early 2010 to provide a forum to facilitate the growth and participation of women in South Africa's mining industry. "Our purpose is to inspire women to build a better world through mining which for me means that WiMSA wants women to change the world through their participation in the mining industry," comments WiMSA Chairperson, Petro du Pisani. "We enable women in the South African mining industry through networking, stake holder collaboration and mentorship.

One of our core aims is to provide support and guidance for personal growth, leadership and career development. Opportunities such as thought-leadership, outreaches, events, partnerships, special projects, building relationships among our women and a strong social media presence are ways the organisation brings both women and young girls to the forum to share and collaborate ideas in a safe space. Our current 4250 members are distributed across all mining careers including operators, geologists, surveyors, managers and safety professionals."

Mining provides the essential ingredients required in virtually every aspect of everyday life; it provides the material for the manufacturing of smart devices,

vehicles, appliances, etc. and for the construction of buildings, bridges, dams, etc. It contributes to food production and medical innovation. "Women should be able to participate in everything that this industry has to offer," states WiMSA Deputy Chairperson, Raksha Naidoo. "Mining provides a means of support for many families where the majority are women-headed households and we are adamant that our members, sponsors, board members, committee members and young girls are given every opportunity to build a career in this sector. South African women are blessed with an entrepreneurial spirit. Women bring a different level of commitment to the job, and a strong sense of honesty and trust that equates to greater success within teams and businesses. I believe that women leaders allow people to learn and develop in safer spaces, with more care and guidance, and provide great mentorship and empowerment of others to enable them to further succeed and thrive within their own careers."

**More information is available on the WiMSA website and social media pages:**

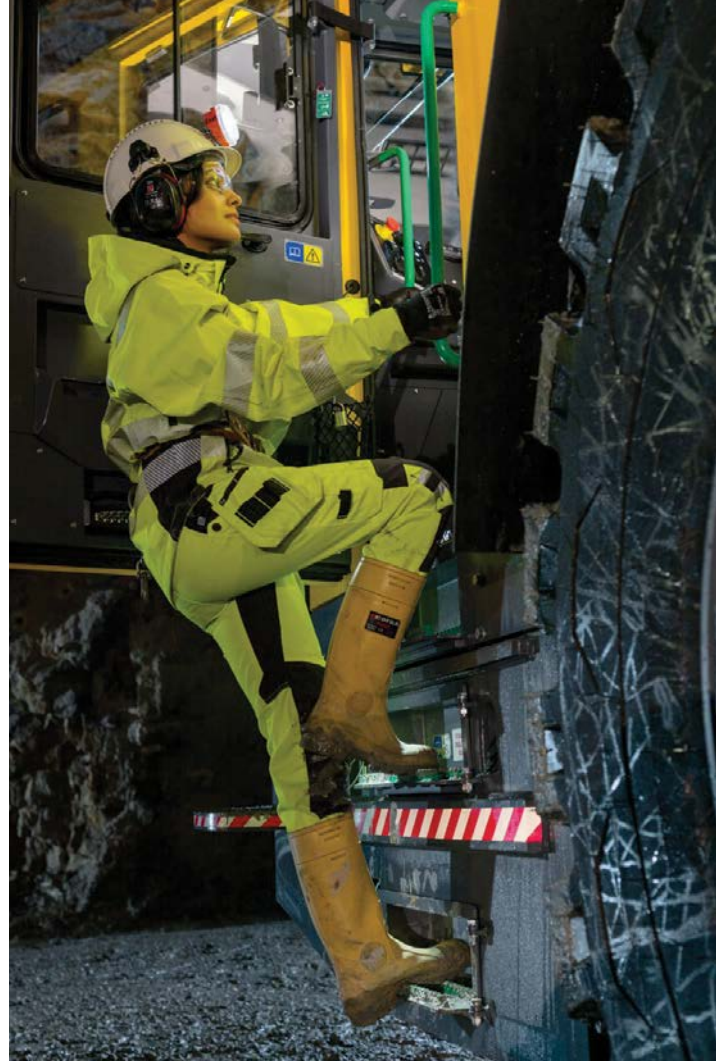


Petro Du Pisani, WiMSA Chairperson



Raksha Naidoo, WiMSA Deputy Chairperson





## Empowering women in the South Africa mining industry

**WOMEN IN MINING SOUTH AFRICA (WIMSA)** is a non-profit organisation that provides a forum to facilitate the growth and participation of women in South Africa's mining industry. It enables women through networking, stake holder collaboration and mentorship. One of its core aims is to provide support and guidance for personal growth, leadership and career development in this challenging and diverse industry. WiMSA currently has 4,250 members distributed across all mining careers including operators, geologists, surveyors, managers and safety professionals - join us today!

**BECOME A FREE MEMBER - VISIT [WIMSA.ORG.SA](http://WIMSA.ORG.SA)**

  
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# Lifecycle of an Underground Gold Mine

## Getting Started

The First Stage is to prepare the mine before efficient and sustainable mining can commence. Prior to mining, exploration takes place to find gold-bearing ore in commercially viable concentrations. Geochemical and geophysical techniques are used to identify the presence of a buried ore deposit. Geologists drill to check mineral quality in identified locations. The government mining department will normally regulate the mining licence processes for exploration, mining, environmental authorisations, and water use. Construction of Mine Site

The Second Stage is to build the actual mining site. The mine site must be prepared for development. The headgear over the mine shaft needs to be built and the shaft sunk deep into the ground to transport people and materials in and out of the mine. Other required infrastructure includes structures for mining, milling, and processing, and various workshops.

## Getting Resources Under the Ground

The Third Stage requires the mine owners to move resources, people, and materials into the ground where the mining and blasting activities will be taking place. Miners, mining materials and equipment are transported deep underground via the mine cage in the vertical shaft, which can go to depths of up to 3.5km below the surface. Open-pit gold mining also takes place in South Africa. This is a mining technique which excavates at the surface to extract ore. The mine is open to the surface for the duration of its life.

Mine planning and development involve establishing tunnels – haulages and cross-cuts – to open up the earth and the stope face so that the gold bearing rock can be accessed.

## Drilling and Blasting

The Fourth Stage is drilling and blasting. Once the stope face has been established and the gold-bearing reef exposed, drilling begins in preparation for blasting of the reef.

After the stope has been blasted, the rock broken in the blast (the gold-bearing ore) is collected – this is called vamping and sweeping – and transported to the shaft, via conveyors and underground locos, to be hoisted to surface.

## Transportation Inside the Mine

The Fifth Stage is transporting the Ore. The ore is hoisted to surface in the materials handling shaft from where it is conveyed, either by overland conveyor, surface rail or truck to the crushing and milling circuits where the process to extract the pure gold from the rock begins.

## Crushing

The Sixth Stage is crushing the rock. The large pieces of ore (broken rock) are fed into a series of crushers and grinding mills to break down the ore into much smaller sized rock so that the gold can be more easily extracted. At this stage of the process, the ore is ground down to fine sand-like particles.

## Processing and Smelting

The Seventh Stage is processing and smelting to extract the gold. These sand-like particles are combined with water to form a slurry to which additional chemicals – cyanide and carbon – are added to facilitate dissolving the gold and help with its extraction. The gold particles, extracted in this process, attach themselves to the carbon. The next step in the process involves stripping the carbon from the gold. Most companies retreat their slurry or 'tailings' for any remaining gold, uranium, and sulphides.

The gold obtained once the carbon has been stripped away is then smelted i.e., heated at extreme temperatures so that it liquefies, and is poured to form gold doré bars.

## International Gold Standards

The Eighth Stage is to get the gold refined in line with LBMA international standards. The doré bars are sent to precious metal refineries for further processing and refining to a purity of at least 99.5% to meet the good delivery quality standards set by the London Bullion Market Association.

## Rehabilitation

The Final Stage is rehabilitation of the mine. Once the gold reserve at a mine has been exhausted, the owner must close and rehabilitate the site. Underground tunnels are stabilised, and entrances are sealed off. Rehabilitation means the process of returning mined land to its pre-existing condition or to another agreed use.



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# Regulatory Pressure compelling Underground Mining Equipment Manufacturers to innovate ‘Sustainable’ portfolios

A new market intelligence study, evaluates the ongoing developments in the underground mining equipment market and projects their impact on the growth of the market between 2022 and 2029. The study projects that the sales of underground mining equipment of worth ~US\$ 15.9 Bn were recorded in 2022. However, the market value is likely to grow at a passive CAGR of 2.4% through 2029.

Rising adoption of automatic underground mining equipment among manufacturers to sync with the ongoing trends in the ever-evolving mining industry is set to incur tech-driven transformations in this landscape, opines the study. In addition, stringent emission regulations regarding controlled diesel emission and personnel safety in the mining industry are likely to stimulate innovations that can enable dealing with the relentless pricing pressure more efficiently, and mitigate the environmental impacts of new-age underground mining equipment.

Advanced techniques of mining and their impacts on various socio-economic factors have been a prolonged concern worldwide. The shift of a majority of miners from surface or open pit mining to underground mining has further amplified concerns vis-à-vis human safety and the environmental impacts.

Technology is emerging as the most efficient tool for introducing enhanced features in underground mining equipment, and study examines the influence of advancements in technologies and other microeconomic factors on the growth of the underground mining equipment landscape.

## **Mineworkers’ Staunch Inclination towards Hard Rock Mining Equipment**

Study finds that every 7 out of 10 underground mining equipment sold in 2021 were designated to applications associated with hard rock mining platforms. Increasing demand for hard rock minerals, such as copper, gold, zinc, and lithium, in wide-ranging industries has given rise to hard rock mining activities in the mining industry. Leading players in the underground mining equipment landscape are focusing on catering to the thriving need for improved

productivity in underground hard rock mines with the launch of next-generation mining equipment.

In addition, conventional hard rock mining techniques result in the release of toxic gases including carbon dioxide (CO<sub>2</sub>), and Sulphur dioxide (SO<sub>2</sub>) among others, which is triggering the adoption of electric equipment in hard rock mines. In addition, the study finds that coupling of underground mining equipment that can carry out multiple operations including parallel cutting, loading, and hauling operations are likely to witness high demand in the coming years.

## **Visibly Growing Preference for ‘Rental’ over New**

In rough terrains such as the mining industry, constant wear and tear of mining equipment lead to high replacement rates, incurring significant depreciation costs to the end users. As large mining machinery, including underground mining equipment, come with a significantly high price tag, purchasing a new equipment creates the need for high capital investments.

A majority of miners are inclined towards purchasing used or refurbished equipment, even considering the option of renting rather than investing in new underground mining equipment. Since a majority of mining businesses are looking for reducing their initial investments, rental service providers are likely to gain traction among in the coming years.

Study finds that more than half the revenue share is accounted by rental service providers in the underground equipment market. Increasing end user preferences for rental equipment are fostering the progression of this trend in the market. A mounting number of rental service companies are offering refurbished mining equipment that are specifically tailored to suit the requirements of the underground mining sector. The report also finds that leading stakeholders and investors in the underground mining equipment landscape are zooming in their strategic focus on providing rental service packages to suit changing needs of their customers, regarding the inventory of equipment.





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# Sandvik releases upgraded Toro™ LH208L low profile loader

**A**nother low profile unit now joins the Toro™ family from Sandvik, Toro™ LH208L loader. The loader is tailor-made to operate efficiently in conditions where working height is extremely limited, with an equipment height of just 1.6 meters but high payload capacity of 7.7 tonnes. The main market for Toro™ LH208L loader is southern Africa.

### Designed for low profile applications

Toro™ LH208L loader is a strong and reliable workhorse for low profile hard rock mining, specifically designed for the toughest of conditions. With its robust reinforced structure, compact size, high payload capacity and components that are designed to perform in the mine environment, the loader is tailored to meet productivity targets in applications where working height is extremely limited. Toro™ LH208L loader frames are reinforced to resist ground and roof impacts, with the welded steel box structures used in the frame and boom providing strong resistance to shock loads.

### Operator safety

Toro™ LH208L loader is fitted with a ROPS and FOPS certified canopy, protecting the operator in the event of roll-over or falling objects. The canopy door includes a door lock and latch mechanism, with an interlock switch which automatically applies the brakes and inactivates boom, bucket and steering when the door is opened. Adjustable high-power LED lights as standard configuration enable better operator visibility, further enhanced by a standard monitoring camera system which includes front and rear cameras. To improve

overall safety underground, a Proximity Detection System (PDS) interface option is also available.

### Improved productivity with digital options

Toro™ LH208L loader offers options specifically designed to improve productivity, such as Sandvik integrated weighing system IWS and traction control, both of which are already available for a number of other Sandvik loaders. The integrated weighing system measures the payload when lifting the boom, as well as the number of buckets filled during a shift, and records the results to My Sandvik Digital Services Knowledge Box™. Payload monitoring assists in maximizing productivity by optimizing loads, reducing overloading and helping to identify training needs. The traction control system reduces wheel slippage when penetrating to the muck pile and filling the bucket, extending tire lifetime and decreasing rubber waste.

### Proven engine technology

The loader is equipped with a robust Deutz 140 kW Stage II engine, with catalytic purifier and muffler. The optionally available diesel particulate filter (DPF) is made of sintered metal and is field serviceable, cleaned using a high-pressure washer or steam cleaner. Using sintered metal as the DPF material also results in a long service interval. To reduce emissions and fossil fuel consumption, the engine can also use paraffinic fuel, thereby meeting BS EN 15940 requirements.





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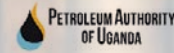
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