CROWN PUBLICATIONS

MODERN MINING

June 2016
Vol 12 No 6
www.crown.co.za

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MODERN MINING

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Printed by:
Shumani Mills Communications

The views expressed in this publication are not necessarily those of the editor or the publisher.

Published monthly by:
Crown Publications cc
P O Box 140,
Bedfordview, 2008
Tel: (+27 11) 622-4770
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www.modernminingmagazine.co.za

Cover
A Sleipner DB120 transports a massive 475A dozer at a mine site. See page 16 for full details of the Sleipner range, which is available locally from JCR Equipment, trading as Sleipner Africa.

Average circulation
(January–March 2016)
4381

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Quiet conference in Gaborone

Having just returned from the Botswana Resource Sector Conference (BRSC) in Gaborone, I thought I would share with readers some of my impressions of the event, which I've been attending for the past decade and which is a firm favourite of mine.

First off, let me say that this was the quietest BRSC I've yet attended. In saying this, I'm not so much referring to the delegate count – at 288 it was on the low side but perfectly respectable given current market conditions – but rather the absence, with a couple of notable exceptions, of any really exciting presentations on new developments within the Botswana mining industry.

What was also a little disappointing was the lack of support for the conference from some of the biggest players within Botswana's mining sector. Debswana, for example, didn't present at the event and nor did BCL, which owns the nickel/copper mine at Selebi-Phikwe and the Tati nickel operation near Francistown.

I appreciate, of course, that Debswana is much smaller than it used to be – it has cut production quite dramatically to adjust to weak global demand for diamonds – and that BCL is struggling to survive. Nevertheless, these two companies are the twin pillars of Botswana's mining industry and it would have been valuable to have heard from them on their current activities and future plans.

Debswana, incidentally, was not the only diamond mining company to be absent from the list of presenters. Neither Gem Diamonds, which owns the Ghaghoo underground diamond mine in the Central Kalahari, nor Kimberley Diamonds, which has just recommissioned the Lerala diamond mine, gave presentations. I can perhaps understand Gem's decision not to participate given that it has downsized operations at Ghaghoo but I would have thought that Kimberley – which presumably has a good story to tell – would have liked to have shared its experiences with delegates.

In fact, it was left to Paul Day, the Gaborone-based COO of Lucara, to carry the flag for Botswana's diamond mining industry. His presentation covered the Karowe diamond mine. There was nothing particularly new in it but Paul is an accomplished speaker and his delivery went down very well with his audience. Particularly entertaining was his account of how – in November last year – he received a phone call from Karowe's GM, Gerry Ndlovu, giving the incredible news that the mine had recovered an 1 100-carat stone – the second largest in history after the famous Cullinan diamond.

Paul immediately flew up to the mine to see for himself this extraordinary stone. As he recounted, this was the start of an amazing week for both himself and Lucara as, within another day or so, two more exceptional stones – one of 813 carats and the other of 374 carats – were recovered by the mine's newly installed XRT diamond recovery units.

As far as I can recall, there was not a single presentation on diamond exploration but one explorer, Pangolin Diamonds, did at least have a stand in the exhibition area. Pangolin, whose Chairman is Dr Leon Daniels, has a number of projects in Botswana including Malatswae, where 13 diamonds have been recovered at surface, and Motloutse where a kimberlite drill target, MG08, has just been identified. I didn't get a chance to talk to Leon at length about Pangolin's activities but I have noticed that the company's shares have been moving up nicely in recent months – which perhaps suggests that we should be pursuing an article on these two projects.

Moving on to copper, there were two excellent presentations given at the conference, one by Johannes Tsimako of Khoemacau Copper Mining and the other by Julian Hanna of Australia's MOD Resources. Both these companies are active in the Kalahari Copperbelt and I will be covering their projects in more detail in our July issue. Suffice it to say here, however, that Khoemacau is one of the few companies actually planning to build a new mine in Botswana. As Johannes explained, it intends starting construction of an initial 3,65 Mt/a starter project in the first quarter of next year. The use of the term 'starter' suggests a small project but in fact the capex is a very substantial US$341 million.

Finally, what of coal? Sadly, there was not much new to report. Companies such as Shumba, Jindal and African Energy are doing their best to bring their substantial coal reserves to account but at this stage there is little prospect of Botswana becoming an exporter of coal, given current market conditions, as well as the country's transport constraints. It appears that the only way to monetise Botswana's coal resources will be to build power stations and export power to the Southern African region. I've no doubt that this will happen in time but progress is painfully slow and my guess is that very little will have transpired by the time the next conference is held in a year's time.

Arthur Tassell

It appears that the only way to monetise Botswana's coal resources will be to build power stations and export power to the Southern African region.

Ivanhoe refutes criticism of its Platreef project

The Platreef site near Mokopane showing the Shaft 1 headgear (photo: Arthur Tassell).

TSX-listed Ivanhoe Mines has hit back at criticism it has received from Mining Watch Canada about its Platreef underground mine, currently under development near Mokopane.

In a recent release on its website, Mining Watch Canada refers to alleged "human rights abuses and illegal operations" by Ivanhoe and its subsidiary, Ivanplats, and mentions in particular the "relocation of hundreds of ancestral graves" in an area excluded from Ivanplats' designated mining area.

In its response, Ivanhoe says it "condemns in the strongest terms possible the attempt by Mining Watch Canada – and its dishonest associates in South Africa – to spread falsehoods about the Platreef mine development project in the South African province of Limpopo. The recycled and false allegations made by Mining Watch Canada are not new and have been previously rebutted by Ivanhoe Mines and its South African subsidiary Ivanplats. However, it is important to repeat the company's position for the benefit of shareholders, the media and the public at large.

"Ivanhoe Mines is disappointed, although not surprised, that Mining Watch Canada has chosen to act as a Canadian blinkered cheerleader for the falsehoods and misrepresentations that have been perpetuated, and violent acts that have been staged, by South African activist Aubrey Langa who has previously been convicted by South African courts of furnishing false information, robbery and attempted murder. Mr Langa is recognised for waging what one prominent South African newspaper recently described as his 'single-minded campaign' against the Platreef mine currently being developed by Ivanplats in Limpopo province."

Ivanhoe points out that Ivanplats is 26 %-owned by South African broad-based black economic empowerment partners – including 20 % belonging to 20 local communities with a combined population of approximately 150 000. A further 3 % is in the hands of historically disadvantaged project employees with the remaining 3 % of the 26 % being held by local entrepreneurs.

Ivanhoe notes that Mining Watch Canada, which it describes as an "anti-mining organisation," has never contacted senior representatives of Ivanhoe Mines or Ivanplats and sought to openly discuss any purported concerns. It says that the organisation's news release, issued on 18 May, is "a recitation of false allegations and unsupported claims by Mr Langa and his cohorts" and emphasises that – contrary to claims promoted by Mining Watch – "Ivanplats has demonstrated the utmost respect for historical gravesites and has fully complied with all prescriptions laid down by the relevant authorities."

Work at the Platreef site is currently focused on the sinking of the No 1 Shaft with the main sink due to start this month (June). Shaft 1 will provide early development access into the deposit and will be utilised to fast track production during the first phase of the project. An in-depth article on the project appeared in *Modern Mining's* April 2016 issue. ■

Armadale to acquire Tanzanian graphite property

AIM-quoted Armadale has entered into a heads of terms agreement to acquire the Mahenge Liandu (Liandu) graphite project in Tanzania. This investment is in line with its strategy to build a portfolio of revenue-generating African resource projects.

The Liandu project is located in the Ulanga District in south-east Tanzania, approximately 300 km south-west of Morogoro and 10 km from the town of Mahenge. The area is known to host proven coarse flake, high grade graphite resources. ASX-listed companies Kibaran Resources and Black Rock Mining have both identified and are developing significant proven and valuable graphite projects immediately adjacent to Liandu.

Armadale geologists have been on the ground and mapped and sampled the graphite schist. Results from seven previous samples ranged from 12,8 % to 24,0 % Total Graphite Content (TGC).

A mineralised trend about 1,6 km in strike length and up to 500 m wide has been identified, which remains open at depth. The field work on the project will commence following the completion of the transaction and will target a maiden resource estimation in late 2016.

Armadale says the transaction will complement its current portfolio of assets, including the Mpokoto gold project in Katanga in the DRC, which has a resource of 678 000 oz Au from 14,58 Mt of ore at 1,45 g/t gold. ■

Syrah secures five-year offtake agreement for Balama

ASX-listed Syrah Resources, which is developing the Balama graphite project in northern Mozambique, has signed a 'Spherical Graphite Offtake Agreement' with Marubeni Corporation (Marubeni), a major Japanese integrated trading and investment conglomerate. In terms of the five-year agreement, Marubeni will purchase a total of 50 000 tonnes of coated and uncoated spherical graphite per annum for major battery and anode customers in Japan and Korea.

"We are very pleased to be able to conclude another Offtake Agreement with Syrah, this time for spherical graphite," says Marubeni General Manager, Inorganic Mineral Resources Sec, Specialty Chemicals Dept, Ryoichi Mano. "Marubeni has worked closely with Syrah to conduct pre-marketing activities in Japan and Korea for nearly 18 months. Extensive test work has been performed on numerous samples provided by the company, and results have shown that Balama spherical graphite is superior to current material supplied from China, exceeding customers' expectations.

"We have also conducted due diligence on the Balama deposit and Syrah's pilot spherical graphite plant. Initial annual volumes of 50 000 tonnes are satisfactory at this time. However, we expect the Japanese and Korean markets to expand significantly in the near term. We see Syrah playing a key role as the major supplier as the market grows."

Syrah's Managing Director, Tolga Kumova, commented: "This agreement with Marubeni represents the largest Spherical Graphite Offtake Agreement that has been signed globally to date. Given that this volume is only for the Japanese and Korean markets, further large opportunities remain available in the Chinese, North American and European markets. Syrah has significantly progressed product qualification with potential customers in such regions and anticipates being able to update the market on developments in such regions before long. The Marubeni agreement has validated our strategy and steadfast belief that the lithium ion battery market will be the major source of growth for the graphite sector in the upcoming years."

Syrah has already started on the construction of the Balama project, with commercial production scheduled to commence in early 2017. Detailed engineering and design is well advanced and civil and structural work has started on site. Steelwork and platework fabrication is well underway with deliveries to site starting this quarter (Q2).

According to the feasibility study on Balama, the open-pit project will have a production of over 350 kt/a. The capital cost is estimated at US$144 million. ■

The Balama site where concrete works have commenced in the key areas of the crushing facility and primary mill foundations (photo: Syrah Resources).

Kibali provides big boost to DRC's economy

The successful development of the giant Kibali gold mine in the north-east province of the DRC has demonstrated the capacity of mining to boost the economies of African countries and improve the lives of their people, says Randgold Resources Chief Executive Mark Bristow.

Bristow was speaking to local media on a recent facility visit to the mine shortly after arriving there with his BoyzonBikes fundraising motorbike ride. Titled 'Safari Kwa Afrika Bora' – Swahili for 'Journey for a Better Africa' – the more than 8 000 km charity ride is crossing the continent from the east coast of Kenya to the west coast of the DRC through dense equatorial jungle. The fourth of its kind Bristow has undertaken, it aims to raise US$3 million for the independent charitable foundation Nos Vies en Partage which Randgold established in 2014. The foundation plans to donate this to programmes which support neglected children and abused women across Africa, with this year's focus being the widows and orphans of past conflicts and the rehabilitation of child soldiers.

With a resource base of 20 Moz of gold and reserves of 11 Moz, the Kibali mine ranks as one of the largest gold mining projects in the world. While it will only be completely developed by 2018, when its underground operation comes into full production, it is already producing more than 600 000 ounces of gold annually and employs more than 4 000 people, almost all Congolese nationals.

A community cooperative called the 'Federation Agricole de Kibali' was established in 2014 by the Kibali gold mine in the DRC to implement an agribusiness strategy (photo: Randgold).

Bristow said Kibali represents an investment of US$1,8 billion to date of which some US$1 billion has already been spent with Congolese contractors and suppliers, many of whom have established local operations leading to the creation of a new economic frontier in this remote region of the country.

"Kibali has brought new life and opportunity to this province, resettling more than 20 000 people from very basic villages in a model town with comprehensive amenities, including provision for healthcare and education, building an effective infrastructure and attracting the providers of the goods and services required by a developing society," he said. "That so much has been achieved in such a short time is a tribute to the cooperation Randgold has received from our DRC business partners, central and local government, as well as the community. And we should not forget the vital role played by the international investors who were prepared to risk their capital on this venture.

"There have been stresses and strains along the way but, by working together towards a common goal, Randgold and Kibali's stakeholders have been able to overcome these. It is in this same spirit of partnership that Randgold is now working with the authorities and the community to unlock the potential of the north-east province's great mineral and agricultural resources.

"A number of projects are already in an

Projected cost of Ghanaian gold mine reduced

Ghana gold explorer and developer Azumah Resources, a Perth-based company listed on the ASX, reports that a review and update of the March 2015 Feasibility Study has substantially reduced capital funding requirements by US$54 million to US$142 million for its proposed Wa gold project in the Upper West Region of Ghana.

Three main deposits have been discovered and extensively drilled at Kunche and Bepkong, adjacent to the Black Volta River and Ghana's border with Burkina Faso, and at Julie, approximately 80 km to the east. Several satellite deposits, including Aduane and Collette, have also been delineated.

The revised estimate by Feasibility Study managers, GR Engineering Services (GRES), was undertaken primarily to incorporate several pre-development and mining initiatives and to reflect the markedly more competitive environment amongst equipment and service providers.

Mining capital and operating costs were updated to reflect a change in fleet ownership from Azumah to the mining contractor which, combined with a rescheduling of ore during construction, saved US$33,8 million in capital.

No changes were made to plant design or supporting infrastructure with plant throughput maintained at a nominal 1,2 Mt/a for primary ore (1,8 Mt/a for softer oxide material). 'Inside the fence' plant costs reduced by US$7 million to US$48,3 million.

The capital cost estimate includes all project costs required to be expended post commencement of Front End Engineering Design (FEED). All project costs incurred prior to this (such as the cost of the study) have not been included and are considered sunk costs.

The capital cost estimate update for mining was based on quotations from Azumah's preferred mining and ore haulage contractor, African Mining Services (AMS), a Ghana-based subsidiary of Ausdrill Limited. This was based on a restructuring of the mining arrangements, rescheduling of the pre-production mining of ore and waste and AMS providing the mining fleet.

Pre-production mining operations costs have also been reduced inclusive of a more efficient stockpiling schedule resulting in a

advanced planning stage," he continued. "The palm oil project, initiated by Kibali, progressed this week when the government issued an arrêté granting the project full exoneration from duties on all capital items needed in the milling and refining operations as well as the plantation establishment. A further two arrêtés, regulating all fiscal and land matters, are expected shortly to complete the agreement with the government regarding the project's investment framework."

The company is also making a significant investment in the development of the country's human capital by training Congolese as professional managers in line with its policy that all its operations should be run by local nationals.

"We're not just creating jobs, we're creating careers, and for generations to come Kibali will be managed by Congolese citizens with world-class skills," he said.

Earthworks start at Rukwa project site

AIM-listed Edenville Energy reports that preliminary earthworks have now commenced at the Mkomolo deposit site which was awarded a mining licence in late February 2016. The deposit forms part of its Rukwa Coal to Power Project (RCPP) in south-west Tanzania.

Mobile earthmoving equipment arrived on site in late April and has initially been put to work on improving the site access. Rebuilding of river crossings close to the Mkomolo deposit was the first task to be completed. Following this, the widening and upgrading of the access road is taking place, which links the main highway to the deposit site and colonial pit area.

Work will continue on road building and upgrading for several more weeks. After the site road upgrades, the equipment will then be put to work improving access to three local villages in the area. This, says the company, is part of its Corporate Social Responsibility (CSR) commitment.

"I am extremely pleased our team in Tanzania have been able to mobilise equipment so rapidly and start work on improving access to the site," says Rufus Short, Chairman and Chief Executive Officer of Edenville. "This will allow greater flexibility to carry out further site works including bulk sample excavation and geotechnical drilling for the pit, along with preparatory site investigations for the power plant.

"This work is the first part of the much bigger development that will ultimately be an integrated coal to power project supplying electricity and providing employment to the Rukwa region and south- western Tanzania. I look forward to updating our shareholders on other aspects of the project in the near future, including the status of our discussions with groups who have expressed an interest in partnering Edenville in the project and providing finance for its further development."

capital cost saving of US$7,4 million.

Ghana's state-owned GridCo has installed a 161 kV power line almost to site at no cost to Azumah except for the payment of statutory compensation to the small number of farmers impacted. A conservative saving of 15 % or US$1,4 million of the study capital cost for the main power supply sub-station was realised due to a change in design approach and adopting GridCo accepted precedents at other projects.

Consultants Knight Peisold revised the construction rates for the tailings storage facility (TSF) and water storage dam based on tenders received for recent similar projects in Africa. No changes were made to the design of these structures or the construction quantities adopted for the study. On the same design and construction quantities, life-of-mine savings of US$4 million were achieved including a US$1,0 million reduction in the initial capital costs.

"This US54 million reduction in the funding hurdle fundamentally repositions for development Azumah's proposed initial seven-year, 90 000 oz/a Wa gold project," says Azumah's Managing Director, Stephen Stone. "The recent high-grade discovery at Manwe, the acquisition of the high-grade, 69 000 oz Julie West resources, a firmer gold price and improved investor sentiment towards overseas gold projects considerably enhance the prospects of securing project finance or a development partner."

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Mining activities start at Baobab phosphate project

ASX-listed Avenira (previously Minemakers Limited) reports that it made good progress in the March quarter on advancing its Baobab phosphate project in Senegal. The company is developing its first open pit within the Small Mine Permit (SMP) area at Baobab.

The Baobab project area covers a total of approximately 1 553 km^2. Within the project area, the Gadde Bissik prospect of approximately 90 km^2 was identified during excavation of water wells in the 1950s. Avenira has managed the exploration of the Gadde Bissik area since early 2014, building up a comprehensive knowledge of the project and its potential.

The SMP was granted in May 2015 over the area of thickest and highest grade mineralisation identified to date at the Gadde Bissik prospect and the focus of exploration has continued to be within this area since that time. A maiden indicated mineral resource estimate for Gadde Bissik East of 12,6 Mt at 21,0 % P_2O_5 at a 15 % P_2O_5 cut-off grade was announced in December last year.

Avenira's strategy to develop the project is based on an initial Stage 1 operation producing 500 000 t/a of phosphate concentrate. Total capital expenditure to production is estimated at US$15 million and the project is fully funded. The operation has been designed to enable multiple stages of expansion.

Mined rock phosphate, once dried on conventional pads, will be trucked 145 km on predominantly sealed roads to the Port of Dakar, which has sufficient existing capacity for export.

Overburden removal at the Baobab site by mining contractor Agromines (photo: Avenira).

Mining of the Stage 1 open pit overburden began at Gadde Bissik during March. Initial mining, undertaken on a 24-hour basis, utilised a 385C excavator and three of the five haul trucks on site. According to Avenira, the mining rate continues to improve as mining conditions are better understood and resources are added. Two new 390 excavators and the remaining trucks were operational by the end of March.

The long lead ultrafine screening equipment has been fabricated in the US and is ready for shipping to Dakar. The site establishment and local resource procurement advance team from the process plant engineering contractor arrived on site at the end of the March quarter.

South African-based specialist engineering group Consulmet is progressing with the fixed price design and construction of the modular wet screening plant. The plant is being fabricated in Johannesburg and will be transported to site for final erection and installation.

"The March quarter has been a very busy and productive period for Avenira," says Cliff Lawrenson, Avenira's MD. "Substantial progress was made on site as mining activities commenced at the Baobab phosphate project. All works are currently on time and on budget and the company remains on schedule to deliver first production during the second half of 2016. Getting to production in the second half of 2016 is our first priority, followed by moving from our current Small Mine Permit to a full Mine Permit to enable increased production." ■

Sarama Resources acquires Bondi gold deposit

Sarama Resources, listed on the TSX-V, has signed a binding Heads of Agreement with Orezone Gold Corporation which will see it acquiring the Bondi gold deposit. Bondi is 100 %-owned by Orezone and is located immediately adjacent to Sarama's South Houndé project in south-western Burkina Faso. The deposit has a historical estimate of mineral resources of 282 000 ounces Au (measured and indicated) and 150 000 ounces Au (inferred).

According to Samara, completion of the acquisition will bolster its position in the region, consolidating ownership of advanced assets in the highly prospective Houndé Belt and providing significant optionality for the development of a mine in the region. Bondi is located within trucking distance of both the 2,1 Moz Au South Houndé project and the 0,7 Moz Au Karankasso project (in which Sarama has a 30 % interest).

The Bondi deposit lies within the 168 km^2 Djarkadougou exploration property in south-western Burkina Faso. Bobo-Dioulasso, Burkina Faso's second largest city, is located approximately 75 km to the west and is linked by a paved highway that transects the property.

The mineral resources within the South Houndé and Karankasso projects are each located approximately 30 km (straight line) from Bondi, presenting an opportunity to ultimately combine the three deposits by trucking feed to a central processing facility.

Metallurgical testwork by Sarama at the South Houndé project has identified several processing flowsheets including heap leaching for oxide material and a staged tank-based plant for hard rock material. ■

First quarter gold production at Blanket up by 8,7 %

First blast at the Central Shaft in September 2015. The 6 m diameter shaft is being sunk to a depth of 1 080 m and will have a hoisting capacity of 3 000 t/day (photo: Caledonia Mining).

Caledonia Mining Corporation has announced its operating and financial results for the first quarter of 2016. Following the implementation of indigenisation in September 2012, Caledonia owns 49 % of the Blanket mine in Zimbabwe.

Gold produced totalled 10 882 ounces, an 8,7 % increase on Q1 2015 due to higher ore production following the completion of the new Tramming Loop – designed to increase tramming capacity from 400 t/d to 1 000 t/d – in June 2015 and improved recovery, offset by a slightly lower grade. The All-in Sustaining Cost (AISC) decreased 3,8 % from US$715/oz in Q1 2015 to US$689/oz.

Commenting on the results, Steve Curtis, Caledonia's President and Chief Executive Officer, said: "The financial and operating results for the first quarter of 2016 were better than expected. Production, as previously reported, was marginally better than target; on-mine operating costs and AISC were lower than in the comparable quarter and reflect continued strict cost control and lower sustaining capital expenditure.

"As expected, Caledonia's net consolidated cash was lower than at the end of December 2015 due to the continued suspension of dividends from Blanket as a result of investments at Blanket mine and the continuation of Caledonia's dividend. Net cash at 31 March 2016 was better than expected due to the combined effects of slightly better than expected production, good cost control and the higher gold price."

Curtis said that progress on implementing the Revised Investment Plan at Blanket remained on track. "Towards the end of the quarter, production commenced as planned from the No 6 Winze and from an additional development which provides access to ore below the 750 m level. These developments have substantially improved operational flexibility and are expected to be the main reason for the projected increase in production from 42 800 ounces in 2015 to approximately 50 000 ounces in 2016.

"The projected increase in production in 2016 is expected to result in improved cash generation due to higher sales volumes and lower costs per ounce of gold as fixed costs are spread over more gold ounces produced," he said. "Capital investment is expected to moderate somewhat over the remainder of 2016 as work at the Central Shaft moves into the main sinking phase. The higher gold price, if sustained, will further enhance cash generation. I therefore expect that Caledonia's treasury will begin to improve in the second half of 2016 when Blanket resumes dividend payments, which will also result in the resumption of the repayment of the facilitation loans from Blanket's indigenous Zimbabwean shareholders.

"A huge amount has been achieved at the Central Shaft since work commenced in late 2014; in the first quarter of 2016 the main sinking headgear was assembled; the winders have been commissioned and sinking is expected to re-commence within a few days. Completion of the Central Shaft remains on track for mid-2018 and will re-establish Blanket's position as a low cost operation with excellent prospects to extend the existing mine life."

EPC bid process for Mbeya power plant kicks off

AIM-listed Kibo Mining reports that feasibility work on the Mbeya Coal to Power Project (MCPP) in Tanzania has now advanced to a level where the company can commence with the formal EPC bid process for both the Mbeya power plant and the Mbeya coal mine.

Kibo is undertaking a Coal Mining Definitive Feasibility Study and a Power Pre-Feasibility Study for the Mbeya project with an integrated Bankable Feasibility Study report for the MCPP to be released in the near term. On 20 April 2015, Kibo signed a Joint Development Agreement (JDA) for the completion of the Definitive Feasibility Studies and development of the MCPP with China-based EPC contractor SEPCO III.

On 31 May 2016 Kibo met with SEPCO III in Dar es Salaam to initiate the EPC bid process for the Mbeya power plant, in accordance with the provisions of the JDA. The meeting in Dar es Salaam marked the official start of the EPC bid process and will be followed by a two-day work session in Brussels this month (June). During this second work session, Tractebel Engineering will brief and guide SEPCO III on the EPC bid process and procedure in accordance with the relevant JDA requirements. The first step in this process will require SEPCO III to agree and commit to an equity investment in the MCPP in order to obtain the right to be the sole EPC bidder for the Mbeya power plant EPC contract.

In the event that SEPCO III is named as the sole bidder for the EPC contract, SEPCO III's bid will remain subject to various pre-conditions related to price, technical standards, operational standards and similar which must be met for the EPC contract to be awarded.

The bid process will take place under the control and supervision of Tractebel Engineering as independent Qualified Person and in accordance with a pre-set, internationally benchmarked specification and standard.

First sale of Lerala diamonds imminent

ASX-listed Kimberley Diamonds Ltd (KDL) says that the first sale of diamonds recovered from its newly operating Lerala diamond mine in Botswana will be held by online auction from Antwerp, Belgium, towards the end of this month (June).

KDL reported in April that its mining contractor, Basil Read Mining Botswana, had started open-pit mining operations at Lerala and announced in May that ore production had commenced, which it described as the culmination of a nine-month project to upgrade and commission the mine.

The deposit at Lerala comprises a cluster of five diamond-bearing kimberlites – designated K2 to K6 – which were originally discovered by De Beers in the early 1990s. Although De Beers undertook trial mining, it was left to Australian company DiamonEx to develop a mine at the site, with commissioning taking place in 2008. The global financial crisis led to the mine being placed on care and maintenance within months of its opening.

A third company, Mantle Diamonds, operated the mine for a few months in 2012 producing approximately 73 000 carats. A range of technical issues in the processing plant, however, resulted in poor recovery and led to the mine once again being put on care and maintenance.

KDL acquired the project – which has a 20,1 Mt resource at an average grade of 24,2 cpht – in early 2014 and has upgraded the plant to reliably treat and recover diamonds at a nominal rate of 200 t/h. Some 1,4 Mt/a of ore will be processed to produce an average of 336 000 carats annually. The mine life is nine years. ■

First kimberlite ore being mined and hauled from the K3 pit at Lerala (photo: KDL).

Gangama Dry Mine successfully commissioned

AIM-listed Sierra Rutile reports that plant commissioning of the Gangama Dry Mine project and handover from DRA Projects to Sierra Rutile was successfully completed on 31 May 2016. The Gangama Dry Mine is now operational and producing high quality natural rutile, a high grade titanium feedstock.

Construction of the mine began in April 2015 and, over a thirteen-month period, Sierra Rutile worked alongside DRA Projects to ensure that the project was completed on time and within budget.

Plant commissioning is deemed to be attained once the dry mining plant has operated and processed ore for seven consecutive days, achieving specific design criteria which includes nameplate capacity of 500 tonnes per hour (t/h).

This test period ran from 22 May to 29 May 2016, during which feed rates and plant utilisation exceeded the design criteria. Specifically, over the seven-day period, the Gangama Dry Mine plant operated at an average throughput of 555 t/h and 87 % availability. Steady-state operation is expected to be achieved within four months.

The Gangama Dry Mine plant has achieved its nameplate capacity of 500 t/h (photo: Sierra Rutile).

Building upon the experience gained in successfully designing, constructing and operating Lanti Dry Mine and Gangama Dry Mine, Sierra Rutile says it remains fully engaged in process optimisation, value engineering and market evaluation of its two further near-term expansion projects, the 250 t/h bolt-on units, one for each of Lanti and Gangama. Additionally, Sierra Rutile also continues to progress towards a definitive feasibility study for the Sembehun Dry Mine.

"The successful completion of the Gangama commissioning and plant handover process confirms that the Gangama Dry Mine plant has achieved its nameplate capacity of 500 t/h during plant commissioning," comments John Sisay, CEO of Sierra Rutile.

"I am pleased to note that during the process guarantee period, the plant proved the ability to outperform its nameplate capacity. We would like to thank DRA Projects for collaborating and working with Sierra Rutile to successfully bring the Gangama Dry Mine into production on time and within budget, further demonstrating Sierra Rutile's continued track record of delivering on its stated goals." ■

Tsodilo confirms that BK16 contains Type IIa diamonds

Tsodilo Resources, listed on the TSX-V, has announced that its BK16 kimberlite in the Orapa Kimberlite Field of Botswana contains rare and valuable Type IIa diamonds.

The company reported in its press release of June 22, 2015 that it had taken possession of diamonds that were previously recovered from BK16. The stones have been stored with I. Hennig & Co at the Diamond Technology Park (DTP) in Gaborone, Botswana, since the company took possession.

The stones were recently cleaned by Lucara Diamond at its facilities in the DTP and then analysed by a Tsodilo technical staff member supervised by Hennig personnel using a Yehuda ZVI colorimeter. One stone in Parcel 1 (25 stones total) and seven stones in Parcel 2 (83 stones total) were consistently identified as 'Type IIa white,' all grading as D colour with no or only a faint level of fluorescence.

Diamonds are classified as either Type I or Type II, with Type I diamonds containing nitrogen while Type II diamonds are nitrogen-free. Type II diamonds (both Type IIa and Type IIb) are very rare and generally thought to comprise less than 2 % of all diamonds.

"One cannot emphasise enough the importance of BK16 containing Type IIa diamonds. Recent and more well-known examples of Type IIa diamonds are the 1 111-carat, 813-carat and 374-carat diamonds all recovered in the later part of 2015 from the Karowe mine owned by Lucara and located 16 miles from BK16, with the 1 111-carat 'Lesedi La Rona' diamond being one of the largest gem quality diamonds ever recovered, second only to the famous Cullinan diamond, and the 813-carat stone, 'The Constellation', recently selling at auction for over US$63 million," comments Dr Mike de Wit, Tsodilo's President and COO.

"It remains to be determined whether BK16 holds such historic diamonds as the Karowe mine, but it is encouraging to know that BK16 does contain Type IIa diamonds." ■

Waterberg drill intercepts continue to impress

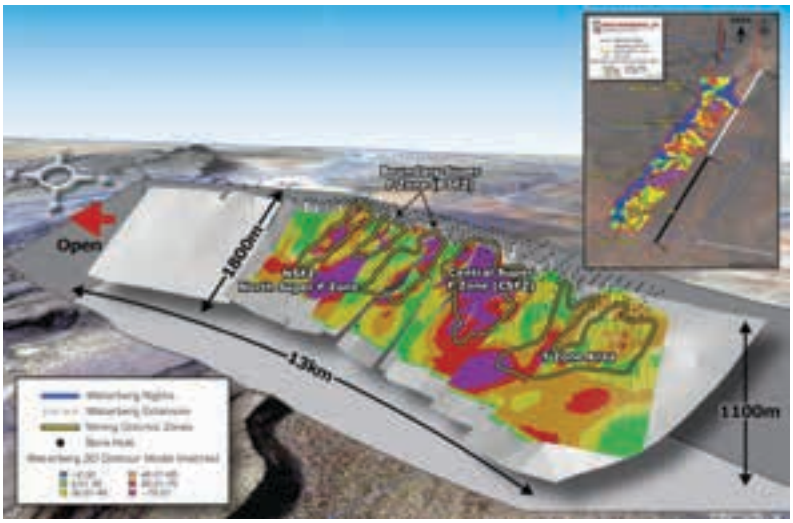
Platinum Group Metals (PTM) reports new platinum, palladium and gold (3E) assay results for recent drill intercepts completed on the Waterberg project in Limpopo Province subsequent to the updated independent resource estimate announced on April 19, 2016.

To give a flavour of the results, one of the drill intercepts on the Super T layerdelivered 9,05 g/t 3E (2,16 g/t Pt, 5,32 g/t Pd, 1,57 g/t Au) over 5,5 m from 1 006,5 m to 1 012 m vertical depth. True thickness of the intercepts is estimated at 70 % of vertical thickness on both the T and F layers.

"These new intercepts continue to demonstrate the extraordinary nature in grade and thickness of the T and F layers at Waterberg compared to most platinum mines in South Africa," comments R. Michael Jones, CEO of PTM. "The Super F and the T layers are also extremely shallow (140 m) as compared to another recent underground discovery on the North Limb. There remains excellent potential to increase the size of the Waterberg deposit and to further define the new Super T area. We continue to work closely with our partner, the Japan Oil, Gas and Metals National Corporation (JOGMEC), to expand and delineate the Waterberg project. A Pre-Feasibility Study for the project is in progress and on track for completion later this year."

The Waterberg deposit is still open to the north and down dip. Surface exploration work up to 15 km north of the known deposit area is now recommencing northward on Joint Venture licences to define the extent of this newly discovered lobe of the Bushveld Complex.

Mineral resources in the T and F layers at Waterberg (100 % project basis) have increased to an estimated 23,89 Moz 4E in the indicated category plus 11,71 Moz 4E in the inferred category. ■



Waterberg 3D contour model looking north.

Marthinusen & Coutts rewinds South Deep stator

Marthinusen & Coutts, a division of Actom, has again demonstrated its ability to undertake challenging work on rotating machinery. The division was recently called upon to assist Gold Fields' South Deep Twin Shafts when the mine experienced a failure on one of the stators on its main winder installation.

Pictured with the stator are (from left) Richard Botton, Divisional CEO at Marthinusen & Coutts, Michael Olivier, Engineering Manager at South Deep, Chris van Heeswijk, electrical consultant to South Deep, and Rob Melaia, Engineering Executive at Marthinusen & Coutts.

Rob Melaia, Engineering and Technical Executive at Marthinusen & Coutts, explains that the sheer physical size of the stator alone is quite unique – especially in terms of the challenges of rewinding such a large unit.

"The 65-ton stator mass driving a squirrel cage induction motor very probably makes this the largest motor of its type in the world," he says. "While there are many larger synchronous motors, it is highly unlikely that there are larger squirrel cage rotor machines."

He says that the 6 MW, 3,3 Hz, eight-pole design of the stator makes it greater than a 90 MW, 50 Hz, 750 RPM equivalent, and that when one adds in the fact that these are driven by cycloconverters, the uniqueness of the installation is apparent.

Following a thorough assessment by Marthinusen & Coutts, it was ascertained that the stator insulation had failed prematurely after approximately eight years, when one would normally expect a 30-year service life from this machine. This failure was unusual in that there was no physical external damage and no signs of overheating. Furthermore, with two parallel connected motors one would expect both to fail if a severe external transient was the root cause. The prevailing root cause remained cyclical stresses on the stator insulation due to thermal expansion and contraction cycles. ➡

Gold projects in Tanzania to be amalgamated

Kibo Mining, listed on AIM, has signed a Memorandum of Understanding (MOU) with Lake Victoria Gold to amalgamate the companies' respective Imweru and Imwelo gold projects into a new company (NEWCO). The board of NEWCO will comprise a mix of Kibo and Lake Victoria management combining significant experience across exploration and mine development.

The projects have combined JORC-compliant stated resources of approximately 755 300 ounces. Based on upside potential identified in the existing Imweru CPR, the combined project will provide NEWCO with the potential to achieve a plus 1 million ounce resource in a relatively short time frame.

The two companies have a production target of 50 000 oz of gold per annum within 12 to 18 months of forming NEWCO, targeting 100 000 oz per annum within 24 to 30 months.

"The past two years' steady work on the Imweru DFS advanced the Imweru project to a level where we could come to an arrangement with Lake Victoria Gold, which will see the amalgamation of the respective projects on a like for like basis, to create a project with critical mass and a clear path to near-term production," comments Louis Coetzee, CEO of Kibo.

The Imweru and Imwelo projects are located in the Lake Victoria goldfield of northern Tanzania, approximately 35 km west of AngloGold Ashanti's Geita mine and within a similar geological setting, prospective for Archaean age 'greenstone' hosted gold mineralisation.

After acquiring the Imweru project in 2013, Kibo carried out additional resource drilling in late 2013 leading to the publication of a new mineral resource statement of 16,48 Mt at 1,14 g/t (550 000 oz) in February 2014. Kibo announced the commencement of a Definitive Feasibility Study (DFS) on the project in October 2014. Since then it has completed a Preliminary Economic Assessment and commenced a Prefeasibility Study which together will comprise the first stage of the DFS.

Lake Victoria Gold's Imwelo gold project is located along strike and contiguous with the Imweru project. It effectively forms an extension of Kibo's Imweru East Mineralised Zone and has a published JORC mineral resource of 205 200 oz at a grade of 2,3 g/t (of which 90 800 oz is in the measured and indicated categories). Lake Victoria was granted a mining licence over the project in January 2015 which should enable mine development to progress rapidly. ■

Melaia says that the identification of the proposed failure mechanism is both new and invaluable in that it identifies a possible weakness with stators, and this, he says, will allow owners to plan and manage any associated risk.

"As a result of the root cause of failure identification, the stator winding and insulation has been redesigned, with the objective of preventing a similar failure," he says. "The modification made by Marthinusen & Coutts has resulted in a marginal but non-negligible difference to the performance and this, in turn, led to a detailed and very important technical assessment by the cycloconverter drive suppliers."

Testing was done at various set stages during the manufacturing process and included dimensional checks, high voltage checks, dissipation factor tests and impulse inter-turn tests.

In total, some 8 000 kg of copper was used for the rewind of this stator. The completed mass of the fully assembled motor is 98 tons.

The new stator coils are also arguably the largest set diamond multi-turn coils manufactured in South Africa and on the continent. Melaia says to add to this challenge resin rich technology was used. "Resin rich technology is a challenge to implement even in small size coils, so producing successful coils of these proportions is an achievement in itself."

ResGen strengthens its team

Resource Generation Limited (ResGen), an emerging ASX- and JSE-listed coal producer, has announced the appointment of Zirk Van Der Bank as Chief Operating Officer of its operating subsidiary, Ledjadja Coal.

Van Der Bank is an experienced mining engineer with more than 20 years' experience in the coal mining industry. He has held a range of supervisory and management positions at Sasol Mining, Moolmans, Shanduka Coal and Glencore Coal SA.

Rob Lowe, ResGen Chief Executive Officer, said: "This appointment is another positive step towards the strengthening of our owner's team and bringing the Boikarabelo mine into the final construction phase. As we develop a new-generation coal mine, Zirk's project and operational experience will be vital to ensure that the project is completed on time and within budget."

The Boikarabelo mine is located in South Africa's Waterberg region. ResGen has reported probable reserves of 744,8 Mt of coal on 35 % of the tenements under its control. Stage 1 of the mine development targets saleable coal production of 6 Mt/a.

ResGen's primary shareholders are the Public Investment Corporation of South Africa (PIC), Noble Group and Altius Investment Holdings.

The company recently concluded a Heads of Agreement and Letter of Intent (LOI) for the design, procurement and construction of the Coal Handling and Preparation Plant (CHPP) for the mine. The agreement with Sedgman, a member of the CIMIC Group and a leading Engineering Procurement and Construction (EPC) contractor in coal and minerals, provides for a fixed lump sum contract for US$141 million subject to exchange rate fluctuation.

The contract price represents a substantial saving over the previously announced estimate and was achieved as a result of the Sedgman design offering a smaller footprint with associated capital savings while offering equal, if not improved, production outputs.

Sleipner provides mine site

The movement of heavy tracked mining equipment – such as excavators and shovels, drill rigs and bulldozers – around mine sites, or even from one mine site to another, is typically an expensive and time consuming operation which can impact severely on production. But this need not be the case. Transport solutions developed by Sleipner Finland and available locally through JCR Equipment, trading as Sleipner Africa, address the problem in a highly effective way, offering dramatic time savings that can significantly increase productivity and reduce machine wear. ***Modern Mining*** *recently spoke to Sleipner Africa's MD, Rory Hollins, to learn more about Sleipner's ingenious systems.*

Sleipner Finland was founded in 1997 by an excavator operator, Ossi Kortesalmi, who was then working at a chrome mine in the Finnish Artic. Troubled by the loss of productivity involved in moving tracked excavators around site, he came up with the simple – yet revolutionary – idea of giving tracked machines a set of wheels through the use of a dolly system. The beauty of the system is that the very truck that is being loaded by an excavator can then be used to tow the excavator to a new site.

The process of putting the excavator on wheels takes just minutes. The machine is first reversed onto the dolly so that the rear of the undercarriage is off the ground. The bucket of the excavator is then placed in the bed of the truck and the machine is lifted using its own hydraulics. The whole assemblage effectively becomes a wheeled truck-and-trailer combination which can move at speeds of up to 15 km/h. Once the excavator arrives at its new work site, the process is simply reversed and the machine can be operational within a few minutes.

"The Sleipner system is so simple that one almost wonders why it took so long for anyone to come up with the idea," says Hollins. "The benefits, of course, are huge. On most mines, excavators can spend up to 15 % of their time travelling. With Sleipner, travel time can be reduced by as much as 85 % – which translates into huge productivity gains. Moreover, use of the system typically doubles, or even triples, undercarriage life, which means that maintenance costs and service downtime are

The DB120 system can transport the world's biggest bulldozers such as the D475 seen here.

mobility for tracked machines

significantly reduced, while fuel costs are also lowered." He adds that the Sleipner system itself requires little maintenance, as it consists of only about 100 parts and incorporates no high-tech systems to go wrong.

Since the late 1990s, Sleipner has considerably broadened the range of what it calls its E-series (the 'E' standing for 'excavator') and now offers units able to handle excavators ranging from 30 tonnes through to 565 tonnes. Two new models – the 600-tonne and 800-tonne class Sleipners – are in development and will be released to the market in due course. There are a multitude of excavator-truck combinations possible for each E-series model. For example, the top-of-the-line Sleipner E550 can accommodate excavators such as the 533-t Hitachi EX5600 or the 565-t Cat 6060 with the trucks used for towing typically being 'ultra' size machines such as the Komatsu 960E or the Cat 797 (which have 327-t and 363-t payloads respectively).

In the African region, many mines use the E-series system including First Quantum's Kansanshi and Sentinel copper mines in Zambia, AngloGold Ashanti's Geita mine in Tanzania, Debswana's Orapa diamond mine in Botswana, Katanga Mines in the DRC and Assmang's Khumani and Beeshoek iron ore mines in South Africa. Open-pit mining contractors have also embraced the technology, among them Diesel Power in South Africa, U&M in Zambia, and African Mining Services in Ghana.

While the success of Sleipner has been founded on the E-series, the company in 2014 added another major product to its line-up. "The E-series caters only for excavators," explains Hollins. "Customers were delighted with the way the E-series models performed but also wanted a system that would allow tracked bulldozers and drill rigs to be transported conveniently. In response to this request, Sleipner's engineers in Finland came up with the DB120 transport system. The 'DB" stands for 'drill and bulldozer' while the '120' in the designation

The DB120 with a tracked drill rig 'on board'.

Loading a dozer onto a DB120 takes just minutes.

Above: *The Sleipner E-series gives tracked machines a set of wheels through the use of a dolly system.*

Right: *With the E-series, travel times for tracked excavators around mines can be reduced by as much as 85 %.*

means that machines weighing up to 120 tonnes can be moved quickly and safely. The DB-series has been an unqualified success with sales having been made to mines around the world. Here in Southern Africa, we've already sold two units – one to Orapa and the other to Anglo American Platinum's Mogalakwena mine near Mokopane – and are negotiating with several other customers."

According to Hollins, the DB120 is every bit as revolutionary as the E-series. "In essence, Sleipner's engineers have re-invented the traditional lowbed – so much so, in fact, that we don't even call the DB120 a lowbed," he says. "We prefer to describe it as a transport solution. It consists of a tilting travel bed which can be towed by a 40-t or 50-t articulated dump truck (ADT) from a customer's mine fleet. Transit speeds of up to 30 km/h are possible and the articulated design guarantees a high degree of manoeuvrability – the turning radius is just 11 m, which is less than that of a 100-tonne truck.

"Uphill performance with a full load is 12 % while downhill transport is safe at gradients of up to 14 %. The DB120 has its own sophisticated braking system – the ADT actually has to pull the trailer downhill – and pressure gauges provide an emergency stop function. Large wheels provide a high degree of stability and a ground clearance of 600 mm, allowing considerable all-terrain capability. The hydraulic system on the DB120 allows for a degree of 'self levelling' when travelling either uphill or downhill, further enhancing the safety. This, combined with a 100 % fail-to-safe emergency braking system (the only one of its kind) means that the DB120 sets a new benchmark in

The DB120 consists of a tilting travel bed which can be towed by a 40-t or 50-t articulated dump truck (ADT).

transport efficiency and safety on site. As with the E-series, the DB-series offers fast loading and unloading, with the loading time for dozers being as little as two minutes."

All bulldozers on the market – including the top-of-the-range Cat D11 and the Komatsu D475 machines – can be transported by the DB120, as well as virtually every tracked drill rig, the only exception being the biggest Pit Viper machine.

While Sleipner Africa is a relatively new company (it was established in 2012), Hollins has been associated with the Sleipner range virtually since it was first developed. "Prior to setting up my own company, I was with Terex Africa – and subsequently with all the successor companies that handled the Terex mining equipment brand such as Eqstra – for many years," he explains. "Terex Africa was the local distributor for Sleipner so I became very familiar with the range and was involved with the first sales in Africa, which were recorded in 2007.

"When Caterpillar bought Bucyrus in 2011 it inherited the Terex mining equipment range. Although this theoretically included the Sleipner distributorship, the agency in South Africa remained with Eqstra but wasn't pursued very vigorously. I was a great believer in the Sleipner product and decided to get involved. Initially, I worked in conjunction with Eqstra as the sole dealer for Southern Africa. This arrangement has now changed and in 2014 JCR Equipment – with the sanction of Eqstra – was appointed as the official Sleipner sole distributor for Southern Africa. We maintain an excellent relationship with Sleipner Finland and work very closely with them to ensure that we provide a first class service – which includes maintenance support, service contracts and training – to the African market. We frequently visit the factory in Finland as well as other Sleipner sites, often taking customers with us."

Hollins acknowledges that the current mining market is difficult. "With this in mind, we are now offering an innovative 'rent to buy' financing solution – which is basically an off balance sheet rental agreement with an option to buy. This makes it much easier for customers to invest in our equipment as the money they have to outlay simply comes out of operating expenditure."

The Sleipner team is relatively small in numbers but highly motivated and with a 'hands on' attitude. All members of the team have backgrounds in mining – or industries serving mining – and bring years of African mining experience to the task of marketing and supporting Sleipner in Africa.

Summing up, Hollins says that while Sleipner Africa is a young company, it has already shown remarkable growth. "We recorded five sales in our first year as agent for Sleipner Finland. If we can do this in the midst of a downturn, then one can only wonder what we can achieve once the mining industry recovers. We're very optimistic about the prospects for Sleipner in Africa and believe that further strong growth lies ahead." ■

Agency acquired for filtration systems

Although the Sleipner range is at the heart of JCR Equipment's offering, the company does have another agency. Says Hollins: "This is for a range of full flow and off-line filtration systems that are manufactured by an Australian owned and operated company, Filter Technology Australia (FTA), based in New South Wales. The units in the range are suitable for hydraulics, final drives, gear boxes, engines and fuel delivery systems and can effectively filter contaminants as small as 2 microns. The filters can be manufactured for specific requirements and are available as on board or mobile units."

Some of the key benefits derived are extended component life, increased oil life, longer lasting injectors, lower fuel consumption and a reduction of environmental impact. "There is a proven return on investment and a short payback period," says Hollins.

FTA installations can be fitted on any type of mobile or static equipment including the entire suite of mining equipment. The system differentiates itself from the competition as each installation is custom built and specific to the machine on which it is being installed. An additional advantage is that the FTA system uses a common filter cartridge replacement philosophy. In other words, it is very rare for a technician to arrive at a machine and find he has the incorrect filter.

JCR Equipment secured the Filter Technology distributorship last year. "One of the African users of the products is First Quantum in Zambia and Filter Technology decided that it needed to find an African representative to support First Quantum and other customers and potential customers in the region," says Hollins. "The owners of Filter Technology, Brian and John Bondi, also run a company, Equipment Placement, which holds the Sleipner agency in Australia – which is how we got to know them.

"We see a great deal of synergy with the Sleipner and Filter Technology brands as we'll often be dealing with the same customers with both product lines." ■

New shaft boring technology

Danie Roos, Herrenknecht AG's Business Development Manager in South Africa.

German engineering company Herrenknecht AG, a world leader in mechanised tunnelling, has developed a range of four shaft boring machines – each designed to operate in specific geological conditions – for the safe and rapid construction of blind shafts or shaft enlargements to 2 000 m. Currently, work is progressing on BHP Billiton's Jansen potash project in Saskatchewan, Canada, on the sinking of two 1 000 m deep mine shafts using this pioneering blind shaft technology.

This is the first time in over two decades that such technology has been employed in mine shaft sinking, according to Danie Roos, Herrenknecht AG's Business Development Manager in South Africa. Safety issues, rising operational costs and a reduction in productivity have resulted in mine operators taking a fresh look at the way mines are run – which has resulted in renewed interest in the mechanisation of mining operations, including shaft sinking, says Roos.

"The excavation of shafts is a critical activity in the development of new mines, or the extension of existing ones, because the quicker an orebody is accessed, the sooner the end product enters the market.

"Mechanised deep shaft boring is regarded as a game-changing technology and supports the universal drive to replace drilling and blasting with alternative technology that removes miners from potentially dangerous areas, like a shaft bench with an unsupported shaft wall," he says.

The largest machine in the Herrenknecht range is capable of developing shafts in hard rock conditions to depths of 2 000 m. This machine, referred to as the **Shaft Boring Machine (SBM)**, was developed as a result of Herrenknecht's involvement in Rio Tinto's 'Mine of the Future' programme and the

Two of Herrenknecht's Shaft Boring Roadheaders (SBRs) are currently in operation at the Jansen project in Canada. The SBR is equipped with a rotating cutting drum installed on a telescopic and slewable boom.

developed by Herrenknecht

design and detailed engineering for it was completed in 2013.

The SBM is capable of sinking shafts between 10 m and 12 m in diameter at three times the rate of conventional shaft-sinking methods. "We are talking about a machine that was designed to achieve a sinking rate of over 10 m a day – and for a performance such as this a massive machine with plenty of power is needed," comments Roos.

Most of the technology used in the development of Herrenknecht's blind-shaft machines – such as drilling and rock support – was adapted from technology developed for the company's internationally recognised tunnelling business. As a result, the SBM is similar to a conventional tunnel boring machine, except that it is suspended vertically in the shaft and employs conventional disc cutting in a unique setup.

Herrenknecht engineers chose the disc-cutter option for the SBM when it was ascertained that roadheaders could not be used effectively when cutting rock with a compressive strength of more than 120 MPa. The massive cutting wheel employed in Herrenknecht's Shaft Boring Machine has a diameter that equals the excavation diameter of the shaft (10-12 m).

The 60-m long SBM is self-suspended by a set of grippers. Up to three systems brace against the shaft wall to stabilise the entire system during cutting.

Herrenknecht's **Shaft Boring Roadheader (SBR)** was developed for blind-shaft boring in soft-to-medium rock or frozen ground to depths of 1 000 m. Two of these machines are currently in operation on the Jansen project in Canada.

"The two SBRs were manufactured and assembled at Herrenknecht's premises in Germany, where cutting tests were performed to the customer's satisfaction before being shipped to Canada where they have been in operation since 2013 at the project," says Roos.

This rapid rock excavating machine is equipped with a rotating cutting drum installed on a telescopic and slewable boom with the result that it is flexible and can be used to cut shafts of variable diameters. The telescopic boom also allows for the excavation of the entire shaft cross-section to a depth of 1 m in a single operation.

While sinking a shaft, the unit is suspended by ropes connected to shaft winders on the surface. As with the gigantic SBM, this smaller machine had to provide safe working conditions for operating personnel while again exceeding the sinking rates achieved by conventional shaft-sinking practices.

The Shaft Boring Roadheader (SBR) was developed for blind-shaft boring in soft-to-medium rock or frozen ground to depths of 1 000 m.

The **Shaft Boring Cutterhead (SBC)** is the third machine in Herrenknecht's stable of blind-boring equipment. One-third shorter (40 m) than the SBM and with a mass of 350 tons, it is well-suited for the excavation of deep blind shafts up to 9 m in diameter in hard rock conditions and is capable of delivering an advance rate of 6 m a day.

The SBC utilises a conical-shaped, full-faced, cutter head equipped with disc cutters and the cutting sequence is highly automated. This mechanical shaft-sinking unit is suspended from and moved by shaft ropes.

"For all machines across the range, the three basic functions – excavation, rock support and installation decks – are common," notes Roos. "During normal operations the crews are not exposed to an unsupported shaft wall and hence falling rock, nor silica dust. No explosives are

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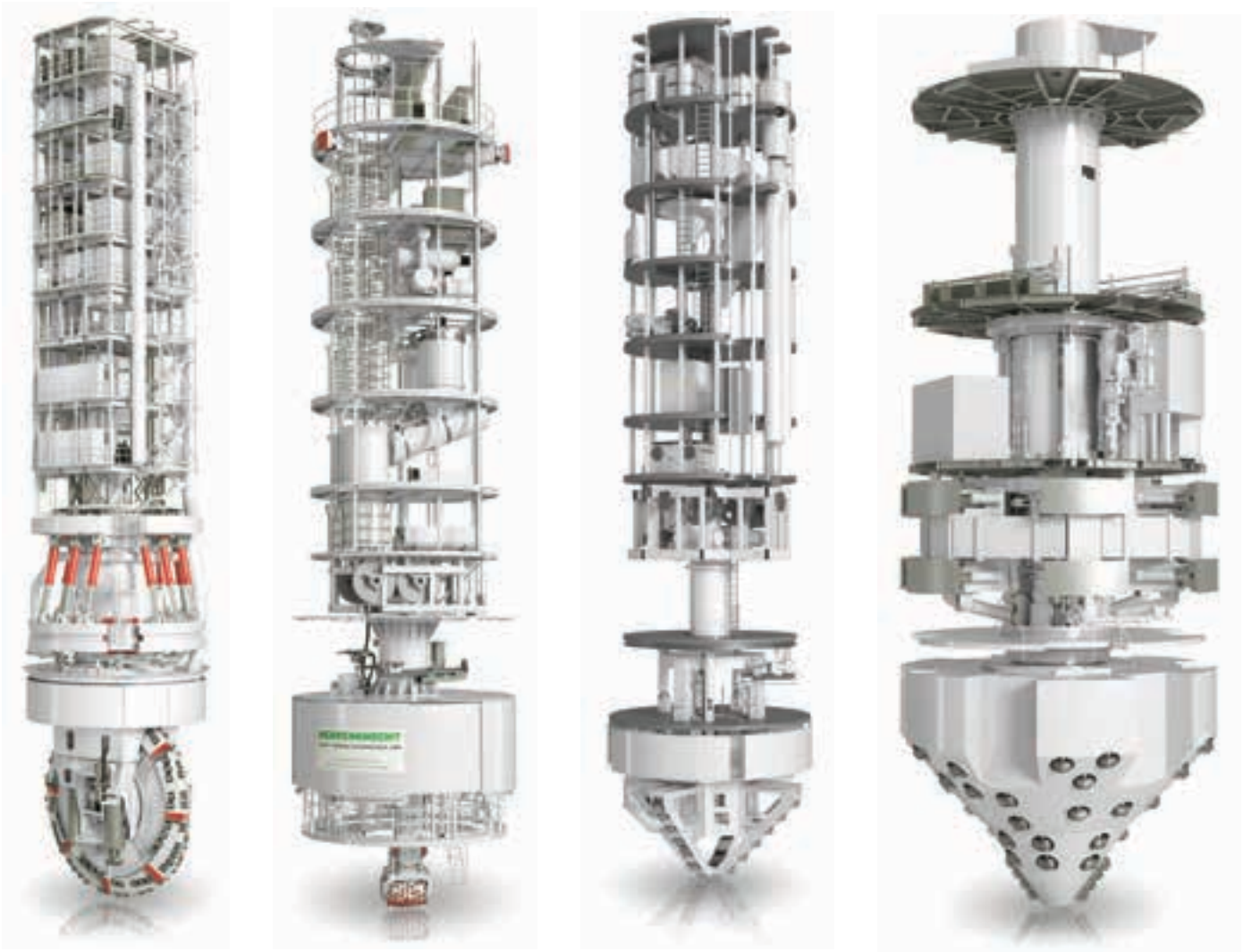


Seen here (from left) are Herrenknecht's four shaft boring machines – the Shaft Boring Machine (SBM), the Shaft Boring Roadheader (SBR), the Shaft Boring Cutterhead (SBC) and the Shaft Boring Machine for Shaft Enlargement (SBE).

used during regular advance operations and the excavation chamber is also a 'no-go' zone while cutting is in progress."

The machines can be modified to support tubbing, rock bolting, shotcrete or concreting activities and unless there are extremely poor rock conditions, excavation, mucking and rock support are carried out simultaneously.

Herrenknecht shaft-sinking machines are kept on course by a built-in guidance system, which removes the need for a centre-core pilot hole used when reaming technology is applied, either from bottom-up or top-down.

The excavation sequence for all machines is fully automated and the material is cut without disturbing the surrounding ground and with almost zero over-break.

The transportation of cut material can be designed to suit customer or project requirements. The removal of muck from the shaft bench can be performed dry or wet, using a high-volume air-flow, a mechanical conveyor system, or a fluid conveyance system.

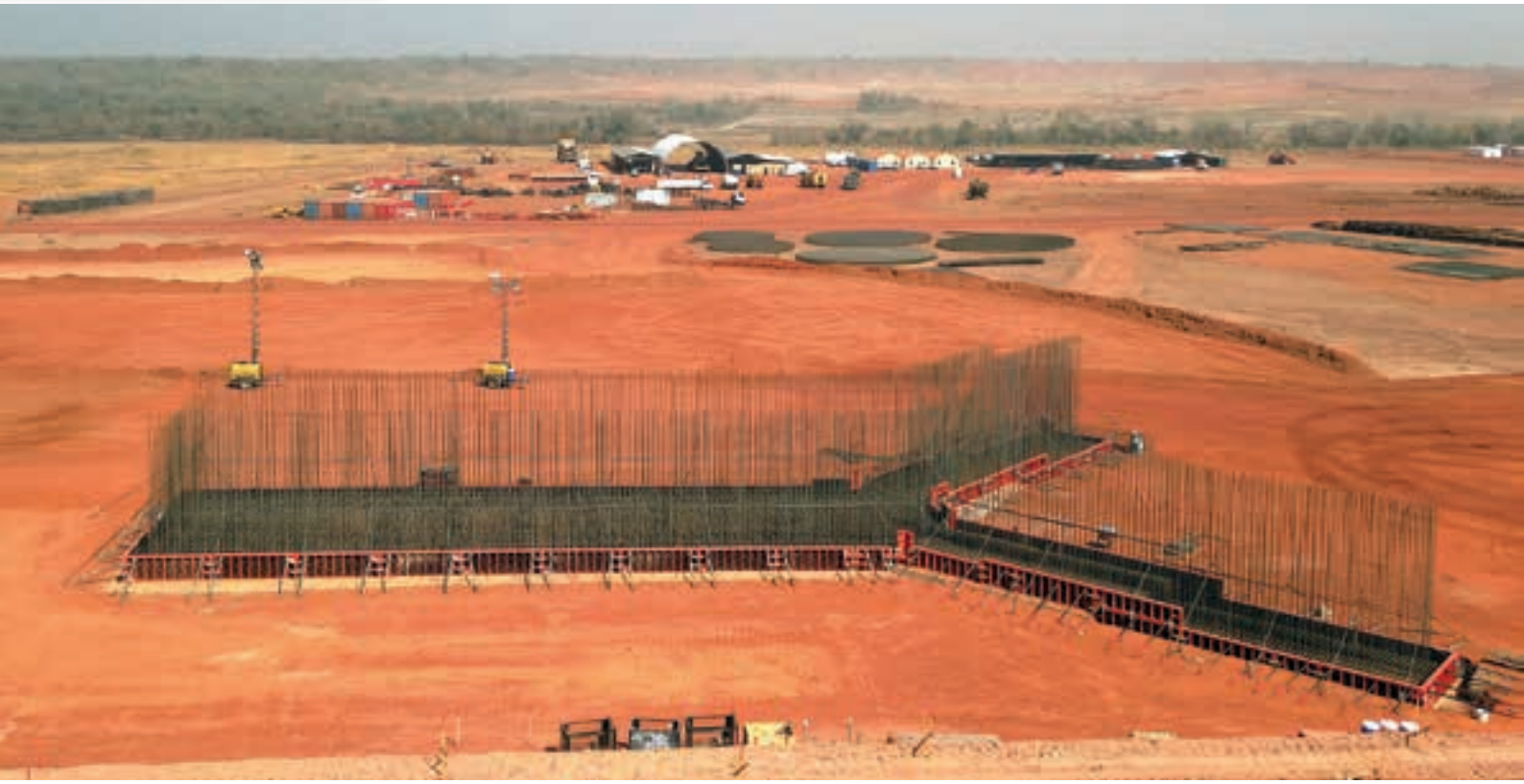
"Herrenknecht is also in the process of developing a new generation of rodless machinery for shaft enlargement for which a pilot hole is used. The **SBE (Shaft Boring Machine for Shaft Enlargement)** project is a joint venture between Schachtbau GmbH and Murray & Roberts Cementation and the aim is to update and adapt existing pilot-hole technology to achieve high sinking speeds and maximum work safety," says Roos.

The SBE is planned for shaft diameters of between 7,5 m and 9,5 m and for shafts up to 2 000 m deep. Material conveyance takes place by gravity through an existing pre-hole.

The machine, 15 m in length, braces itself in the shaft before each drilling stroke, which enables the thrust cylinders to push the rotating cutterhead against the borehole floor to cut into the hard rock.

"Herrenknecht is committed to the development of blind-shaft technology and the introduction of mechanised shaft sinking for the mining industry. We look forward to demonstrating the safety and productivity benefits of our pioneering machines for upcoming mining projects in South Africa," Roos concludes.

Photos courtesy of Herrenknecht



Foundation formwork of the primary crusher structure. Some 4 million tonnes of ore per year will be processed through this structure.

Fekola destined to be Mali's second biggest gold mine

Canada's B2Gold Corp, listed on the TSX, NYSE MKT and the Namibian Stock Exchange, reports good progress on its Fekola project in Mali, which it says is on course to start gold production in late 2017. With a planned annual production of 350 000 ounces in the first seven years of its life, Fekola will be the second biggest gold mine in Mali (after Randgold's Loulo-Gounkoto Complex) and certainly the biggest in B2Gold's stable, which currently comprises four operating gold mines, including the highly successful Otjikoto mine in Namibia which was officially opened in June last year.

Completed on time and within budget, Otjikoto is arguably a text book case of efficient project implementation and B2Gold is looking to repeat this success in Mali. Indeed, the same team that built Otjikoto, led by Bill Lytle (now B2Gold's Senior Vice President of Operations), is responsible for Fekola and is working closely with engineers Lycopodium to deliver the project. B2Gold's strategy is to minimise the use of contractors and build projects using its own internal resources and this same formula is being followed at Fekola.

Initial construction activities started in February 2015. These early works included the construction of a new 40 km road to the site to allow year-round access and an on-site airstrip, the establishment of a concrete batch plant, construction of the camp pad and the start of clearing within the mill footprint. The pace of work intensified later in the year, with the official ground-breaking ceremony occurring in late November 2015.

Since then, the first piles have gone in, the first concrete pours have taken place, the first phase of the permanent camp has been built, the tailings dam walls have been materially completed (excluding a small opening to allow

feature

The entry way to the new permanent camp accommodation with 350-person capacity.

run-off during the 2016 rainy season) and construction has started on the process water and contact water dams. Currently, the construction force on site numbers around 700 workers from both B2Gold and contractors.

To date, many of the major processing plant packages have been identified and purchase orders issued. Equipment already on order includes the SAG and ball mills, thickeners, cyclones, the primary crusher and tanks. During the first quarter of this year, B2Gold also signed a US$80,9 million equipment facility with Caterpillar Financial which secures the funding for the mining fleet.

The Fekola project is located within the Kayes Region of south-western Mali near the border with Senegal. It is situated about 40 km south of the city of Kéniéba and is 525 km by road from the Malian capital of Bamako, with the 480 km stretch from Bamako to Kéniéba being the new Millennium Highway. The project was acquired by B2Gold in 2014 after it merged with Papillon Resources, which had taken the project to pre-feasibility stage. Papillon, however, was by no means the first company to have held the project. The gold mineralisation in the area was first discovered in 1953 and subsequent explorers of the property – which hosts an orogenic-style deposit – included BRGM (1975-82) and Randgold (1998-2001).

The project is being developed as an open-pit mine, where run-of-mine ore will be trucked to the plant, crushed, and then treated in a grinding circuit utilising conventional SAG and ball mills, and a carbon-in-pulp (CIP) recovery process.

The mine plan is based on probable mineral reserves of 49,2 Mt at an average grade of 2,35 g/t containing 3,72 Moz of gold at a stripping ratio of 4,5:1 to be mined over 9,5 years (with use of stockpiles extending the mine life to 12,5 years). Annual mined tonnage will total 32 Mt, using stockpiling to optimise head grade and gold production in the first seven years of the project. Over the life of mine, the average annual gold production will be 276 000 ounces of gold a year at an operating cash cost of US$552 per ounce. Production in the first seven years, however, will average 350 000 ounces a year at a US$418/oz operating cash cost.

The Fekola pit, which will ultimately be 320 m deep, is planned for development in a sequence of seven 150 to 250 m wide and 500 to 750 m long stages (cutbacks). The staged pit development strategy allows B2Gold to defer the waste mining requirements and bring forward the mining of high grade ore. It also mitigates the geological, geotechnical and economic risks for the project considering the 1,9 km length of the pit. The design of the future pit stages during the operations, especially the last two stages with higher production cost per ounce, can be adjusted progressively depending on the operational experience, exposed ground conditions and changes in economic conditions.

The waste dump design is based on 120 m vertical lifts with 18 deg faces and 5 m berms, with dump location considerations based on minimising haulage, surface water drainage and area availability.

B2Gold will be undertaking the open-pit mining in house using a mining fleet which will include – according to current planning – two (and later three) 200-t class shovels and

Crews worked through the night during the 56-hour mill foundation concrete pour.

feature

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two 120-t class backhoes working in conjunction with Cat 777 trucks. The shovels will work on 10 m high waste mining benches while the backhoes will be used to mine selectively and in difficult areas. It is envisaged that the start-up truck fleet will number 16 units but this will increase to a peak of 34 as haul distances increase.

The processing plant facility and supporting infrastructure is being built to a design throughput of 4,0 Mt/a with a 25 % design factor which allows for an increase in future throughput with minimal additional capital.

Run-of-mine ore from the open-pit operations and stockpiles will be delivered to the gyratory primary crusher. The crushed ore will be transferred by conveyors to a reclaim stockpile with a 10 000-tonne live capacity. Reclaimed ore is conveyed to the SAG ball crushing (SABC) comminution circuit consisting of a primary SAG mill, a secondary ball mill, and a pebble crusher resulting in a P80 grind size of 75 µm.

The grinding circuit product will be thickened and treated in the leach and CIP circuit for extraction and recovery of gold. The tailings from the CIP circuit will be treated by cyanide destruction and thickened prior to being discharged in the tailings storage facility (TSF). Gold is recovered from the loaded carbon in an elution and electrowinning circuit and will be poured into doré bars on site. Life of mine average recovery is projected to be 92,8 %.

The TSF is a fully high-density polyethylene lined facility 1 km north of the process plant. The first stage has capacity for 16 to 18 months of production. Annual downstream raises constructed primarily with mine waste are designed to contain 62 Mt of tailings.

Finally, it should be mentioned that while Fekola will be B2Gold's first West African mine, it could ultimately be followed by a second of even bigger scale (in terms of tonnages though not gold production). The company owns the Kiaka project in Mali's neighbour, Burkina Faso, which it describes as one of the largest – though relatively low grade – undeveloped gold resources in the region. B2Gold completed a Pre-Feasibility Study (PFS) which estimated that the resource could support a 6 Mt/a mine producing 186 000 ounces of gold a year for 13,6 years. B2Gold – which has committed US$2,6 million to further exploration of the property during 2016 – says it is currently reviewing economically feasible options for development in the current gold price environment. Higher throughput scenarios will be considered to take full advantage of the project's 4,86 million ounce measured and indicated mineral resource.

Report compiled by Arthur Tassell, photos courtesy of B2Gold

The concrete team pours the next section of the conveyor columns.

Employees enjoy the new high-end kitchen facilities. Phase 2 of the camp is due to be complete in July 2016.

Payback period for Fekola just 28 months

In June last year B2Gold announced the "robust results" of an Optimised Feasibility Study (OFS) for Fekola, indicating that the project would cost an estimated US$395 million to build (excluding US$38 million for early works) with a further US$67 million being required for the mining fleet and for on-site power generation (to be provided by a 47 MW HFO generator plant).

According to the OFS (and based on a reserve gold price of US$1 300 per ounce), the project has a positive pre-tax NPV of US$1,01 billion at a discount rate of 5 % and a pre-tax IRR of 35 %. Payback is approximately 28 months after the first gold production. ■

feature

Yaramoko – just 13 months from breaking ground to pouring gold

Canada's Roxgold Inc, listed on the TSX-V, has poured the first gold at its Yaramoko gold project in Burkina Faso – 13 months after breaking ground at the site. The initial gold pour totalled 1 020 ounces. Located 200 km south-west of Ougadougou, Burkina Faso's capital, within the Houndé greenstone belt, Yaramoko is a low-cost, high-grade underground mine representing an investment of US$110,8 million. The mine is designed to produce 99 500 ounces a year over an initial mine life of 7,4 years at a LOM all-in sustaining cost of US$590 per ounce.

The 'Plant Practical Completion and Processing Performance Tests' confirming nameplate throughput and recovery assumptions were completed over a month ahead of schedule and mine development remains ahead of plan year to date. In the underground operation, four sublevels are fully developed to the eastern end of the resource and ore development is continuing to the western end of the first mining block on three levels. Ore development is expected to increase further when development commences in Block 2 on the western side of the deposit. Stoping operations in Block 1 will commence in July, further increasing the mine's productivity.

As of mid-May, there were approximately 30 000 tonnes of mill feed grade ore on the run of mine (ROM) pad. This represents approximately six weeks of plant throughput at the nameplate level of 750 tonnes per day (t/d) and, together with development ore, should ensure that the processing plant is adequately supplied through the ramp up phase.

The processing plant was built on an EPC basis by a South African joint venture of DRA and Group Five and has been designed to be easily expandable. According to Roxgold,

The Yaramoko processing plant which has a capacity of 270 000 t/a (photo: Roxgold).

feature

capacity can be increased by 50 % at a cost of approximately US$5 million. The flowsheet incorporates primary crushing, grinding with a single stage SAG mill, gravity concentration, classification, leaching and adsorption, tailings thickening, electrowinning and smelting. The SAG mill has been upgraded to a 1,5 MW motor (from 900 kW in the Feasibility Study) to allow for added flexibility.

The underground mine is accessed by a dual ramp system via a single portal at the bottom of a 23 m deep boxcut. Ramps are designed at a -14,3 % gradient with dimensions ranging from 5,3 m (width) by 5,8 m (height) to 5,0 m by 5,5 m depending on the planned air flows.

Longhole open stoping (including up hole retreat in certain areas) is the main mining method with a limited application of cut and fill for the crown pillar mining. All methods except up hole retreat will employ waste rock as backfill. The mine layout is based on 17 m sub-levels. Standard longhole stopes two sub-levels in height (34 m) and 25 m in strike length will be utilised to mine the narrow vein orebody.

Ventilation requirements for the mine are estimated at 212 m^3/s for a production rate of 750 t/d. All of the intake will be through the main access ramp. Exhaust will be through the east and west return air raises, each sized at 3 m diameter.

The underground mining contract was awarded to AUMS (African Underground Mining Services) – which has considerable African experience – in September 2014 although the company only mobilised to site in mid-2015. It is envisaged that by December 2018, AUMS will have delivered 17 100 m of jumbo development, 120 000 m of specialised, narrow-vein, 64 mm longhole drilling and 460 000 tonnes of ore.

Yaramoko's probable mineral reserve totals 1,1 Mt at a grade of 11,83 g/t for 759 000 ounces of gold. The indicated resource (including reserves) amounts to 1,6 Mt at 15,8 g/t at a 5 g/t cut-off (810 000 ounces) while inferred resources total 840 000 tonnes at 10,26 g/t (278 000 ounces).

There is considerable scope to increase the resource base. The current mine plan is to a depth of 430 m but high-grade results have been encountered to a depth of 900 m and there is also potential for lateral expansion of the orebody. In addition, RoxGold has a number of promising regional targets. A high-grade satellite resource – QV1 on the Bagassi South permit – was discovered in April last year, 1,8 km south of the 55 Zone (where the underground mine is located). In April this year Roxgold declared a maiden inferred resource for QV1 of 563 000 tonnes at 12,14 g/t for 220 000 ounces of gold at a cut-off grade of 5,0 g/t.

Photos courtesy of Roxgold

Celebrating the first gold pour are John Dorward (left), Roxgold's President and CEO, and Paul Criddle, Chief Operating Officer (photo: Roxgold).

feature

GSR goes underground in Ghana

Golden Star Resources (GSR), listed on the TSX, NYSE AMEX and the Ghana Stock Exchange (GSE), reports it is progressing well with the development of two high-grade, low cost underground mines at its Wassa and Prestea properties in western Ghana. Wassa Underground is the more advanced project and is due to deliver its first gold production within the next few weeks while Prestea Underground should be in production by mid-2017. The estimated pre-production capex for the two projects is US$39 million for Wassa and US$63 million for Prestea.

Located approximately 35 km north-east of the town of Tarkwa within the southern portion of the Ashanti greenstone belt, Wassa – acquired by GSR in 2002 – is currently an open-pit operation with the ore being treated in a CIL plant with a nameplate capacity of 2,7 Mt/a. In late 2014, GSR initiated a Feasibility Study (FS) to determine the viability of an underground mine operating in conjunction with the open pit. The results were announced in March last year and confirmed the economic case for the project.

The FS covers both the open-pit and underground operations and essentially constitutes a mine plan through to 2024. It estimates the combined gold production from both operations over this period will average 163 000 ounces a year with the IRR (at a gold price of US$1 200 per ounce) estimated at 83 % and the NPV (assuming a 5 % discount rate) at US$176 million. The FS puts the payback period at 3,25 years.

The underground mine – which will exploit an underground mineral reserve of 5,4 Mt at 4,26 g/t for 745 000 ounces of gold – is accessed by a twin decline system (currently at an advanced stage of development) from the north-east wall of the current Wassa open pit. The system will enable efficient ventilation during the early stages of the underground life and removes the requirement for a raisebore

A Cat 50-t truck at Wassa. The mining fleet deployed on the project includes Cat LHDs and haul trucks and Sandvik jumbos and drill rigs.

feature

The Wassa underground mine is accessed by a twin decline system. The portals of the declines are seen here.

ventilation raise and escape way close to the start of the decline. The main decline is 5,8 m high by 5,2 m wide and is being developed using standard trackless mechanised methods.

The upper stopes will be mined using longitudinal longhole open stoping with waste rock fill. This will enable efficient early production before a cemented rock fill preparation and delivery system is installed. The open pit will eventually mine down to the top of these upper stopes, but only towards the end of the life of mine.

In the deeper, wider areas of the deposit a transverse longhole open stoping method will be used. A primary-secondary mining sequence will be implemented with the primary stopes filled with cemented rock fill and the secondary stopes with waste rock fill. The overall stoping sequence will be bottom-up to reduce the incidence of sill pillar development.

New surface infrastructure to support the underground mining will be constructed including electrical power supply from the grid with backup genset support and surface mechanical and electrical workshops.

At steady state production, Wassa Underground is expected to produce an average of approximately 2 000 tonnes per day across the life of mine.

The underground ore will be treated in the existing processing plant, which is located just 500 m from the open pit. This relatively modern facility – GSR constructed it in 2005 – incorporates a four-stage crushing circuit, grinding, gravity recovery, CIL circuits and a thickener. It requires only minor upgrades – in progress and soon to be completed – to serve the needs of the underground project. Average

Channel sampling underground at Wassa.

The open pit at Wassa. Ore from the underground mine will soon start to supplement the open-pit production.

metallurgical recovery in fresh ore is currently 93 % and future recovery from the combined Wassa open-pit and underground operations is expected to be the same.

Work started in earnest on Wassa Underground after completion of the FS and in May this year GSR reported that the declines had advanced 1,9 km, with the average rate of advance achieved being 8,6 m per day during the first quarter of 2016 (which was more than 20 % higher than the development rate in Q4 2015). GSR is currently predicting that Wassa will produce between 120 000 and 135 000 ounces of gold this year, with between 20 000 and 25 000 ounces of this total coming from underground.

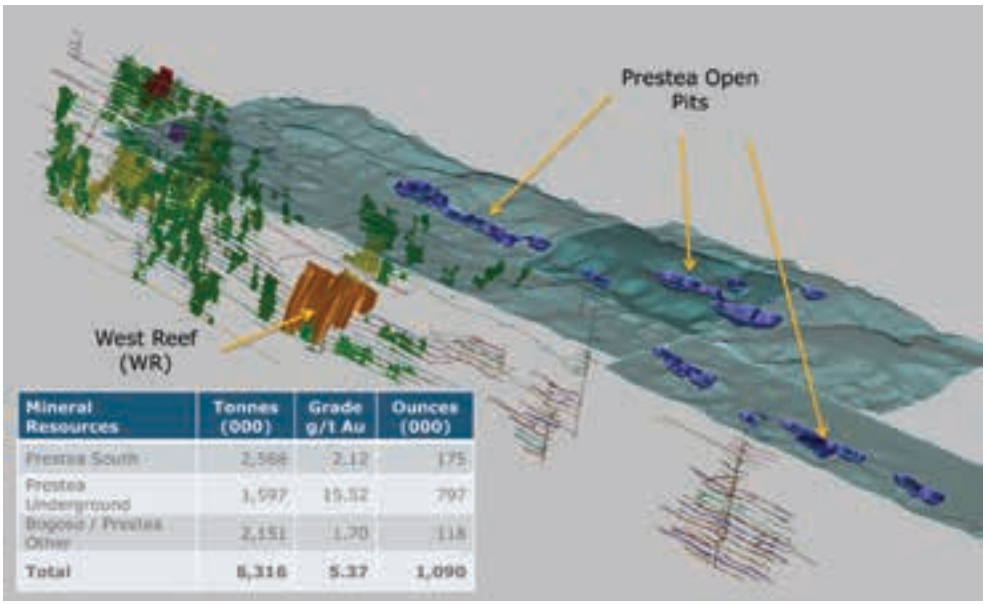
Turning to Prestea, this is located south-west of Wassa near the town of Prestea. Probably the most famous mine in Ghana after Obuasi, it started production in the late 19th century and has reputedly produced 9 million ounces of gold over its life. It consists of an established underground mine and adjacent surface deposits. It was acquired by GSR in 2002 but placed

GSR personnel at Prestea. The mine's infrastructure – operated over 100 years – includes vertical and inclined shafts, horizontal development, raises and stopes developed along the 9 km of strike length of the gold mineralisation.

feature

on care and maintenance while evaluation and exploration activities continued.

Mining from the surface deposits at Prestea started last year with the ore being treated at the Bogoso non-refractory plant roughly 16 km to the north. Bogoso is also owned by GSR although the high-cost refractory mining operations there have now been suspended. It is envisaged that the Prestea open pits will produce 60 000 to 70 000 ounces of gold in 2016 at an operating cost of US$840 to US$970 per ounce.



Mineral Resources	Tonnes (000)	Grade g/t Au	Ounces (000)
Prestea South	2,368	2.12	175
Prestea Underground	1,597	15.52	797
Bogoso / Prestea Other	2,151	1.70	118
Total	6,116	5.37	1,090

Prestea open pits and Prestea underground.

Similar to the strategy it is adopting at Wassa, GSR is working to make Prestea into a combined open pit and underground operation. This will see the West Reef at Prestea being extracted using existing infrastructure, which is in the process of being rehabilitated.

The Prestea infrastructure includes surface and underground vertical shafts, inclined shafts, horizontal development, raises and stopes developed along the 9 km of strike length of the gold mineralisation. The primary access shaft for the West Reef is the Central Shaft located in the town of Prestea and the secondary shaft is the Bondaye Shaft, 5 km to the south. The Central Shaft will be used for personnel access, materials transport, dewatering and hoisting while the Bondaye Shaft will act as the secondary means of egress, as well as being used for dewatering.

The West Reef mineralisation lies approximately 2 km south of Central Shaft and 3 km north of the Bondaye Shaft at a depth of between 550 and 1 025 m below surface. The mineralisation dips at approximately 60 to 85 deg to the west and varies in width from 0,5 to 3,5 m with an average width of approximately 1,8 m. The probable mineral reserve is 469 000 ounces at an average grade of 14,0 g/t.

The West Reef material is free milling with approximately 96 % metallurgical recovery being achievable using gravity followed by CIL processing. The proportion of gravity recoverable gold identified in the test work is high at between 50 % and 90 %. GSR will upgrade the Bogoso plant to include a high-grade, low tonnage circuit to handle the underground ore.

In the Feasibility Study (FS) on Prestea Underground completed late last year, shrinkage stoping was identified as the preferred method to mine the West Reef. In January this year, however, GSR initiated an internal study to investigate changing the proposed FS mining method from conventional shrinkage mining to mechanised shrinkage mining.

The study was completed in March and indicated an increase in project value with a post-tax IRR of 54 % (compared to 42 % in the FS) and an NPV of US$134 million (compared to US$124 million in the FS) based on a discount rate of 5 % and a gold price assumption of US$1 150 per ounce. Cash operating costs of US$468 per ounce and all-in sustaining costs of US$615 per ounce were estimated over the mine life of 4,5 years at an average annual production rate of 90 000 ounces.

Updating on the project in its Q1 results this year, GSR says rehabilitation works are ongoing on 24 level to improve the track for high-speed haulage and to install new electrical and water supply services. Mechanical and electrical rehabilitation work is planned to be completed in the fourth quarter of 2016 and development blasting is expected to commence in the fourth quarter of 2016. Pre-development of the resource is expected to take place from the fourth quarter of 2016 to mid-2017 while it is anticipated that stoping will start in mid-2017 with full production being achieved by the end of 2017.

GSR's future production will increase by approximately 25 % over 2015 levels once both the Wassa and Prestea underground mines are fully ramped up, with Wassa contributing 160 000 ounces a year and Prestea 80 000 ounces a year. The company believes there is scope for continued growth and mine life extension of the Prestea pits, as well as potential for significant mineral reserve growth at the underground projects. ■

The West Reef material is free milling with approximately 96 % metallurgical recovery being achievable using gravity followed by CIL processing.

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Bouly on the brink of production

The Bouly gold project in Burkina Faso is advancing ahead of both budget and schedule with production expected to start in Q3 2016, says its owner, LSE-listed Nordgold. Located 5 km from Nordgold's Bissa mine and 85 km north of Ouagadougo, Bouly is a 7 Mt/a open-pit, heap leach project which will have an annual production of approximately 120 koz over a life of mine of 10 years at an AISC of US$730/oz.

Bouly, which was explored by Randgold in 1996-97, was acquired by Nordgold in 2008 when it gained a majority interest in High River Gold. A first JORC resource estimate of a million ounces of gold at 0,78 g/t was published in 2012. In the same year preliminary metallurgical tests showed heap leach potential for weathered and transitional rock. A scoping study was completed in 2013/14, followed by a feasibility study in 2014/15. Based on the positive results of the feasibility study, the project was approved and entered construction in the second quarter of last year.

As a result of intensive exploration programmes carried out in 2013-2014, Bouly's mineral resources have tripled to 3,5 Moz, and maiden ore reserves of 1,32 Moz at 0,56 g/t Au were declared in the course of the feasibility study. The study demonstrated strong economic fundamentals for the project, according to which Bouly's IRR is 40 % at a gold price of US$1 250 per oz and approximately 26 % at a gold price of US$1 100 per oz. It estimated the payback period at 2,2 years for the US$1 250 gold price scenario.

The mining operation is expected to be low cost given the low strip ratio of 0,7 t/t while gold recovery is expected to be in the region of 83 %. There is the possibility of a life of mine extension through the processing of fresh rock ore resources.

Norgold says the total construction capex is expected to be approximately US$145 million,

Plant construction underway at the Bouly gold project. This is the view looking towards the primary crusher.

US$10 million less than initial capex guidance of US$155 million due to significant savings achieved during earthworks conducted in-house and lower equipment prices combined with disciplined procurement and foreign exchange gains.

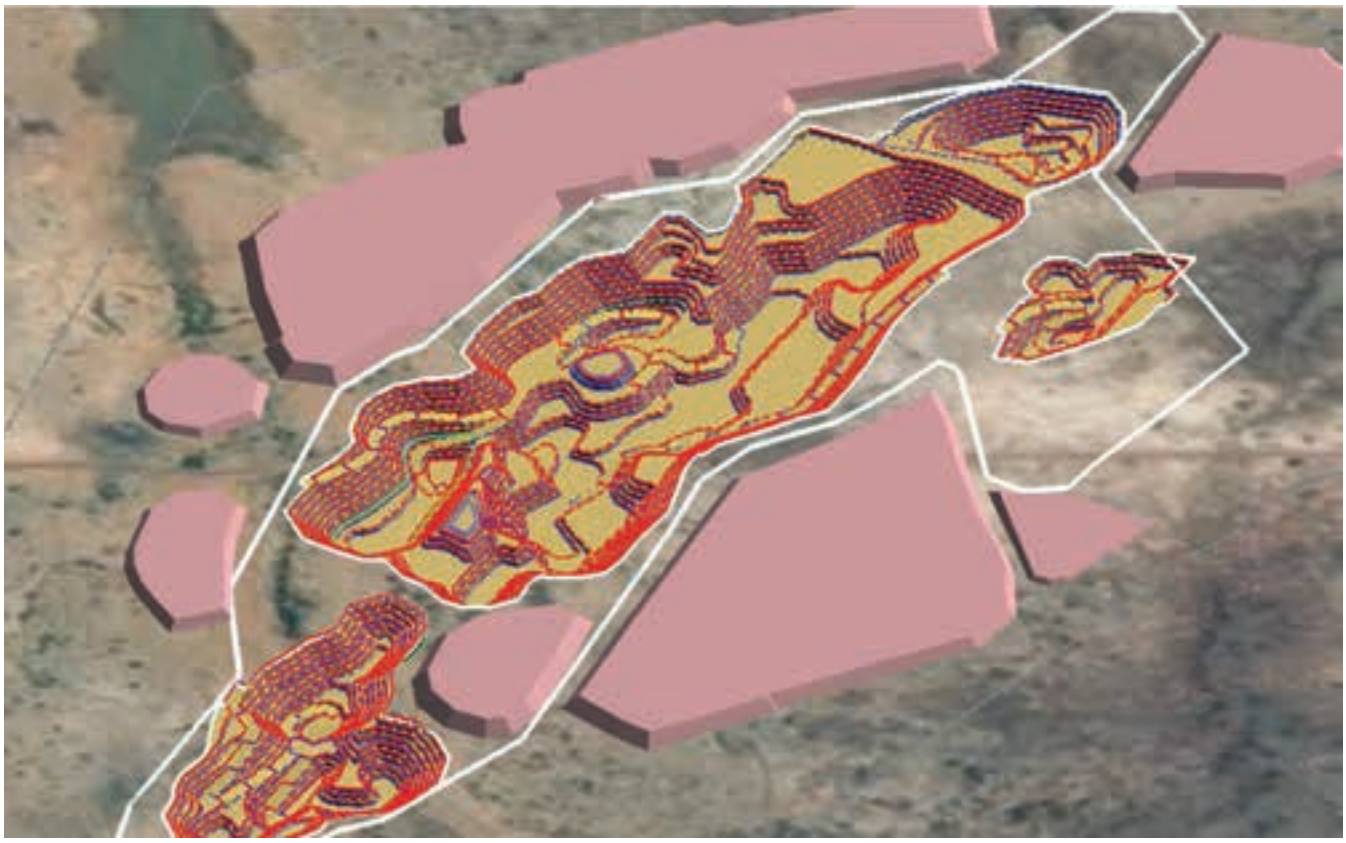
All major mechanical equipment, plate work and structural steel have been installed with piping and electrical installation progressing on schedule. The entire mining fleet had been delivered to site and was commissioned by the end of Q1 2016. Pre-stripping of the starter pit began in late February 2016 and the first ore was mined in March. Approximately 76 % of earthworks on the heap leach pad and 56 % of the pad HDPE lining were completed by the end of Q1 2016.

Nordgold produced 950 000 ounces of gold in 2015. Its portfolio of mines includes three in Africa – Taparko and Bissa in Burkina Faso and Lefa in Guinea – with the balance being in Russia and Khazakstan. Nordgold was established in 2007 as Severstal Gold, a gold producing subsidiary of Severstal, the Russian steel company owned by Alexey Mordashov.

The proximity of Bouly to Bissa means that the two mines will be able to share infrastructure. Commissioned in early 2013, Bissa is an open-pit/CIL mine which is expected to produce 200 00 ounces of gold in 2016. Nordgold's other operating mine in Burkina Faso, Taparko, also an open-pit/CIL operation, is located 200 km north-east of Ougadougou. It produced approximately 83 000 ounces of gold in 2015. Nordgold's third African mine, Lefa in Guinea, is similar in size to Bissa in terms of gold production (214 000 ounces in 2015). Opened in 2008 and acquired by Nordgold in 2010, it is a typical open-pit mine with processing via a CIP plant.

Photos courtesy of Nordgold

Bouly has been designed as a heap leach project. The agglomeration drum is seen here.



Pit design. The pit will eventually be approximately 3 km long and 500 m wide with a maximum depth of around 80 m. Nordgold will undertake the mining in-house.

feature



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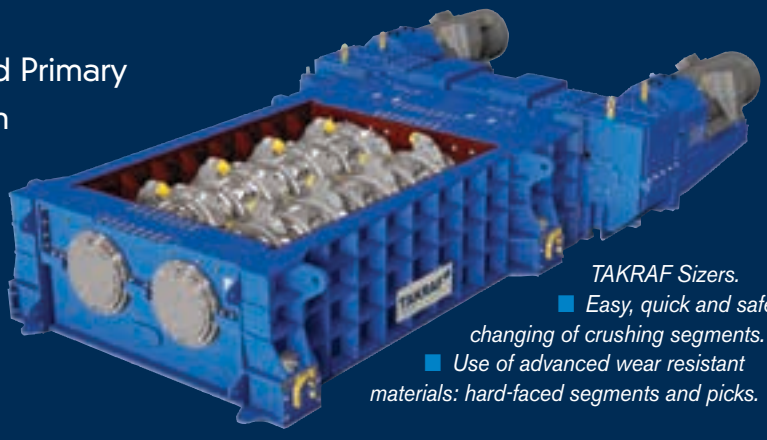

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Perseus poised to emerge as a major West African player

With its recent acquisition of Amara Mining, Perseus Mining, headquartered in Perth, Australia and listed on the ASX and TSX, now has a strong growth pipeline in place in West Africa. The company, which was already the owner of the Edikan gold mine in southern Ghana, a plus 200 000 ounce-a-year producer, and the development-ready Sissingué gold project in Côte d'Ivoire, now also controls the advanced 5,2 Moz Yaouré gold project in Côte d'Ivoire as a result of the Amara acquisition, as well as the Baomahun gold project in Sierra Leone.

As the company's only revenue-generator, Edikan – a multi-pit operation – will remain the backbone of Perseus for the immediate future. The mine, which produced 212 000 ounces in the year ended 30 June 2015, has ore reserves of 2,27 Moz and Perseus is projecting an average production of 222 000 oz/a at an all-in sustaining cost (AISC) of US$865/oz for the remainder of its mine life of 7,5 years.

During the first quarter of this year, mining activities took place in Stage 3 – the final stage – of the Fobinso pit and Stage 1 of the Fetish and Chirawewa pits. A total of 37 150 oz of gold was produced during the quarter by processing 1,66 Mt of ore grading on average 0,85 g/t. This was 15 % greater than in the prior period, reflecting an 8,4 % decrease in tonnes of ore processed offset by a 25 % increase in the head grade of ore treated and a 1 % improvement in recovery. Later this year (in the December quarter), Perseus expects to start mining the 475 koz Esuajah North deposit.

The Edikan gold mine in Ghana is currently Perseus's only operating mine (photo: Perseus).

Perseus's second operating mine will almost certainly be Sissingué (formerly known as the Tengrela gold project) in Côte d'Ivoire. It is located 620 km north of the commercial capital, Abidjan, in the far north of the country close to the border with Mali. A US$3,7 million programme of early works, including a material part of the front end engineering and design (FEED) programme, construction of site access roads, and initial earthworks, was initiated last year and has now been completed.

According to Perseus, it will be committing to the full-scale development of Sissingué as soon as financing arrangements are finalised, which is expected shortly, with first gold production likely in 2017. The total upfront capital cost will be approximately US$100 million. The aim is to fund the project development through a combination of Perseus's existing cash resources, term bank debt and mezzanine debt.

Sissingué – which has ore reserves of 5,5 Mt at 2,4 g/t containing 0,43 Moz of gold – will be a much smaller mine than Edikan. A straightforward open-pit operation, it will have an average annual production of 75 000 ounces at a life-of-mine all-in site cost of US$632/oz. The processing rate of the plant will be 1,2 Mt/a for oxides and 1,0 Mt/a for fresh ore. The process flowsheet will include single stage crushing, single stage grinding with a pebble crusher, a gravity circuit, six stages of carbon in leach (CIL), and elution and electrowinning. An overall gold recovery of 90 % is expected for fresh ore.

Perseus's third operating mine is likely to be Yaouré, which was clearly the primary target

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when Perseus moved to acquire Amara. Located in central Côte d'Ivoire, it has the potential for large-scale, long-life, low cost production. An optimised PFS completed by Amara earlier this year outlined an open-pit mine with an average annual production of 248 000 ounces in years 1-5 and average annual production of 203 000 ounces over a 15-year life of mine (LOM) from a single open pit containing 3,2 Moz. The average head grade processed would be 1,62 g/t based upon the mineral reserve estimate announced in January this year. The PFS estimated the upfront capital cost at US$334 million, including a US$44 million contingency and US$60 million for an owner-operated mining fleet. The PFS put the payback period at 2,1 years with mining throughout this period focused on the higher grade, continuous CMA zone where 72 % of Yaouré's proven mineral reserves are located.

Perseus is now starting work on a bankable feasibility study for Yaouré, commencing with a 42 000 m drilling programme designed to confirm mineral resource estimates as a basis for mine optimisation. It expects to complete the DFS, financing and execution plan within 18-24 months with mine commissioning following roughly within 18 months of a development decision. ■

An early works programme has been completed at Sissingué (photo: Perseus).

feature

Baoulé bulk sampling completed

AIM-listed Stellar Diamonds has completed its 100 000-tonne bulk sampling and trial mining programme at its 75 %-owned Baoulé kimberlite pipe in Guinea. Some 11 808 carats were recovered at an average grade of 11,4 cpht at a +1,25 mm cut-off.

Baoulé is a 5 ha pipe which was discovered in the late 1990s by a Canadian company. The project is located in the heart of the Aredor diamond district of Guinea which has historically yielded very large, high value diamonds from alluvial mining. Stellar acquired the project with a local partner just over three years ago and launched the trial mining programme in November 2014.

The geology of the pipe is complicated in parts with what seem to be multiple intrusions and brecciated contact zones in both lobes, with the western lobe in particular hosting a number of late stage and cross-cutting kimberlite dykes. For the purposes of evaluation, it was not possible to separate and process separately each kimberlite lithology. However, the east and west lobes were sampled and processed separately, which did confirm a difference in grade between the two. Some 46 561 tonnes were processed from the eastern lobe and 56 555 tonnes from the western lobe.

In all, 11 808 carats have been recovered to date from Baoulé, giving an average grade of 11,4 cpht. However, says Stellar, it is clear that the eastern lobe has a higher grade at 13,3 cpht than the western lobe (at 9,8 cpht). The company believes this could be a consequence of different kimberlite types or processing efficiencies, since it was noted that the western lobe did yield a lower percentage of -7 sieve stones (<1,83 mm) compared to the eastern lobe.

A total of 929 stones greater than 1 carat have been recovered including numerous high value gem and fancy coloured (yellow) diamonds of up to 12 carats in size. The biggest diamond recovered thus far is a 55-carat stone. Although it is of low quality, Stellar says it confirms its belief that the Baoulé pipe is a source of the large diamonds for which the Aredor area is renowned.

Three diamond sales have been held to date. Some 8 400 carats have been sold realising

Approaching the end of mining in the Western Lobe open pit (photo taken in May this year).

feature

Panorama of the Baoulé site showing the treatment plant (right) and workshop/ garage (left) and the Tourou mountains in the background.

US$1 million in revenues. Diamond values have varied widely from US$91 to US$156 per carat, depending on the market sentiment at the time of the sale and the diamond mix of the parcels sold. However, says Stellar, it is notable that a number of gem and fancy coloured diamonds commanded premiums and values of up to US$6 800 per carat, confirming the presence of high value stones in the Baoulé pipe.

"The results show a clear difference in grade and diamond quality between the eastern and western lobes, with the volumetrically larger eastern lobe being of higher grade and quality," comments Stellar's Chief Executive, Karl Smithson. "With the higher grade area identified, we intend to sell a further 3 188 carats later in June, with these diamonds all arising from the western lobe. This planned sale will add to the US$1 million generated to-date from diamonds sold, which has contributed significantly to the costs of the exercise. We will then complete the necessary diamond grade and value modelling as part of the resource estimation exercise, with our resource target remaining approximately 3 million carats contained within the Baoulé pipe. This will then allow us to formulate the next development steps for the project."

Apart from the Baoulé project, Stellar also holds the Tongo project in eastern Sierra Leone. Since 2007 Stellar has carried out systematic and extensive exploration programmes which have culminated in the establishment of a JORC-compliant diamond resource of just over 1,45 million carats. A recently completed Preliminary Economic Assessment (PEA) has defined robust economics for an 18-year life of mine on the Dyke-1 kimberlite, with significant opportunity to enhance both life of mine and project economics through either deeper mining and potentially bringing in any of the three other high grade kimberlites (Dykes 2, 3 and 4) on the property into the mine life.

Stellar reported recently that it had been verbally informed that the Minerals Advisory Board (MAB) had approved the application for a mining licence over the project. Progression of the licensing process remains subject to the National Minerals Agency (NMA), the licensing body of the Ministry of Mines, formally writing to Stellar to inform it of the decision and drawing up a licence agreement to be forwarded to the Minister of Mines for approval. Thereafter the fiscal terms of the mining licence will be negotiated between Stellar and the Government of Sierra Leone and the resulting mining concession agreement will then require ratification through Parliament.

Photos courtesy of Stellar Diamonds

Jaco du Toit - 12 years

Christina Ramotsabi - 9 years

Ricardo Montoya - 25 years

Rejean Foisy - 25 years

Godwin Dzwairo - 26 years

Noel Mills - 33 years

Frengelina Mabotja - 9 years

Roy Roche - 34 years

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Compliance simple with Greenmined

There is a considerable move away from the continued use of in-house personnel to undertake applications for authorisations and other environmental requirements within the mining sector. Sonette Smit, MD and senior environmental consultant at Greenmined Environmental, believes this shift can be seen as both appropriate and cost-saving as – when it comes to applications for authorisations, environmental audits and other related activities – all work done in-house at a mine or quarry will, in any event, need to be reviewed by an independent environmental assessment practitioner.

Changes in legislation have seen the regulations surrounding the Environmental Act, the Water Act and the Minerals and Petroleum Resources Development Act combined into a single system. While this is advantageous for mines and quarries, the distinct lack of understanding around the requirements has made this quite daunting for individuals within these operations.

Smit says that in the past mine and quarry managers would have appointed either an in-house employee or a consultant to handle the requisite applications. "Today, even where an in-house person prepares the applications for authorisation, organisations will have to employ the services of an independent consultant to review these. The external review is to ensure the integrity of the information being supplied," she explains.

Cutbacks, due to the pressure under which the mining sector has been operating, have also meant that, in many instances, the infrastructure which supported an in-house environmental department or officer has been significantly reduced. In some cases the environmental aspects of the operation have even been incorporated into the function of the safety department or officer.

"All this has created an increased demand for a skilled independent environmental consultancy with practitioners who can bring complete impartiality to the table. This impartiality, coupled with our broad spectrum of applications knowledge and in-depth understanding of the duties as well as the rights of the applicant or licence holder, ensures our customer base of a level of proficiency not readily available elsewhere," Smit says.

This depth of knowledge and experience

Greenmined Environmental has the applications knowledge and in-depth understanding to conduct intensive on-site audits.

feature

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The Greenmined Environmental team from left: Sonette Smit, MD; Daryn Price, office administrator; Murchellin Saal, project consultant; and Jemma Bowles, legal advisor.

includes that of all departmental processes and even though the application process has been dramatically simplified, Smit believes that it is ever more critical for organisations to use the services of practitioners who are able to seamlessly follow the requisite processes through the 'One Environmental System'.

An important differentiator that Greenmined Environmental offers its client base is access to an in-house legal advisor. "This assists with the processes according to the legislation time frame, and having this level of expertise on hand is a real advantage as – should there be any legal issues on a client site – we are able to offer a legal service directly from our consultancy," Smit says. "This can translate into a major cost saving in terms of time, which is of the essence in such applications, and is obviously also a saving in bottom line costs."

Another service offering that is seeing a steady increase in demand is that of occupational hygiene. With the focus on uplifting levels of occupational hygiene and the need to comply with the requirements of the Mine Health and Safety Act, operators are reviewing current programmes to ensure that these are in line with the mandatory codes of practice applicable to individual sites.

"We are able to conduct a full audit on occupational hygiene monitoring programmes and this includes aspects such as personnel exposure to noise, airborne pollutants, the thermal environment and ergonomics. We are able to assess both the physical and chemical stresses and provide comprehensive feedback," Smit says.

Such programme audits will determine any gaps in the management and monitoring system, and then identify appropriate corrective action to address any non-conformances. Greenmined Environmental is able to make recommendations in terms of implementing the corrective action and then monitoring the programme going forward.

Greenmined Environmental was founded in early 2012 by Smit, whose environmental management experience draws from her tenure at private environmental consultancies and at the Department of Water Affairs (DWA). The company offers a depth of understanding of government departmental mechanisms and the functions that support the success of departmental application processes.

Smit says that although the consultancy is a small business, it has a solid reputation for delivering results that ensure its client base remains compliant with current legislation. ■

feature

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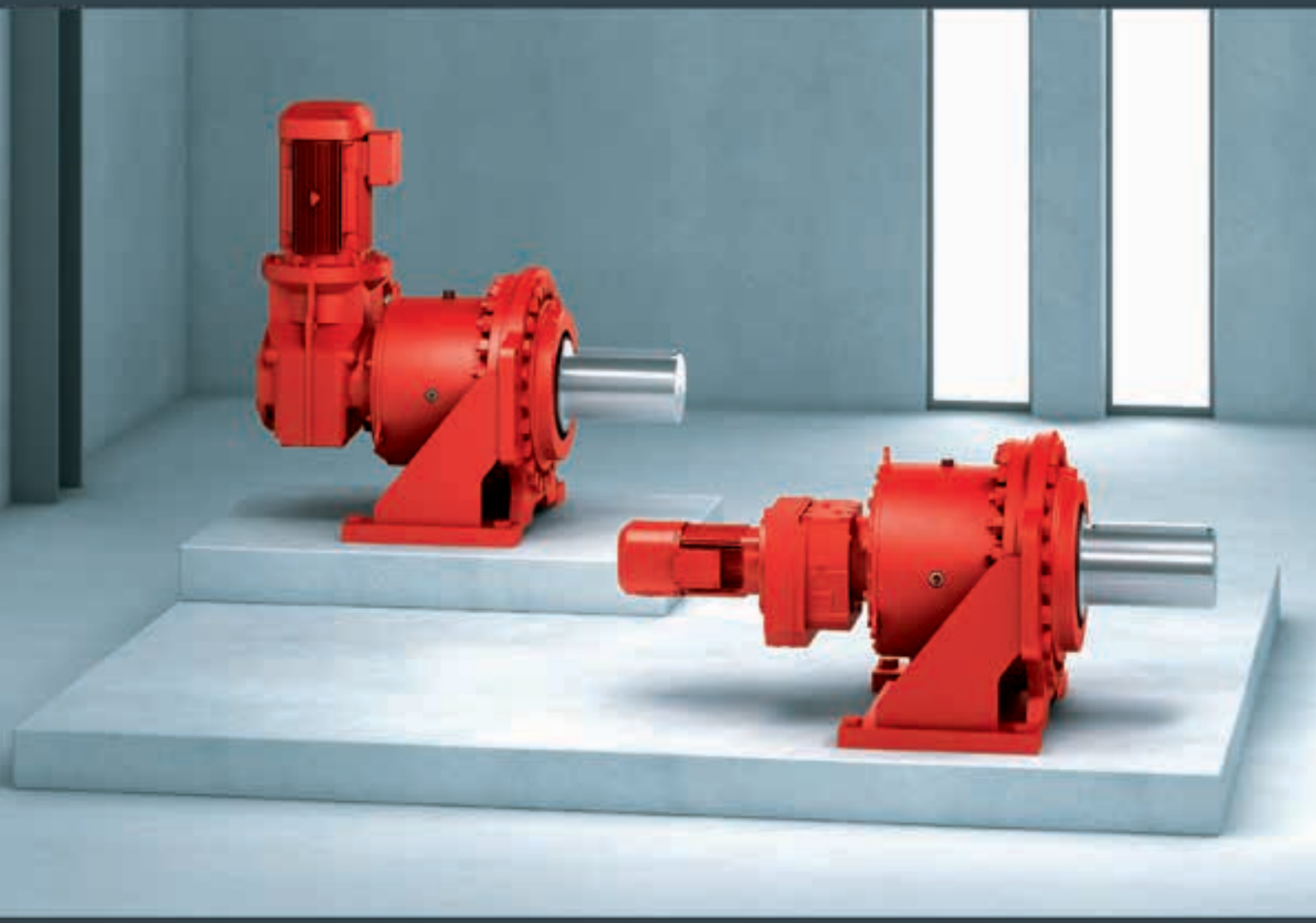

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Gold recovery and clean-up go hand in hand at Mogale sites

Local mining and raw material processing firm Ncamiso has joined forces with Mintails Mining SA-Mogale Gold to carry out vital services in order to ensure maximum gold recovery as well as environmental remediation. "In each of the Mogale gold projects that Ncamiso has taken on, we will be helping to increase their revenue through the recovery of gold from the areas we are working on as part of overall land rehabilitation efforts," says Ncamiso's MD, Fikile Mashinini.

According to Mashinini, the projects "fill our dedication to CSI by also providing jobs as reef pickers to those in the immediate communities that we operate in. Furthermore, by cleaning up and rehabilitating the land we assist in the eradication of illegal miners in the areas."

The work being carried out by Ncamiso at various Mogale Gold sites includes the following:

- DRD cluster: cleaning out of the old reduction plant and removal of contaminated surface material so that Blue Print Developments is able to build low-cost houses.
- Goudrand: removal of contaminated surface material to rehabilitate the ground for Blue Print Developments.
- Kimberley Reef: shallow opencast mining to remove gold-bearing conglomerates close to the surface (that would otherwise be sterilised) so that the soft underlying layers of reef can be removed to prepare the land for use as a recreational park.
- Sub-Nigel: screening out fine materials and reef from Afrisam's waste rock, which can then be used to produce building materials.
- Springs Market: rehabilitating an old reduction plant on a farm belonging to Markon Realty for future use in hydroponic fish farming and industrial development.

At all the sites, the fine materials are sent to Mogale Gold for gold processing.

On a day to day basis, Ncamiso is responsible for delivering material loaded and hauled from the abovementioned sites. It handles on-site sampling of delivered material, screening at -20 mm and loading of material onto the conveyor belts which make the transfer to the relevant processing plants. To date, says the company, more than 200 kg of gold has already been recovered from 200 000 tonnes of material delivered to Mogale Gold, and a total of more than 500 kg from than 1 Mt to various mines – a very high yield for surface mining.

Ncamiso is screening out fines and reef from waste rock at Sub-Nigel.

Mintails Mining SA's CFO, Eddie Milne, says that Ncamiso's services have always been efficient. "Their employees display an open and honest persona and their work ethic is exceptional," he says. "Ncamiso has been open and transparent in its dealings with Mintails, acting as partners in the various projects, sharing both the benefits and the struggles. Ncamiso adds value to our business and we will continue to partner with them in the future."

The environmental remediation being carried out by Ncamiso and Mogale Gold reduces the state's liability for the number of waste dumps that need to be rehabilitated and reprocessed. "The joint projects with Mogale Gold help both parties to build and strengthen the relationships between the mine and non-mine stakeholders. Mintails Mining SA-Mogale Gold and Ncamiso are establishing their reputation as companies invested in the sustainability and upliftment of the communities they work in," says Milne. ■

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Lesedi Community Centre refurbished

Thanks to Ivanplats, an Ivanhoe Mines company, together with on site project management and quantity surveying assistance from Turner & Townsend, the Lesedi Community Centre near Mokopane in Polokwane has undergone a complete refurbishment to the tune of approximately R2 million. The centre is situated off the N11, about 10 km north-west of Mokopane.

The centre – which first opened its doors in 2010 – is aptly named as Lesedi, which means 'light' in Tswana. Its main focus is to provide physical, educational, financial, nutritional and emotional support to the orphans and vulnerable children and their families in the nearby villages of Kgobudi, Sekgoboko and Malepetleke.

Over and above the 101 orphans and vulnerable children cared for, Lesedi also looks after 62 patients with chronic illnesses, operating out of a building which was donated by the local community.

Ivanplats' Werner Botha, senior projects manager, social and legal compliance and project lead on the Lesedi refurbishment, and Manny Dos Ramos, senior manager, strategic support and project manager for Lesedi, say the refurbishment project was undertaken by Ivanplats in response to the company's strategic social responsibility commitments to the communities around its Platreef mine, which is currently under development.

Adds Raphael Baiden, associate director, Turner & Townsend: "Due to our involvement in the main mining contract, we were approached by Ivanplats to assist with providing quantity surveying services on the refurbishment project. As part of our CSR commitment to add value and make a real difference to local communities, we were delighted to undertake this work. Previously we have assisted with a similar refurbishment project at the Tharullo drop-in centre in Mokopane, also through Ivanplats, where a funding proposal was compiled for the Japanese Government, and which kicked off in March 2016."

All in all, the three-month Lesedi project to renovate, restore, rejuvenate and recondition the centre required 4 257 bricks, 60 bags of cement, 5 m³ of building sand, 87 m³ of concrete and a crew of 15 providing some 4 350 man hours.

Community members enjoy the new mini-soccer field at Lesedi Community Centre.

Seen on site during the Lesedi refurbishment project are (from left) Palesa Mabelane, graduate quantity surveyor; Luthando Jele, graduate quantity surveyor; Raphael Baiden, associate director mining and metals for Turner & Townsend; and Werner Botha, senior projects manager, Ivanplats.

As a result the local community now has access to a flourishing vegetable garden, a mini-soccer field with astro turf, a netball court, and play area with a jungle gym. The building has been completely refurbished and furnished, including school benches, chairs and a gas stove. ■

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Big Lift Trucks appointed as MDS distributor

Big Lift Trucks (BLT) has been appointed distributor in Africa for MDS International, global specialists in trommel screens and apron feeders.

"BLT's carefully structured expansion programme encompasses a strategy to extend the company's range of materials handling equipment to meet exact market demand in Africa and the Indian Ocean Islands," says Ken Mouritzen, MD of Big Lift Trucks. "MDS trommels and apron feeders, which are also available from BLT on a fully serviced rental basis, are designed especially for mineral processing and recycling applications.

"These flexible systems are used to remove the small fraction – fines – from a waste stream to make the remaining material easier to handle for the operatives or processing equipment. Trommels are used in the classification of solid waste, treatment of waste water and recovery of valuable minerals from raw materials."

MDS trommels can be designed and manufactured to exact specifications and vary in terms of dimensions of the trommel width, diameter and aperture of holes. The size of fines removed by the trommel screen is predetermined by the holes in the trommel drum and varies depending on the operation, waste stream, volume of material and product specifications.

Heavy duty MDS trommels, which are available as mobile and stationary units, have output capacities between 250 and 1 000 t/h and can handle rock sizes up to 1,5 m.

MDS M515 trommel screening primary blast material up to 800 mm.

The M515 track trommel, with a 30-t hopper capacity, is supplied with fold out stockpiling conveyors and can move around a mine and from one site to another. This machine, the most popular in the MDS range, is capable of producing three products concurrently, at an output of over 400 t/h. In a recent project, it removed fines up to 120 mm through the swivel fines conveyor at the rear of the unit. A mid-sized product (120 – 250 mm) was produced through the left conveyor and oversize materials (250 – 750 mm) out the front of the machine. A notable feature of this unit is that it is also able to separate difficult and sticky materials.

M615 static trommels are designed for removing soils and fines from rip rap or blasted rock. These machines have an output capacity between 350 and 500 t/h.

The M820 unit is a large, heavy duty rock trommel, capable of screening rock up to 1 m in size, at approximately 750 t/h. This modular machine is available with three or four splits and is suitable for cleaning dirty rock or for screening blasted material.

The static M825 machine, which handles rocks up to 1,5 m in size, is said to be perfect as a primary screener for material direct from a blast. The hopper, with 100 t capacity, can be loaded by dump trucks, with an output of 1 250 t/h. This unit is also available with an hydraulic rock breaker.

MDS apron feeders, with an electric or hydraulic drive, are available as standard units for quarries, aggregates or recycling applications and as heavy duty machines for mining, ore and coal environments.

Big Lift Trucks (Africa and Indian Ocean Islands), tel (+27 31) 274-8270

Felt liners for 'no dig' pipeline renovation

Fibertex KAVI felts – manufactured from polyester fibres – form the basis for effective coating, impregnation and installation of cured-in-place pipe (CIPP) liners, for efficient 'no-dig' pipeline renovation projects.

"Fibertex KAVI multiple layer felt liners make it possible to repair even heavily damaged pipelines using the 'no-dig' method, with numerous advantages over conventional open trench pipe repair procedures," says Lance Woolley, Business Development Manager, Fibertex South Africa. "With these cured-in-place liners, there is no need for excavation during pipeline repair work and thus inconvenience to traffic, production, business or residents is minimised.

"These environmentally-friendly needle-punched nonwoven felts are designed to restore full or partial pipeline bearing capacity, improve hydraulic pipeline parameters, increase flowrate and ensure perfect pipeline tightness.

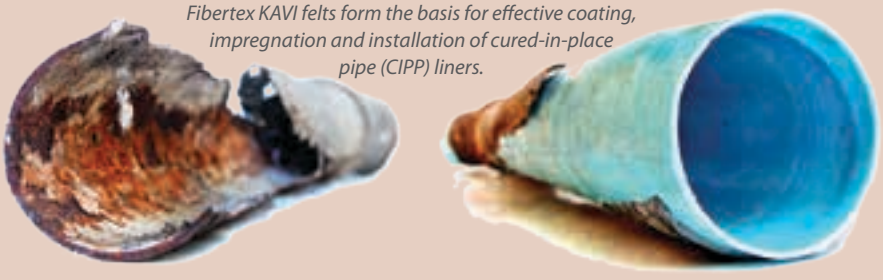
"The felts, which are resistant to abrasion and chemical agents, are designed to later accept the saturation of epoxy-based polyurethane resins to ensure efficient performance and extended service life from the cured pipe liner," Woolley continues. "Fibertex KAVI needle-punched fabrics also ensure elasticity of the repaired pipelines, providing a smooth interior, with no joints. Contamination is minimised and cracks in the yielding soil are prevented."

A uniform felt weight and density is designed to meet exact application requirements, as well as the diameter and shape of the pipe to be repaired, including ovoid, arch shaped or circular cross sections. Felts made for building up layers are produced to precise width and length specifications, with uniform thickness.

Benefits of Fibertex cured-in-place technology also include polyester fibres that provide at least 50 years of durability, biaxial stiffness made to exact specifications and suitability for inversion, pull-in and inflate installations.

There are two locally produced Fibertex KAVI nonwoven fabrics in the range – Fiberliner 030 and Fiberliner 060 – that complement the European options – KAVI 660, KAVI 6805 and KAVI 960 – and both are available in standard 100 m length rolls.

Fibertex South Africa, tel (+27 31) 736-7100



Fibertex KAVI felts form the basis for effective coating, impregnation and installation of cured-in-place pipe (CIPP) liners.

Liner plates fitted to Volvo dump truck

Chromium Carbide (CrC) expert Rio-Carb recently fitted R-C700 liner plates to Danoher Construction's R3,9-million Volvo 30-ton dump truck. Due to their impressive hardness, the R-C700 CrC liners were installed to prolong the life of the original truck bin – which is known to withstand approximately 10 000 hours of unloading – by six times.

Rio-Carb Product Development Manager Luis Garcia explains that – during unloading – the rear section of a dump truck bin receives the greatest amount of wear from severe sliding abrasion. The R-C700 CrC liner plates, with a hardness of between 56 and 58 Rockwell C, act as a barrier to protect the truck bin from corrosion and wear due to the abrasive silica they carry.

Depending on what is being mined, the material causes damage to the bin. Therefore many companies opt to discard the bin once it has corroded and replace it. Rio-Carb's R-C700 CrC liner plates are claimed to be extremely wear resistant when compared with its competitors' liner plates. To test this theory, one truck has been fitted with Rio-Carb liner plates and the other with 400 material. They will undergo a test to see which will last longer at a mine in Lydenburg. The trucks will be put through the same conditions and unload the same material during testing and a comparison will be made.

Rio-Carb recently fitted R-C700 liner plates to Danoher Construction's R3,9-million Volvo 30-ton dump truck.

Even though it is the first time Rio-Carb has designed and fitted a truck with liners, the company was able to finish the project within a week, which included getting approval on the actual designs, engineering and fitting them. "We had to take measurements for sizes, made drawings and suggested how the liner can be laid up and fitted. Working outdoors was a challenge, as we lost a day and had to move indoors but everything went well, thanks to our experience and expertise," says Garcia.

Rio-Carb says it is the only local liner plate and equipment manufacturer that follows international welding standards. Its liner plates are etched at the back with a unique number of identification and recorded in the company's database. All the designs are computerised, so the company does not have to go back on site to take measurements and redesign them when they need to be replaced.

Luis Garcia, Rio-Carb, tel (+27 11) 908-1014

Osborn secures orders for Catoca

Mining equipment specialist Osborn has secured a R12-million export order to Angola for robust machines that will enable the world's fourth largest diamond mine to process the more competent material that it is now mining.

Osborn will supply the Catoca diamond mine with a large vibrating grizzly feeder and a jaw crusher, says Marketing Director Martin Botha. The mine, which is located near Saurimo in the Lunda Sul province of Angola, is upgrading its primary tip in order to accommodate the harder material being mined, he adds.

Osborn jaw crusher for Angola's Catoca diamond mine.

Botha notes that an interesting aspect of this order is that it has arisen through complex global cooperation – between Osborn's Russian agent, a Russian engineering house with a design office in Germany, South African manufacturer Osborn and a diamond mine in Angola. "Osborn netted this order through our agent in Russia, which is working with a Russian engineering firm that also has offices in Germany with which Osborn has worked in the past. It is a truly international undertaking that reflects Osborn's widespread reputation for delivering robust, hardworking equipment," he says.

The vibrating grizzly feeder to be supplied to Catoca is an Osborn gearbox driven, 3-step, 2 m x 4,6 m machine while the jaw crusher is a 50 x 60 unit. Botha reports that both machines have been customised for the client, with electrical control panels included at the mine's request. Osborn will be supplying the machines and commissioning them after installation.

"A second phase of Catoca diamond mine's upgrade to machines designed to process more competent material is in the pipeline, and may offer further opportunities for Osborn in Angola," Botha concludes.

Osborn Engineered Products, tel (+27 11) 820-7600

Welding screens from Apex

Safety in the workplace continues to be a prime focus, and many manufacturing operations make use of Apex welding screens to ensure workers are protected against weld splatter and fumes as well as from harmful UV radiation.

The screens are available in various configurations to suit a variety of individual requirements. The most popular version has a free-standing frame, allowing easy handling and portability. The feet of the screen are angled to allow optimum utilisation of floor space.

These features further promote ease of erection, making it simple to set up and arrange the screens in different shapes according to the specific demands of each particular workshop.

The screens absorb, scatter and filter the light spectrum to create a safer working environment for the welder and any co-workers and supervisors in the immediate vicinity.

Tests for total visible light transmittance have reportedly demonstrated that conventional materials permit 78 % light transmittance while Apex material allowed only 15,5 % – a dramatic difference, says the company, particularly when one considers long term exposure of workers and the consequent repercussions on their eyesight and even their skin.

Another important design characteristic of the Apex welding screen is the patented Balledge® design on individual strips, which facilitates easy access for both personnel and equipment to cordoned-off areas. Strips are made from specially formulated PVC material and are impervious to burning.

Apex Strip Curtains, tel (+27 11) 452-8723

Dozer specialist adds Cat machines to its fleet

Expertise comes with tried and tested experience, which for Cat mid-sized track-type tractors makes Rail Plant Hire an expert in this field as one of the southern hemisphere's largest dozer fleet owners.

"In fact we're even more specialised since our fleet predominantly comprises Cat D6R units," explains Chris Barclay, MD of Rail Plant Hire, which currently owns and operates more than 62 dozers.

The company has a well-established contractor base in the construction and mining sectors and recently expanded its fleet with the addition of four new Cat D6Rs. Five D8Rs were also acquired towards the end of 2015 for deployment within the mining segment.

As Barclay explains, the company caters for both short-term hire as well as longer term contracts for projects ranging from new power station developments to national highway construction.

"Historically we've worked nationally and internationally, and continue to support our customers on cross-border projects."

One of Rail Plant Hire's recently acquired Cat D6R units adds to the expanding dozer fleet.

Alongside its mainstream activities, in the past 12 months Rail Plant Hire has also participated in two Caterpillar pilot programmes in conjunction with Southern African Cat dealer Barloworld Equipment. The first is the field testing of a new type of Cat undercarriage system, and the second a performance trial on a Cat D6R Series 2 track-type tractor.

As Barclay points out, when it comes to testing and real-life application, machine site matching and operator proficiency are especially important for dozers. This is particularly the case when it comes to the longevity of their undercarriage systems. Simply put, the average cost for track maintenance over the life of a dozer will typically equate to around 40 % of its original purchase price, assuming correct utilisation. In the wrong hands, it will end up costing a lot more.

Underscoring these statements, Rail Plant Hire employs a specialist technician who focuses exclusively on undercarriage inspections and assessments across the company's dozer fleet.

"We monitor our overall availability closely, but in the event that a machine does go down in the field, we have back-up units in place and prefer to change-out rather than conduct in-situ repairs," says Barclay.

Leveraging off Caterpillar's second and third life rebuild design philosophy, Rail Plant Hire's maintenance team is fully equipped for machine overhauls and follows the latest Cat maintenance handbooks. All Cat units are also registered on the Cat S·O·S™ fuel and wear analysis programmes.

"Overall, our machines deliver excellent mechanical availability and the D6 remains a versatile dozer well-suited for the plant hire industry," Barclay adds.

Barloworld Equipment, tel (+27 11) 929-0000

Product R&D at the core of MSA Africa's strategy

The latest Department of Mineral Resources stats have revealed that the South African mining industry recorded a record-low 77 fatalities in 2015 – down 8 % on the previous year – setting the industry on course to attaining its 'Zero Harm' objectives. MSA Africa says it places a high priority on ensuring that these objectives become a reality.

Statistics revealed that the most fatalities were recorded in gold mines, where 33 miners lost their lives. Platinum recorded 22 fatalities and coal a total of five. Other mines recorded a combined fatalities total of 17. MSA Africa Director Colin Oliver says that the gold and platinum sectors experience considerably higher death rates, due to the fact that the mines are located in deep hard rock areas.

"South Africa features the deepest underground gold mines in the world, which stretch down as far as 4 000 m beneath the surface. At this depth, greater risks are naturally inherent. Examples are rock collapse, explosive gas pockets, toxic gas, fire and underground water, to name a few. Reliable safety equipment is therefore of the utmost importance, and more operations are realising this," he notes.

Oliver highlights the fact that the South African mining sector's health and safety record ranks among the best in the world, and he attributes the latest drop in fatalities to closer co-operation between the government, mines and trade unions, as well as continual improvements made to safety products used in the industry. "Continual product research and development is at the core of MSA Africa's strategy. As a result, we have been instrumental in introducing new safety technologies."

MSA Africa safety products that are used extensively in the local mining sector include the Altair 4X Mining multigas detector, reportedly the only SABS-approved instrument of its kind. It boasts a sensor response and clear time of less than 15 seconds and can detect up to four gases at any given time.

Another innovative MSA Africa mining safety product is the Luminator cap lamp, which sets itself apart from all other cap lamps in the world as it enhances the miner's ability to more effectively detect cracks on hanging walls, which usually represent signs of ground falls and roof collapse.

For head protection, MSA Africa offers miners its stylish range of patented V-Gard hardhats, which provide high comfort and performance levels. MSA Africa also boasts a comprehensive range of face masks and self-contained breathing apparatus (SCBA).

MSA Africa, tel (+27 11) 610-2600

The Altair 4X can detect up to four gases at any given time.

VXPmills to be used in "severe process conditions"

Because they operate at a power intensity that is higher than low speed mills and overlaps that of high speed mills, one of the major traits of VXPmills is their flexibility, allowing them to be engineered and manufactured for a host of grinding applications.

This important characteristic has been demonstrated again, with FLSmidth's South African operation in Roodepoort involved in the engineering design and manufacturing that will see VXPmills used in extreme acidic conditions on a copper processing operation in the Middle East.

This VXP2500 in Zimbabwe was the first of the updated VXP2500 mill series.

"The outcome of this project was yet another derivative of these mills. In this instance, we adapted the VXPmill's design to work in severe process conditions," says Terence Osborn, Sales & Marketing Manager for sub-Saharan Africa at FLSmidth.

He says the VXPmill is a vertically oriented stirred media mill that is open to the atmosphere and designed with a modular impeller that has removable discs and spacers. Slurry enters at the bottom, travels upward through the mill chamber, and overflows through a media retention screen at the top. The rotating polyurethane discs activate inert ceramic grinding media inside the milling chamber. This fluidises the media bed, attrition grinding the particles in the slurry.

Osborn says the system is designed to allow changes to the distribution of the media and energy within the mill by altering the number and spacing between the impeller discs when the mill is commissioned.

Assembly of the two mills will start in August this year, followed by testing at FLSmidth's facility in Johannesburg. The mills will then be containerised and shipped to site and commissioned by FLSmidth before the end of the year where after they will play their role in helping the copper producer improve the recovery of very fine copper particles.

Because the mills will be exposed to pulp, they had to be engineered specifically for extremely acidic environments, with a PH of 2,5. This meant the components of the VXPmills had to be made from a variety of materials that would not only withstand arduous operating conditions but also ensure that the plants could be built within budget.

Osborn says this was a complex undertaking providing various challenges for the company's local engineers. The South African team also made extensive use of the expertise of FLSmidth's design engineers in India.

Osborn describes the end result as an ingenious solution. "We did not go for one specific material selection, such as stainless steel, but rather opted for a combination of many different materials based on the principal operational requirements of each component as well as the suitability to withstand the acidic environment. We do not believe that there are many engineers who would have been able to achieve this outcome, over the time period and within budget," he says.

The end result saw only a 7 % increase on the initial costing of the mills, with the solution comprising a combination of mild steels, austenitic and duplex stainless steels, fibre reinforced plastics, as well as polyurethane and polyurea coatings.

FLSmidth, tel (+27 10) 210-4820

Cast iron gear pumps feature extended longevity

Hydraulic and Automation Warehouse (HAW), part of the Hytec Group, one of the largest distributors of hydraulic components in Southern Africa and specialist supplier of products for mobile machinery, has added newly-developed cast iron gear pumps with extended longevity and numerous advantages to its existing range of Salami gear pumps and other hydraulic components.

The newly developed PG331 series is a spheroidal-designed cast iron gear pump with four different porting arrangements. It can be supplied in variations of 12 different displacements and has up to five flange mounting styles and seven shaft types. The pump design also allows for standard SAE flanges.

The gear pumps are compact with smaller dimensions achieved by installing the gear set, gear support bushings, and suction and delivery ports within the main body, housed by a front mounting flange and rear cover. "Competitor models, generally, have larger and longer front and rear housings to accommodate shaft supports which may separate port housings and are therefore less compact," explains HAW Key Accounts Manager Dries van Wyk. "This range of pumps can accommodate any engineering design and satisfies a variety of OEM manufacturing designs."

Strength, high efficiency and long service in severe operating environments are achieved through the pump's one-piece drive shaft construction, with a large area, and low friction bushings. "In addition," states Van Wyk, "an advanced thrust plate design and high quality machining tolerances optimise performance and high volumetric efficiency throughout the full pressure range. This also allows for excellent axial compensation. Moreover, PG331 gear pumps feature double shaft seals on pumps with reinforced inner shaft seals for motors."

Another advantage of this pump range is the high carbon content and low static discharge capabilities of the pumps due to their cast iron make-up. This combination renders them 'explosion-proof', making them a suitable choice for use on underground vehicles and equipment – even those used in fiery mines.

HAW's newly developed PG331 cast iron gear pump has four different porting arrangements.

HAW is the official authorised sub-Saharan Africa distributor for Salami-manufactured gear pumps, motors and mobile control valves.

Dries van Wyk, Hydraulic and Automation Warehouse, tel (+27 11) 281-3800

South African screens ordered by Australian mine

MBE Minerals reports it has secured yet another export contract from Australia for the supply of its custom engineered and manufactured heavy duty vibrating screens. The South African original equipment manufacturer (OEM) attributes the ongoing successes being achieved in Australia to its ability to produce vibrating screens that offer reliable operation in the mining sector.

Heinz Mittermaier, Engineering Manager at MBE Minerals, says that the recent contract underpins South African OEMs' capabilities in producing equipment for demanding applications in the mining sector, and particularly those in a First World country like Australia.

One of the MBE Minerals screens that form part of an ongoing replacement cycle at an Australian iron ore mine.

The screens form part of an ongoing replacement cycle at an Australian iron ore mine and Mittermaier says that with its extensive experience in such applications on the African continent, MBE Minerals has been able to optimise its screen design.

"Those screens already supplied previously have proven successful in terms of throughput tonnages and operational reliability and the customer has chosen to continue with this optimised product."

But what is of even greater importance is that MBE Minerals has been able to leverage not only its engineering and manufacturing capability but also communication technology to ensure that the customer's needs have been met. "The strength of this customer relationship and collaboration is underpinned by our ability to accurately interpret the specific needs of an individual customer and to meet these while being on a different continent," Mittermaier says.

The MBE Minerals screens being supplied are 2,4 by 4,5 m and have been optimised for this iron ore operation. The design makes use of the benefit of low power consumption for the movement of large masses which is only provided by the resonance system. In addition to the already low power consumption of the vibrating screen, the life expectancy of the screen box has been improved significantly by combining state-of-the-art wear resistance components with the reliably designed heavy duty screen structure.

MBE Minerals SA, tel (+27 11) 397-4660

Quarry sold on Aury's woven wire screens

The AfriSam Olifantsfontein ready-mix and aggregate quarry in Gauteng has been making use of Aury Africa woven wire screens since 2014. The screens are claimed to be more cost-effective and to last up to five days longer than competitor products, thereby minimising downtime and ensuring substantial long-term savings.

The AfriSam Olifantsfontein quarry is a dolomite aggregate operation that produces a wide range of products – including sand, ballast, gravel, crushed stones and cement – which range in size from 0,075 micron to 26,5 mm. The dolomite aggregate produced is predominantly consumed by concrete producers, due to the fact that it has cementitious properties.

The quarry recently completed a plant upgrade, which involved the repositioning of the whole primary jaw crusher to increase tonnages. As a result of this capital-intensive investment, AfriSam Production Superintendent Joseph Dlamini notes that it is essential for the operation to minimise excessive costs on plant consumables.

"The previous supplier's wire mesh lasted about 800 hours before it needed to be changed. Since switching to the Aury Africa range, changing intervals have significantly improved to 850 hours, which equates to approximately five more days of screening per screen cloth. It takes many hours to change a screen due to weight and dimensions. Since we spend less time removing Aury Africa screens, we can capitalise on our investment, which places us ahead of our competitors," he says.

With less time and money being spent on changing screens while separating excavated materials, Dlamini adds that the Aury Africa woven wire screen cloths have improved productivity at the Olifantsfontein quarry. "This also enables us to extract, sort and deliver our superior quality aggregates to our customer base in the quickest turnaround times."

Dlamini believes that Aury Africa's after-sales service and technical support is unrivalled. "A new screen cloth with new screen opening size, wire diameter, and attachment typically takes around 15 days. In some cases, we may require the screen in considerably shorter timeframes, due to customer demands, and Aury Africa representatives are always happy to accommodate us."

Kelly Houchin, Aury Africa, tel: (+27 11) 026-6642

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