

MODERN MINING

February
2017

Vol 13 No 2

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- Chrome recovery plant launched
- Walkabout to fast-track graphite project
- Improved mood at Mining Indaba



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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

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Cover

The Volvo A60H, the largest ever articulated dump truck to be launched by Volvo Construction Equipment (Volvo CE). See page 18 for an interview with David Vaughan, MD of Babcock's Equipment business, the dealer for Volvo CE and Terex Trucks in Southern Africa.



Average circulation
(July–September 2016)
4347



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Another mine mothballed in Botswana

Sad to see that Gem Diamonds has decided to place its Ghaghoo diamond mine in the Central Kalahari on care and maintenance. This is a mine I know reasonably well. I travelled to site in late 2013 by road from Gaborone in the company of Ian McAdam, who was then the Project Director (and is now semi-retired), and I returned in September 2014 (this time in a light aircraft) for the official opening, and on both occasions was highly impressed with what I saw.

Ghaghoo, of course, is remarkable on several counts. It's the first permanent mine to be established in the Central Kalahari Game Reserve and also the first underground diamond mine in Botswana. Moreover, accessing the kimberlite – buried under about 80 m of Kalahari sand – was a complex task. In the event, the project team decided to tunnel through the sand using a shield, which at the same time was used to install a concrete lining consisting of precast segments.

Shield tunnelling is not common in our part of the world and pretty rare in mining generally and, in fact, I recall Ian telling me that the use of a tunnelling shield on a decline – which dips at 8 deg – probably represented a world 'first'.

Ghaghoo has been a success technically but has fallen victim to low diamond prices. In its statement announcing the cessation of operations, Gem says the development of the mine had been progressing well and that it was close to commencing full production.

"However, the material fall in the prices of its diamonds from US\$210 per carat in early 2015 to US\$142 per carat at its most recent sale in December 2016 emphasises the weak state of the diamond market for this category of diamonds," says Gem in its statement. "With the company's focus on profitable production, the decision has been made to place the asset on care and maintenance, and to continue to monitor market conditions for a time when commencing full production would make economic sense."

I'm sure that Ghaghoo will be revived in due course but the decision to mothball it comes at a bad time for Botswana's mining industry, which has seen a rash of other closures over the past couple of years. The worst of these is undoubtedly the closure of mining operations at Selebi-Phikwe and Tati Nickel due to the insolvency of BCL.

These mines were pillars of the industry in Botswana and the effects are severe. Not only is there a huge loss of jobs – BCL employed over 4 000 workers at Selebi-Phikwe – but there are also huge ramifications for the wider

Botswanan economy. To take just one instance, BCL was a major consumer of coal from Morupule – Botswana's only coal mine – and the closure of its operations could conceivably lead to production at the colliery having to be scaled back.

Other mines to have closed are the Boseto copper mine, which ceased operations in early 2015, and the Mowana and Thakadu copper mines of African Copper, which were put on hold later in the same year. One might also mention that the newly re-opened Lerala diamond mine of Kimberley Diamonds near Martin's Drift is clearly not performing as it should, as the company announced in October last year that it was temporarily suspending mining operations (as a result of excessive stockpiles of ore being available).

Looking for the silver lining, the assets of Boseto – notably the modern concentrator plant – have been acquired by Khoemacau Copper Mining (a subsidiary of US-based Cupric Canyon) and the plan is to incorporate them into Khoemacau's ambitious Zone 5 project, which will see an underground copper/silver mine being developed, while the Mowana mine is being acquired by AIM-listed Alecto Minerals, which intends bringing it back into operation after modifying the plant to raise its capacity from 1,2 Mt/a to 2,6 Mt/a. I had a chat with Alecto's Operations Director, Dominic Doherty, at the Mining Indaba earlier this month and he is absolutely confident that Alecto and its partners can successfully resurrect a mine which has defeated the best efforts of previous owners.

As for BCL, there are various rumours floating around about potential buyers, the latest being that investors from the UAE have expressed an interest. I personally would not have thought that there's too much life left in the Selebi-Phikwe mine (although the surface assets are valuable) but there's certainly some potential at Tati Nickel – and in fact in September last year we reported that Advisian (part of the WorleyParsons group) was busy with a BFS on a proposed new open-pit operation at the Selkirk deposit, previously the site of the Selkirk underground mine which closed in 2002.

Looking somewhat further ahead, Cut 9 is clearly on the horizon at Debswana's Jwaneng mine. If it does go ahead, it will provide a major boost for Botswana's mining industry. Add to it Khoemacau's Zone 5 mine and a probable open-pit copper/silver mine at MOD Resources' neighbouring T3 deposit, and the future for mining in Botswana does not look quite as bleak as recent events suggest.

Arthur Tassell



The decision to mothball Ghaghoo comes at a bad time for Botswana's mining industry, which has seen a rash of other closures over the past couple of years.



The Mothae diamond project in Lesotho.

Lucapa's bid for Mothae proves successful

The Government of the Kingdom of Lesotho (GOL) has awarded the advanced Mothae kimberlite project to ASX-listed Lucapa Diamond Company following a competitive international tender process. Mothae has a NI143-101 indicated and inferred resource of 1 million carats.

The agreements signed by the GOL and Lucapa will see Lucapa acquiring a 70% interest in the project. The acquisition price is US\$9 million (which compares with historical development spending on the project of approximately US\$36 million).

Infrastructure and facilities at Mothae include accommodation and site offices,

workshops, a processing plant, a tailings storage facility, fresh water dams and diesel-generated power.

Lucapa's Managing Director, Stephen Wetherall, said he was delighted that Lucapa's proposal to acquire and develop the highly sought-after Mothae project had been selected as the successful bid by the GOL.

"This acquisition is in keeping with Lucapa's stated strategy of continued growth as a diamond producer and explorer. Mothae complements the producing high-value Lulo diamond mine and our highly prospective exploration assets

in the advanced Lulo kimberlite project and the earlier stage Brooking and Orapa Area F projects.

"There is only one thing better than owning one diamond mine that produces large high value diamonds – and that is owning two. Mothae is a fantastic diamond asset, located in a cluster of operating diamond mines in Lesotho and just 5 km from Gem Diamonds' Letšeng mine, which is the highest average dollar per carat hard rock diamond mine in the world. Similar to Lulo in Angola, the Mothae kimberlite pipe hosts large premium-value and Type IIa diamonds."

Wetherall further stated that Lucapa's widespread diamond mining experience and recent success in developing the Lulo mine – which delivered the highest price per carat run of mine diamond production in the world in 2016 – were key factors in its successful bid for Mothae.

The Mothae diamond resource is supported by extensive trial mining, drilling programmes and geological modelling conducted between 2008 and 2012. During this time, 31 bulk samples totalling 603 000 tonnes were extracted and processed from various locations and depths in three phases.

From these samples, a total of 23 446 carats of diamonds was recovered at an average grade of 3,88 carats per 100 tonnes (cpht) using a bottom cut-off size of -2 mm. The diamonds recovered included 96 stones weighing more than 10 carats. The gem-quality Mothae diamonds were

Avesoro Resources provides guidance for 2017

Avesoro Resources Inc (previously Aureus Mining), the TSX- and AIM-listed West African gold producer, has announced annual production guidance for 2017 of 90 000 to 100 000 ounces of gold at a cash cost of US\$750 to US\$800 per ounce of gold produced and an all-in sustaining cost (AISC) of US\$925 to US\$975 per ounce of gold produced from its New Liberty Gold Mine in Liberia.

Capital expenditure in 2017 is forecast to be approximately US\$24 million, comprising US\$10 million of non-sustaining capital allocated to enhance operations and US\$14 million of sustaining capital, a significant portion of which is non-recurring and relates to expenditure deferred from previ-

ous years. Exploration spend throughout 2017 is forecast to total US\$5 million and be focused upon discovering additional mineable near mine satellite deposits.

Commenting, Serhan Umurhan, Chief Executive Officer of Avesoro Resources, said: "In 2017 we aim to continue ongoing optimisation of the processing and mining operations and to also improve the production profile at New Liberty whilst reducing the cost of production. We remain committed to our disciplined approach to capital allocation, and enhancing the mine life of New Liberty through a near mine exploration programme that will commence during Q1 2017 and will be focused on finding additional mineable satellite deposits." ■

sold in three separate sales and achieved prices up to US\$41 500 per carat.

Previous development plans for Mothae have predominantly been focused on larger-scale mining and processing scenarios. In contrast, Lucapa will be adopting a staged, low capital and low risk approach to developing the kimberlite mine.

Lucapa and the GOL will develop the Mothae mine in two phases. Phase 1 is designed to generate early cash flows within 12 months of acquisition from a low up-front capital investment. The production plan involves processing approximately 2 Mt of weathered surface kimberlite material (including previous stockpiled material) over a minimum period of three years via conventional open-pit mining. The planned treatment rate is 720 000 t/a.

The mining costs during this phase will be minimised because the weathered surface material at Mothae can be mined as 'free dig' which does not require conventional drilling or blasting. In addition, the mine plan includes very limited waste stripping.

Capital expenditure costs to bring Phase 1 into production are estimated at approximately US\$12 million, which includes upgrading and improving the process plant to a capacity of 100 t/h, installing XRT technology to more efficiently recover large Type IIa diamonds and changing the plant front-end with further modifications to de-bottleneck the crushing.

During Phase 1 production, Lucapa will undertake additional studies to determine the scale and development of the Phase 2 plan, which will involve processing of material at higher rates from the deeper unweathered zone on a conventional open-pit, drill and blast mining method. ■

Commercial production achieved at Wassa Underground in Ghana

Golden Star Resources, listed on the NYSE MKT, TSX and the Ghana Stock Exchange, says it has achieved commercial production at its Wassa underground gold mine (Wassa Underground) in Ghana, effective January 1, 2017.

The project construction of Wassa Underground, including the installation of all ancillary infrastructure, is essentially complete and operational, in accordance with the company's planned schedule and budget.

Gold production is anticipated to continue to ramp up during 2017 as Golden Star's mining operations begin to access the B Shoot, which is a higher grade area of the Wassa Underground orebody. The company plans to begin longitudinal stoping of the B Shoot in the first quarter of 2017, with the larger, transverse stopes expected to be accessed in the third quarter of 2017.

Since Golden Star blasted the first stope at Wassa Underground in July 2016, the company has been mining development and stope ore in the F Shoot.

Total gold production from Wassa Underground in 2016 was 11 062 ounces, with the fourth quarter accounting for 7 865 ounces of this total. Total gold production from the Wassa Main Pit in 2016 was 93 319 ounces with 21 411 ounces of this being produced in the fourth quarter.

Sam Coetzer, President and

Chief Executive Officer of Golden Star, commented: "Achieving commercial production at Wassa Underground marks the successful completion of a 17-month construction period. It is also another important milestone in our transformation into a high grade, non-refractory gold producer. Golden Star also anticipates that it will benefit from Wassa Underground's lower cost production, as a result of the higher grade ore being fed into the Wassa processing plant. I want to thank our project construction team for their outstanding efforts as Wassa Underground was constructed safely, on schedule and within our capital budget." ■



Wassa Underground, seen here, is now supplementing the open-pit production at Wassa (photo: Golden Star Resources).



Petra's expansion projects improve ROM grade profiles



Tips and impact breakers on 839 level – the new production/extraction level for Cullinan's C-Cut project (photo: Petra Diamonds).

In its latest trading update for the six months ended 31 December 2016 (H1 FY 2017), Petra Diamonds says that production was up 24 % to 2,01 million carats (compared to 1,63 Mct for H1 FY 2016) due to increased contribution from undiluted ROM ore leading to improved ROM grades, and additional tailings production from Kimberley Ekapa Mining.

The Group says it remains on track to deliver full year production of approximately 4,4 to 4,6 Mct.

Underground expansion projects

remain on track with Finsch's Block 5 SLC and Cullinan's C-Cut Phase 1 delivering initial production during the period as evidenced by the improving ROM grade profiles.

Finsch's ROM carat production increased 9 % to 816 001 carats, driven by improved ROM grades of 54,5 cpht due to continued pillar mining in Block 4 and the increasing contribution from the newly established Block 5 SLC, partially offset by lower ROM tonnes. Overall production reduced by 6 % to 1,03 Mct, due to the

planned reduction in tailings production.

Cullinan's diamond production increased 30 % to 419 754 carats, in line with the company's guidance. Initial production from the C-Cut phase 1 block cave, coupled with continued pillar and reclamation mining, resulted in a ROM grade of 34,5 cpht for the period, an increase of approximately 15 % on ROM grades achieved in H2 FY 2016, and in line with company guidance of 33 to 35 cpht for H1 FY 2017.

As announced during the Q1 FY 2017 Trading Update, production at Koffiefontein was hampered by downtime required to resolve issues encountered in the SLC ore handling infrastructure. The mine is now set to deliver planned levels of production from H2 FY 2017 onwards.

Kimberley Ekapa Mining's attributable production delivered 432 174 carats further to the acquisition of the Kimberley Mines and the associated tailings resources during January 2016. Underground mining production continued as expected and treatment of ROM tonnes was restricted due to the planned installation of a crushing circuit at the Central Treatment Plant to process fresh ROM ore.

ROM stockpiles of around 200 000 tonnes were built up during the period and these will be processed during H2 FY 2017. Tailings grades of 12,1 cpht were achieved, above the 9-10 cpht grades previously guided, due to increased recovery of diamonds in the smaller size categories.

At the Williamson mine in Tanzania, diamond production increased 12 % to 106 831 carats (with larger volumes of ROM tonnes treated). During the period, commissioning of the newly installed mill section commenced and is expected to be completed during Q3 FY 2017. Once fully commissioned, both ROM grades and throughput will improve and therefore Petra is maintaining its full year production guidance.

The commissioning of the new Cullinan plant is due to commence towards the end of the current quarter (Q3 FY 2017), with production from the old plant ceasing by the end of February, allowing for tie-ins between the new and existing infrastructure and the commencement of sectional commissioning of the new plant. Petra says that ramp up to full production is expected in Q4 FY 2017. ■

Afarak restarts opencast mining at Mecklenburg

Afarak Group has entered into a 'Mining Services Agreement' with Pholagolwa Mining to continue the opencast mining at its Mecklenburg chrome mine on the Eastern Limb of the Bushveld Complex. Work is currently underway on increasing the high wall to 65 m from 40 m. The first tonnages are expected shortly and full production is expected to be reached by April for a period of six months.

Full production will be 30 000 tons of chrome ore per month and the total opencast for the project is expected to be just over 200 000 tons of chrome ore. This will also allow better access to the underground mining area which has the potential to produce 4,5 million tons of chrome ore.

Development of the shaft is scheduled to start later this year.

Dr Alistair Ruiters, outgoing CEO of Afarak, said that this project highlights Afarak's responsiveness to market conditions. "In response to the market upswing, an opportunity was identified in increasing the high wall and which will allow opencast mining and facilitate underground mining. This added production capacity allows us to reap the benefits of the current market upswing."

Afarak is a global vertically-integrated producer of speciality alloys with operations in South Africa, Turkey, Germany, London, Helsinki and Malta. It is listed on the NASDAQ OMX Helsinki Stock Exchange and the London Stock Exchange. ■

Syama underground mine on track

Reporting on the quarter ending 31 December 2016, ASX-listed Resolute Mining says that the Syama underground mine is on track to deliver first development ore over the coming quarters and first production ore during the second half of 2018.

Syama is located in the south of Mali, approximately 30 km from the Côte d'Ivoire border and 300 km south-east of the capital, Bamako. The Syama operation comprises two separate processing plants: a 2,1 Mt/a sulphide processing circuit and a 1,3 Mt/a oxide processing circuit.

Mining at the main Syama open pit was completed in May 2015 with ore for the sulphide circuit being sourced from stock-piled material. Ore for the oxide circuit is provided by mining satellite orebodies. A Definitive Feasibility Study announced last year outlined a plan for the new underground operation to extend the mine life at Syama beyond 2028.

Excavation of the decline continued during the quarter with the 1200 portal completed along with the 1200 Fresh Air level (1200 FAD). Excavation advanced on both the decline to the 1130 level and the incline to the main boxcut entrance at the south-eastern edge of the Syama pit.

Resolute says it is committed to investigating and adopting appropriate leading edge technology solutions and innovations to increase efficiency and productivity. Discussions continued with a number of equipment manufacturers over the quarter to ensure the proposed mine design at Syama captures the safety and productivity benefits that new technologies can provide. With drilling results indicating significant extensions to the depth and mine life of the Syama under-

ground mine, a preliminary study into the viability of using underground crushing and conveying instead of truck haulage was completed and is being evaluated.

Updating on its other projects at Syama, Resolute says that Project 85 remained on schedule with the site civil work completed. The staged commissioning on the project is on track for the end of March 2018. Project 85 is targeting a 7% increase in current gold recovery levels in the sulphide treatment plant based on the typical feed grade of the future underground ore.

A second project – Project Reprise – involves reclaiming deslime tailings from a dedicated storage facility and processing this material through the roaster and the sulphide treatment plant. Outotec has been commissioned to undertake preliminary engineering to develop a Low Carbon Roaster with mechanical tie-ins to be implemented during the planned roaster shut in October 2018. Successful implementation should see a further improvement in gold recoveries.

Finally, Project Phoenix involves the assessment of economically recovering residual gold from the reclamation and treatment of stored flotation tailings. One sector of the Flotation Tailings Storage Facility (FTSF) was drilled during the December 2016 quarter using aircore drilling. Assay results from the drillholes provided sufficient confidence for the Resolute board to approve additional funds to conduct a specialised drilling programme to test the grades within the FTSF. The rig will be mobilised from South Africa and is expected to be drilling in late March/April 2017. The programme will also provide samples for metallurgical testing of the tailings material. ■



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The 1200 portal at the Syama underground mine (photo: Resolute).



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Randgold delivers record gold production in 2016

In its report for the fourth quarter and year ended 31 December 2016, Randgold Resources says it increased production for the sixth successive year in 2016 while reducing total cash cost per ounce. With profit of US\$294,2 million up 38 % on the previous year, the board has proposed a 52 % increase in the dividend to US\$1,00 per share.

The flagship Loulo-Gounkoto Complex in Mali set a blistering pace to exceed its annual guidance by 37 000 ounces at its lowest-ever total cash cost per ounce, and solid performances from the other mines contributed to the record group production of 1,25 Moz (2015: 1,21 Moz). The group's total cash cost per ounce of US\$639 was down 6 % on the previous year.

In spite of the high level of activity at its operations, Randgold broke another record by reducing its lost time injury frequency rate by 22 % to a lowest ever 0,46.

Chief Executive Mark Bristow said in a year of significant achievements, it was also notable that Randgold had passed its net cash target of US\$500 million, with US\$516,3 million in the bank at the end of 2016, and no debt.

Turning to the operations, he said Tongon in Côte d'Ivoire had achieved its revised production guidance and reduced its total cash cost per ounce while Kibali in the DRC came back strongly after a slow first half and upped quarter-on-quarter production by 21 % in Q4. The shaft development of Kibali is scheduled for completion by the end of this year with the integration of its underground mine's decline and vertical shaft systems. Kibali's second hydropower station has just started commissioning while the third station is currently being built by an all-Congolese contracting team.

Randgold's first mine, Morila in Mali, is now a tailings retreatment operation but continues to make a contribution towards its rehabilitation costs. As it heads for closure in 2019, Morila has advanced its plans for an agribusiness centre – which will encompass the wide range of agribusiness projects it initiated over the years – to the point where this qualifies for government support as an 'agripole'. The development of this project is in line with Randgold's policy that its host communities should benefit



Above: Open-pit mining at Tongon in Côte d'Ivoire. The mine achieved its revised production guidance and reduced its total cash cost per ounce in 2016.

Right: A safety briefing at Loulo. Randgold broke another record by reducing its lost time injury frequency rate by 22 % to a lowest ever 0,46 during 2016 (photos: Randgold).



from its activities, even after mine closures.

"We have shared with the market our 10-year plan, which shows how we plan to sustain our profitability over the next decade at a gold price of US\$1 000 per ounce. It also envisages – but does not depend on – the development of three new mines over the next five years," Bristow said.

"The board has now given the go-ahead for the Gounkoto super pit and the technical and financial study on the Massawa-Sofia project in Senegal has demonstrated that this has the potential to meet our investment criteria. In the meantime, our exploration programmes have continued to add reserves at Loulo-Gounkoto and Sofia and to expand our portfolio in Côte d'Ivoire. As reported earlier, we have also increased our presence in our target areas through a number of early-stage joint ventures."

In its report, Randgold notes that the Gounkoto super pit option was shown to be economically more attractive than the

smaller pit and underground option. It also had other benefits including a lower operational risk in managing the local grade variability present in the high grade portions of the Gounkoto orebody and ore flexibility for the Loulo-Gounkoto complex. An additional smaller underground opportunity still exists below the super pit which will be investigated with a feasibility study in 2017.

The super pit project envisages that the total ore mined from the Gounkoto super pit and Faraba pit will total 17,9 Mt of ore at an average grade of 4,2 g/t containing 2,4 Moz of gold. A strip ratio of 13,7:1 gives total tonnes mined of 263 Mt, which includes 60 Mt of capitalised waste stripping, representing the excess waste in periods where the strip exceeds the average LoM strip ratio. The capex is estimated at US\$69,8 million including the surface water diversion trench, pumping, workshop and the rebuilds of equipment, while a further US\$139 million is expected to be capitalised in respect of waste stripping. ■

New drill results expand Kakula copper discovery

TSX-listed Ivanhoe Mines has announced assay results from another 25 holes as part of the ongoing 2016-2017 drilling campaign at the Kakula Discovery on the company's Tier One Kamo-Kakula copper project. The project is located to the west of the mining centre of Kolwezi in Katanga in the DRC.

The Kakula Discovery remains open along a north-westerly/south-easterly strike. Massive potential for resource expansion is considered to remain within the Kakula Discovery area. High-grade, chalcocite-rich copper mineralisation has been outlined along a corridor that currently is approximately 1 km wide and at least 5,5 km long.

According to Ivanhoe, the latest drilling results further reinforce the exceptional continuity of high-grade copper mineralisation and the relatively flat-lying geometry.

Highlights include DD1093, a step-out hole drilled 1,6 km north-west of the

boundary of Kakula's current inferred resources, which intersected typical Kakula-style mineralisation similar to holes drilled in the centre of the high-grade Kakula Discovery.

The hole intersected 11,10 m (true width) of 5,82 % copper at a 3,0 % copper cut-off, beginning at a downhole depth of 993,0 m; 11,10 m (true width) of 5,82 % copper at a 2,5 % copper cut-off; 11,90 m (true width) of 5,7 % copper at a 2,0 % copper cut-off; and 12,88 m (true width) of 5,26 % copper at a 1,0 % copper cut-off.

"It is remarkable to drill a step-out hole more than 1,6 km beyond the limits of the previous mineral resource boundary and intersect almost identical, high-grade, chalcocite-rich mineralisation," comments Ivanhoe's Executive Chairman, Robert Friedland.

"The open-ended nature of the extremely high-grade copper mineralisation at the unfolding Kakula Discovery certainly has caught the attention of the

mining industry. The ongoing results speak for themselves – and leave me speechless."

In addition to the drill holes that extend the Kakula Discovery to the north-west, hole DD1079, drilled 400 m south-east of Kakula's current inferred resources and beyond a line of poorly mineralised drill holes, intersected significant Kakula-style chalcocite mineralisation within a siltstone unit.

The hole intersected 3,51 m (true width) of 3,63 % copper at a 3,0 % copper cut-off, beginning at a downhole depth of 851,0 m; 3,51 m (true width) of 3,63 % copper at a 2,5 % copper cut-off; 3,51 m (true width) of 3,63 % copper at a 2,0 % copper cut-off; and 3,51 m (true width) of 3,63 % copper at a 1,0 % copper cut-off.

"This hole provides profound encouragement for the potential continuity of Kakula-style mineralisation along strike to the south-east," said David Edwards, Geology Manager for the Kamo-Kakula project. ■

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AECOM wins accolade for AMD treatment plant



View of the completed Eastern Basin Acid Mine Drainage (AMD) treatment plant.

AECOM has received a 'Highly Commended' citation at *Construction World's Best Projects Awards 2016* for its work on the Eastern Basin Acid Mine Drainage (AMD) treatment plant for main client, the Trans Caledon Tunnel Authority (TCTA). This is one of the largest high-density sludge (HDS) plants in the world, with a maximum treatment capacity of 110 Mℓ/d.

AMD poses a major environmental threat on the Witwatersrand. The depletion of gold reserves in the area has meant a cessation of mining activities and related dewatering operations, which has resulted in the flooding of mining voids. AMD is generated when ore and other sulphide-containing mining waste is exposed to oxygen and water. The water in the mining voids thus becomes acidic

and contaminated with heavy metals.

TCTA was mandated by the Department of Water Affairs to implement the necessary AMD water management and treatment infrastructure. The project encompassed treatment plants in the Randfontein Estates area (Western Basin), the ERPM South-West Vertical Shaft area (Central Basin) and the Grootvlei Mine Shaft No 3 area in Springs (Eastern Basin).

The Eastern Basin plant designed by AECOM (in association with Golder Associates) followed typical industry practice for water/wastewater treatment works, says Claire Hurrell, Senior Civil Engineer, Africa for AECOM. "Some aspects of the detailed design were verified and optimised using state-of-the-art techniques, which not only added value to the engi-

neering, but also ensured cost-savings for the client."

Hurrell explains that, due to the size of the project, AECOM decided to standardise on tried-and-tested technology, as this has been proven to work best globally. "However, we were able to improve on the standard abstraction method."

The three 20-m long by 1-m diameter super duplex stainless steel deep-level abstraction pumps selected were installed from ground level down into the 370-m-deep shaft, allowing for the abstraction of the AMD without having to re-establish underground workings.

Construction began in June 2014, and was completed in August 2016. The total construction cost was just under R1 billion. The main contractor was the CMC/PG Mavundla Eastern Basin Joint Venture, with Andritz supplying the deep-level abstraction pumps.

Prior to construction, an underwater camera was lowered into the flooded mine shaft at the Eastern Basin to check for any blockages or significant damage to the shaft. A modified underwater sonar system was also deployed to provide a wider field of view in order to reduce the potential risk of damage to the abstraction pumps.

Such preliminary investigation was essential as the mine shaft had been in disuse for several years, and had seen a lack of maintenance, as well as vandalism by illegal miners.

Additional constraints were posed by a railway on one side and a wetland on the other. Therefore the plant design allowed for the deep excavations for the thickener recycle pump station to be moved as far as possible out of the wetland area for ease of construction.

However, these excavations still posed a considerable construction challenge, as the excavated material was silty clay prone to shear failures. Hence extreme care had to be taken during excavation.

"A decision was taken to use self-drilling anchors, which flush the area with grout while drilling takes place. This allows the hole to remain open while the voids are being grouted and stabilised in the same operation," Hurrell explains. "The solution was implemented successfully, allowing for the necessary lateral support to be installed in the large thickener excavations." ■

Kennedy Ventures appoints Chief Executive Officer

Kennedy Ventures, the AIM-quoted investment company which – through its stake in African Tantalum (Aftan) – has an interest in the Tantalite Valley Mine (TVM) in Namibia, has announced the appointment of Larry F Johnson as its new Chief Executive Officer with immediate effect. Johnson replaces Peter Hibberd.

Johnson, aged 58, has more than 25 years' experience in the tantalum industry having worked with two large US-based publicly listed companies with core inter-

ests in tantalum. During his career, he has held several senior key positions, most recently as Director: Mining and Global Tantalum Supply Chain at KEMET Electronics Corporation.

Johnson will be based in Windhoek, Namibia, where he will be seeking further investment opportunities and managing the company's investment in Aftan.

Peter Hibberd has been with the company for two years and steps down from the board to pursue other business interests. ■

Aveng Moolmans to mine at Karowe

Canada's Lucara Diamond Corp has announced the appointment of Moolman Mining Botswana (Pty) Ltd (Aveng Moolmans) as its new mining contractor at the company's 100 %-owned Karowe diamond mine in Botswana.

Aveng Moolmans, a company forming part of Aveng Mining, has been contracted for a six-year period to provide the full suite of mining services at the Karowe mine, including all drill, blast, load and haul functions for both ore and waste. Aveng Moolmans is currently mobilising to site and expects to begin mining activities in early March 2017.

"We are very pleased to have engaged Aveng Moolmans as our new mining partner at the Karowe mine," says William Lamb, Lucara's President and CEO. "Their extensive expertise in working in Botswana and other African countries, together with their proven track record and their ability to achieve production volumes over the contract period, makes them a valuable partner as we work to maximise the future value of this incredible resource, at Karowe, for our shareholders and all our stakeholders in Botswana.

"The transition to Aveng

Moolmans also provides the company with increased mining flexibility and capacity to achieve sustainable production and continued strong operating cash flows.

"Since December 2016, we have continued to process ore from the south and centre lobe stockpiles and are in line to achieve our production and operating guidance for 2017."

Comments Stuart White, Operating

Group Managing Director, Aveng Mining: "We are grateful for the opportunity of joining the Lucara team at the Karowe mine as its mining department and look forward to adding value to this prestigious diamond mining operation.

"This long-term project allows us to build on our 15-year presence in Botswana in which we will strive to make a positive contribution to all our stakeholders, including the communities in which we operate." ■



The open pit at Lucara's Karowe mine in the Orapa area of Botswana (photo: Lucara).

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Mining of the open pit at Buzwagi (seen here) is now expected to continue until the end of 2017 and will be followed by at least two years of processing stockpiles (photo: Acacia).

Another strong quarter from Acacia Mining

In its fourth quarter production report for the three months ended 31 December 2016, LSE-listed Acacia Mining says that its three Tanzanian gold mines produced 212 954 ounces, a 6 % increase on the corresponding quarter of 2015 and a 4 % increase on Q3 2016. The preliminary AISC is put at US\$952/oz sold, after a US\$47 per ounce credit in respect of share-based payments, 5 % lower than Q4 2015.

The increase in production was predominantly driven by higher grades and recoveries at North Mara and increased run-of-mine processing at Bulyanhulu.

North Mara gold production of 91 183 ounces was 18 % higher than the prior year period as head grade increased by 16 %

compared to Q4 2015 due to the higher grade contribution from the Gokona underground mine. Also contributing was an increase in the open-pit mine grade at Nyabirama combined with a resultant 3 % higher recovery.

At Bulyanhulu, total production amounted to 79 859 ounces, 2 % above Q4 2015. Production from run-of-mine processing of 70 808 ounces was 6 % ahead of Q4 2015 as head grade increased by 5 % due to an improvement in underground mined grades, in combination with a 3 % increase in recovery. The increase in run-of-mine production was partly offset by a 20 % (2 298 ounces) decrease in production attributable to reprocessed tailings due to

lower head grade and resultant lower recovery, partly offset by higher throughput.

Gold production at Buzwagi of 41 912 ounces was 7 % lower than in Q4 2015, driven by a 14 % lower head grade as a result of ore tonnes being sourced predominantly from the lower grade splay areas due to a change in mine sequencing.

Acacia notes that 9,6 Mt were mined for the quarter compared to 10,1 Mt in Q4 2015, primarily due to lower waste tonnes mined at Buzwagi. Ore tonnes mined of 2,6 million were 8 % lower than Q4 2015, mainly due to lower ore tonnes from the Nyabirama open pit at North Mara as mining focused on waste stripping of the next stage of the pit.

"We are pleased to report strong fourth quarter production of 212 954 ounces, which resulted in record full year production of 829 705 ounces, almost 100 000 ounces ahead of 2015 and above already increased guidance," comments Brad Gordon, CEO of Acacia. "2016 was the fourth consecutive year of production growth at Acacia, which was driven by a record production year at North Mara and the highest production year at Bulyanhulu since 2006.

"The strong operational performance during the quarter led to a further build-up in cash of US\$16 million, representing an increase of US\$114 million in net cash during 2016. We are also pleased to confirm we will extend mining at Buzwagi by six months, and it will now continue until the end of 2017 before at least a further two years of processing stockpiles." ■

Milestone for Nachu graphite project in Tanzania

ASX-listed Magnis Resources has announced another key milestone in the development of its Nachu graphite project in Tanzania with the signing of a Memorandum of Understanding (MOU) with Russia's ROSATOM International Network (ROSATOM) for project financing and offtake of Super Jumbo and Jumbo flake graphite.

"ROSATOM is the world leader in the development and construction of nuclear reactors with over US\$130 billion worth of orders in place," comments Frank Poullas, Chairman of Magnis. "Larger flake graphite which our Nachu project will produce is a key material used in these nuclear reactors and it is highly sought after. Our

project therefore is strategically important to ROSATOM over the longer term."

Under the agreement, both organisations will work together towards a binding offtake agreement once further negotiations take place and certain milestones are met. Interest revolves around the Super Jumbo (+500 microns) and Jumbo (+300 microns) flake graphite sizes.

Through its subsidiary, Uranium One, ROSATOM is the owner of the Mkuju River uranium project located in Southern Tanzania which was acquired in 2011 from ASX-listed Mantra Resources. Over US\$1 billion was paid for Mantra Resources despite the Fukushima incident taking place during the transaction. ■

Opencast operations start at New Clydesdale

ASX-listed Universal Coal has secured a five-year, 650 000 sales tonnes per annum export contract with a global commodities trader, providing additional security for the New Clydesdale Colliery (NCC) debt facility and enabling commencement of opencast operations.

The opencast operation represents the second phase of the planned 3,3 Mt/a ROM NCC development, following the commencement of underground operations in September 2016.

The underground operation delivers primarily 6 000 kcal thermal coal, focused on the export markets, from the Diepspruit shaft, and is set to achieve nameplate annualised tonnage rates of 900 000 t/a ROM by the end of the current quarter.

Opencast operations will deliver a further 2,4 Mt/a ROM premium quality domestic thermal and 'low phos' metallurgical coal from the adjacent Roodekop pit once steady state is achieved in mid-2017, translating to contracted sales tonnes of 1,2 Mt/a to Eskom and 0,1 to 0,2 Mt/a of low phos metallurgical coal sales.

Universal's CEO Tony Weber commented: "With both the Eskom and the long-term export offtake agreements now secured for NCC, the debt funding is now near complete, thereby having allowed for the commencement of the Roodekop opencast operation. Additionally, the long-term export coal contract provides us with significant exposure to the improved thermal

coal export market and further advances our revenue diversification strategy.

"Upon achieving steady state at NCC mid-2017, Universal and our partners will be producing saleable coal at a rate in excess of 4 Mt/a over our two operations from a total ROM exceeding 6,5 Mt/a. We expect NCC to generate robust cashflow, complementing contributions from our first mine at Kangala, positioning Universal well to fund future growth while underpinning a dividend return going forward. We remain growth oriented with a focused and disciplined approach in advancing our excellent project pipeline for further organic growth," Weber continued.

During the December 2016 quarter, NCC delivered first export quality coal sales totalling 107 570 tonnes from the Diepspruit underground operation, ramping up from 27 710 tonnes in October to 42 860 tonnes in December. Currently two of the three coal handling and preparation plants (CHPPs) are operating, with the third CHPP set to be operational by the end of the first quarter of 2017.

Trollope Mining Services, the appointed opencast mining contractor for the Roodekop operation, has started site establishment activities and has also commenced with stripping overburden in lieu of the box cut development. ■

Bannerman starts on update of Etango DFS

ASX-listed Bannerman Resources has started work on a Definitive Feasibility Study (DFS) update for its flagship 100 %-owned Etango uranium project located in Namibia. This follows the successful completion of the Etango heap leach demonstration plant programme.

The six-phase demonstration plant programme was initiated in 2014 with excellent results reportedly being generated across all phases. Among other things, the test-work demonstrated exceptional leaching dynamics (93 % extraction in 22 days) and lower acid consumption (14,4 kg/tonne), confirming Etango's low potential risk.

"Our two year commitment to the Etango

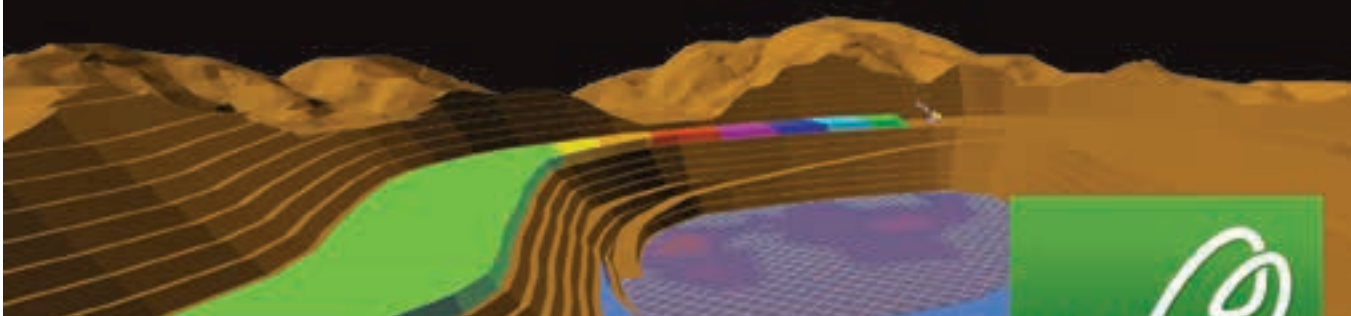
demonstration plant programme has been a remarkable success," comments Brandon Munro, CEO of Bannerman. "Not only have we consolidated Etango's position as one of the most advanced large uranium projects globally, but we have also generated substantial opportunities to enhance and further de-risk the Etango project.

"Combined with the excellent internal engineering our team has undertaken over the last year, and partnering with AMEC Foster Wheeler, we can now evaluate a stream of potential capital and operating cost wins that should collectively deliver a DFS Update which substantially improves Etango's forecast economics." ■


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The Asanko processing plant operated at an annualised rate of 3,6 Mt/a (20 % above design) during Q4 following crushing circuit upgrades in late Q3 2016 (photo: Asanko Gold).

Impressive quarterly performance by Asanko Gold Mine

Asanko Gold Inc, listed on the TSX and NYSE MKT, has announced production results for the fourth quarter of 2016 (Q4) from Phase 1 of the Asanko Gold Mine (AGM), located in Ghana.

Ore mining rates in the quarter averaged 433 353 tonnes per month (tpm) at an average mining grade of 2,0 g/t. Ore mining took place from the central portion

of the pit as well as the newly opened up 'eastern flank'. The dual ramp system was fully commissioned enabling access from both the eastern and western sides of the Nkran pit. Focus on waste mining shifted to the north and western sides in preparation for the next sequence of ore mining in the centre and east of the pit.

The processing plant operated at an

annualised rate of 3,6 Mt/a (20 % above design) during the quarter following the crushing circuit upgrades in late Q3 2016. In addition, metallurgical recoveries continued to exceed expectations at 94 %. With the benefit of six months of steady-state operations data, the company expects these recoveries to continue into the foreseeable future. As a result, gold production for the quarter averaged 19 000 ounces per month, which is well above the original feasibility parameters.

Gold production for the quarter was 57 178 ounces with gold sales of 58 483 ounces at an average realised price of US\$1 199 per ounce, generating gold sales revenue of US\$70,1 million.

Commenting on the quarter's performance, Peter Breese, President and CEO of Asanko Gold, said, "The operations once again had an impressive quarter with record production of over 57 000 ounces. With the mine now delivering against expectations and the process plant running steadily at 300 000 tonnes per month, or about 20 % above design, we enter 2017 with a high performance operating asset that will position us well to finance our Phase 2A expansion project with cash flow from the operations.

"Such a strong operating performance would not be as meaningful without the requisite safety performance and I'm again delighted to report that no Lost Time Injuries were recorded during the quarter. It underscores the tremendous efforts of the on-site team who I commend for their dedication and hard work during a transformational year." ■

Ramp-up at Montepuez progressing well

ASX-listed Mustang Resources reports that its strategy to ramp up production and generate the first sales revenue at its Montepuez ruby project in Mozambique is firmly on track, with commissioning of the relocated processing plant now completed. The relocation has placed the plant closer to the key Alpha deposit and important water sources.

Production is currently ramping up to the targeted rate of 525 tons/day (approximately 11 025 tons per month, assuming 21 operational days per month running one shift), which is forecast to result in a substantial increase in the company's monthly ruby production.

Mustang also reports that it has sent its first commercial batch of rubies to US service providers and customers. These include the highly regarded gemstone cutter Meg Berry and leading jewellers in California. This shipment is aimed at enabling Mustang to obtain further opinions from experts about the range in potential ruby values and the best marketing strategies to unlock their maximum value.

"The initial results following the plant relocation suggest we can triple through-

put rates," says Mustang's MD, Christiaan Jordaan. "At the same time, we have achieved a key milestone for Mustang with the first commercial shipment of rubies recovered through bulk sampling as well as our highly successful prospecting teams that form part of our local community engagement and employment programme."

Mustang reports that it mined and stockpiled 15 585 m³ of ruby-bearing gravel (including the immediate material above and below the gravel contacts) from the Alpha deposit during the period from the start of the bulk sampling programme to 20 January 2017. Of this total, 7 290 m³ was processed through the plant resulting in the recovery of 1 638,76 carats of high quality ruby.

In addition to these recoveries, Mustang has used prospecting teams to assist in its exploration programme and to accelerate the discovery and testing of new areas which can then be followed up with bulk sampling and auger drilling. The company says this strategy has already proven itself to be highly successful in covering a great deal of ground and rapidly testing new areas. ■

Avnel improves the figures for Kalana Main project

TSX-listed Avnel Gold Mining has announced the results from a number of optimisation programmes for its fully permitted Kalana Main project in south-western Mali, for which a Definitive Feasibility Study (DFS) was published on March 30, 2016.

The Optimised Feasibility Study (OFS) results indicate an increase of 25 % in the after-tax NPV to US\$321 million, at a 5 % discount rate, compared to US\$257 million estimated in the DFS, and an improvement in the after-tax internal rate of return (IRR) to 50 %, compared to the 38 % IRR in the DFS at a gold price of US\$1 200/oz.

The OFS does not incorporate any changes to the project's underlying NI 43-101 compliant mineral reserves and resources and the production profile and the mining plan of the project outlined in the DFS remain unchanged; however, as a result of the optimisation process, the project's cost structure has been reduced.

Initial capital expenditure has been lowered by US\$25 million to US\$171 million and, accounting for pre-commercial production revenue generated from processing historic tailings from the existing underground Kalana gold mine, the net funding requirement to commercial production, including contingency, is estimated at US\$139 million, approximately US\$24 million lower than previously estimated in the DFS.

"The optimised feasibility programmes demonstrate significant financial improvements in the Kalana Main project and on a sensitivity basis indicate attractive returns even at gold prices materially below the

current spot price," comments Howard Miller, Chairman and CEO of Avnel.

"With the improved results from the optimisation, Avnel is in advanced discussions on project debt financing for a substantial portion of the required capital and is also considering other strategic alternatives to advance the Kalana project to production and maximise value for shareholders."

The OFS incorporates certain design refinements undertaken since the release of the DFS, including the removal of the standby cone crusher (saving US\$0,8 million) and the addition of a mineral sizer (adding US\$1,4 million).

These minor changes will serve to de-risk ore handling at the project in the event of exceptional rain fall. Further, the changes provide increased flexibility for a different character of saprolite ore from Kalanako or other satellite deposits.

The DFS proposed that saprolite would pass through a jaw crusher prior to milling. Fresh ore would also pass through the jaw crusher and then be crushed in a secondary crushing circuit. As fresh ore will not be milled until, at the earliest, month 30 of the project, the capital expenditure for the run of mine bin, jaw crusher and secondary crusher will be postponed from Phase 2 to Phase 3.

As part of the optimisation process, Avnel has advanced discussions with an international power provider to the mining industry, KPS Africa (Pty) Ltd, to provide an 'over the fence' power supply based on a hybrid plant utilising fossil fuel and solar energy sources. The power provider will fund the project capital and charge the

company a rate per kWh. The capital cost, including sustaining capital, in the DFS was significantly reduced to provide only for civil works.

For the first five years, operating cost per kWh will be impacted by the recovery of capital investment. The project predicts that 20 % of the power requirements will be generated from the solar plant, leading to significant cost reductions and a lower environmental impact. Project risk is reduced by the power provider being contracted for the operation and maintenance of the power plant, plus the risk of any higher fossil fuel prices.

Avnel has agreed in principle to appoint a joint venture of DRA Mineral Services and Group Five Projects to be the Engineering, Procurement and Construction (EPC) contractor for the project. The EPC covers Phase 1 and Phase 2 of the gold plant construction to enable the processing of the existing tailings and saprolite ore. Phase 3 will enable the processing of fresh rock and will be implemented as an EPCM contract.

Snowden Mining Industry Consultants reviewed the mining schedule and optimised the haulage profiles for the later years of the mine life. This resulted in a decrease in mining cost of US\$20 million over the life of the mine.

Avnel is considering the option of undertaking contract mining. This is not included in the optimisation of the DFS. Any decision to employ contract mining would be subject to further negotiations with mining contractors, as well as additional due diligence from both Avnel and any project lender. ■

Vector gears up for Maniema exploration

Vector Resources has confirmed the appointment of several key technical and administrative management personnel to accelerate on ground exploration activities at the company's recently acquired Maniema gold project in the DRC.

Experienced Congolese geologists Falanka Afi Antoine, Lukusa Mukengabantu Jean and Diallo Abdoulaye have all been appointed to manage and implement the upcoming exploration programme under the oversight of the company's Senior Consulting Geologist, Peter Stockman.

The confirmation of the in-country

appointments follow meetings in Kinshasa by the company's newly appointed Chief Executive Officer, Simon Youds, with key staff and the company's joint venture partner.

"These technical appointments demonstrate the company's intent to immediately commence and aggressively explore its significant and highly prospective ground holding at the Maniema gold project," said Youds.

"Our senior Congolese geologists bring a thorough understanding of the Maniema gold project, having been involved in all

aspects of the historical exploration activities carried out there over the past five years.

"Importantly, they have already added significantly to our understanding of the project and identified many new and exciting areas that will now be followed up as part of the company's planned exploration programme this year."

In addition to the technical appointments, the company has also appointed Makonga Ngoy Pelasa as the Country Director, Munganga Sumaili Gode as Logistics and Administration Manager and Ngamunguela Muna Ngamunguela as Community and Government Relations Director. ■

Babcock upbeat on prospects



Dave Vaughan, Managing Director of Babcock's Equipment business.

Although he acknowledges that 2016 was a “challenging” year for all companies supplying equipment to the mining industry, David Vaughan, Managing Director of Babcock's Equipment business, says he is very optimistic on the prospects for 2017 and beyond. “We’ve noticed a change in mood amongst our customers, who clearly see better times ahead and, in some cases, are looking to renew or expand their fleets,” he says. “Certainly, we are very busy sending out quotes in response to the many enquiries we’re getting. In addition, we’ve had some excellent orders for both our Volvo and Terex machines and are starting the year with a healthy order book.”

The EC950E, the new flagship of the Volvo tracked excavator range.

Among the orders that Vaughan refers to is one from Burgh Plant Hire for the newest and biggest machines in the Volvo line-up – the Volvo A60H, the largest ever articulated dump truck to be launched by Volvo Construction Equipment (Volvo CE), and the EC950E crawler excavator, the new flagship of the Volvo excavator range. The order – for three of the A60H units and one EC950E – was

placed at last year's bauma show in Munich, Germany, and the machines are expected to be delivered within the next couple of months.

“The order from Burgh was the first order from anywhere in the world for the A60H and they will be working mainly in the Highveld coalfields,” notes Vaughan. “Burgh is a long-standing customer of Babcock and already has more than 100 Volvo machines in its fleet, mostly articulated haulers. The A60H is a





perfect match for the new EC950E, which now ranks as Volvo's biggest excavator."

He adds that both machines are attracting huge interest from customers, the A60H in particular. "In fact, the interest we've seen in the A60H is unprecedented indicating that it very clearly fills a gap in the market. It is evident that many operators have been waiting for an articulated machine of this capacity that provides an alternative to less versatile rigid trucks. I think potential customers also like the fact that it is a true articulated hauler with a standard three-axle layout which incorporates all the market-leading technology of the Volvo articulated hauler range. Volvo pioneered the articulated hauler concept just over 50 years ago and has been in the forefront of the field ever since."

The payload of the A60H is 61 short tons or 55 metric tons (tonnes). When it was unveiled at last year's bauma it offered a full 40 % increase in payload on Volvo's next biggest ADT, the 39-tonne capacity A40. Since then, Volvo CE has introduced the A45, which can carry 45 000 short tons or 41 000 tonnes. The latest incarnation of the articulated hauler range is the G Series. "We don't have any G Series machines in the country yet but will be introducing them shortly," states Vaughan.

The EC950E is a significant step up – in terms of capacity – from the EC750, which was previously Volvo's biggest excavator. A 90-tonne class machine equipped with a powerful 450 kW Volvo D16 engine, it combines power and stability with fuel efficiency and is ideal for

demanding mining applications. Quick cycle times are achieved with the enhanced hydraulics system which increases pump power for a fast and smooth operation while Volvo's unique ECO Mode optimises the hydraulic system to reduce loss of flow and pressure.

Vaughan, who became MD of Babcock's Equipment business in November last year

The new Generation 10 Terex TA400 articulated dump truck.

The pace-setting Volvo A60H, the biggest articulated hauler in the Volvo lineup.





The payload of the A60H is 61 short tons or 55 metric tons (tonnes).

(he was previously Sales Director), notes that Babcock has been the official Volvo CE dealer in South Africa since 2000 and has really put the brand on the map. “There were others before us who had the agency but we’re the ones who have made all the headway – so much so, in fact, that on three occasions we’ve been named Volvo CE ‘Dealer of the Year’.

With Volvo CE having acquired Terex’s hauler business in 2014, Babcock is now also the dealer for Terex Trucks, based in Motherwell, Scotland. “We took over as the Terex Trucks dealer in October 2015, so the Terex brand has not been with us for too long – but we’ve already had some notable successes,” states Vaughan. He adds that Babcock has forged a close relationship with Terex Trucks in Scotland, which is intent on growing

A Terex TR60 rigid truck. This is one of three new TR60 trucks recently purchased by Atlantis Mining.



its market share in the Southern African region.

Terex Trucks offers both articulated and rigid haulers. The articulated range consists of three models – the TA250, the TA300 and the TA400, with hauling capabilities from 25 to 38 tonnes – with the latest versions being the New Generation 10 machines.

The rigids come in a four model line-up, the TR45, the TR60, the TR70 and TR100, offering payloads from 41-tonne capacity to 91-tonne capacity.

Commenting on the articulated Terex units, Vaughan says these are extremely capable machines with a strong following in the local market.

“The existing customer base is very loyal to the brand and many owners have told us that they are delighted that we are now providing the support and backup. We’ve also notched up some good sales in the relatively short time we’ve had the agency, with ten TA300s and 20 TA400s being sold during 2016.”

Vaughan says that Babcock – which prior to taking on the Terex Trucks dealership was unable to offer its customers a rigid truck – is expecting to do well with these. “They’re very robust and easy to maintain and are ideal for African conditions,” he observes. “They’re also known for their rimpull and their ability to handle steep gradients. Already we’ve sold three of the TR60s to Atlantis Mining, which has deployed them in the Middelburg area. Atlantis has been using Terex trucks since the 1980s and has quite a substantial fleet of TR60s. Some of them have worked for 25 000 hours and are still going strong – which is testimony to just how durable they are.”

Vaughan says that the company is particularly excited to have the 91-tonne capacity TR100 in the range. “This is an incredibly versatile and capable mining truck and there is a considerable population of TR100s out in the field. One mining contractor is about to deploy a large fleet of them in Botswana and we will be providing the support, involving putting technicians – and a spares inventory – on site. As yet, we haven’t sold any new TR100s but anticipate sales as mining recovers. Because of the downturn experienced over the past couple of years,



Left: A Volvo EC750 tracked excavator at Babcock's new Middelburg branch. The workshop has 12 large 9 m wide bays.

Below: The Middelburg branch includes a well stocked parts warehouse.

many mines and contractors have deferred purchase decisions and are now ready to invest in new machines. We believe many of them will look very closely at the TR100.”

While Babcock has the advantage with Volvo and Terex Trucks of marketing genuinely world-class brands, this is only part of the equation. Aftermarket support is critical and Vaughan says that this is an area where Babcock excels. “We believe the support we provide is industry leading. We work closely with our customers and have our branches strategically located in areas of their operation throughout South Africa and the wider Southern African region. This is a network which few other suppliers can match,” he says.

Evidence of Babcock's commitment to customer support is provided by its state-of-the-art Middelburg branch, opened just on a year ago and representing a R100 million investment. It serves the Witbank/Middelburg area, which is home to many Babcock customers, most of them involved in coal mining.

Located on a 30 000 m² site, the new energy-efficient complex – as we reported in an article last year – includes 12 large 9 m wide workshop bays (able to accommodate trucks of up to 100 tons such as the Terex TR100), overhead craneage of up to 40 tons, dedicated washing bays for yellow metal vehicles, an industrial spray booth, a steel fabrication section for dump truck repairs and 900 m² of office space. It can handle full rebuilds and also has a huge parts holding.

Comments Vaughan: “The new facility has been a huge success and has certainly improved the backup we are able to supply to



customers, some of whom are literally just minutes away from us. Moreover, new machines shipped from our principals overseas can now be delivered directly to Middelburg rather than first having to come through our Bartlett branch in Johannesburg – this vastly improves delivery times.”

Finally, and looking forwards, Vaughan says Babcock's Equipment business is in the process of restructuring. “In essence, we're moving from a matrix organisational structure to a regional structure. This is designed to streamline the business and improve lines of communication,” Vaughan states. “We're looking forward to putting the new structure in place in the coming months and are confident that it will result in Babcock's Equipment division becoming an even more efficient and responsive organisation than it is at present with the overall customer experience being greatly enhanced.” ■

Chrome recovery plant launched

Anglo American Platinum launched a chrome recovery plant at its Amandelbult Complex in Limpopo Province in early February. The new facility, which represents an investment of R474 million, has the capacity to produce up to 700 000 t/a of commercial grade chromite concentrate. It is expected to reach steady-state production by the end of H1 2017.

The plant – the ‘Automatic Chrome Recovery Plant’, to give it its full name – was commissioned in the second half of 2016 and is owned and operated by Anglo American Platinum’s wholly owned subsidiary, Rustenburg Platinum Mines, with a 74 % stake, and Baphalane Siyanda Chrome Company (BSCC) with a 26 % shareholding. The Baphalane Ba Mantserre community that surrounds the Tumela and Dishaba mines within the Amandelbult complex owns 75 % of the share capital of BSCC, with the remainder owned by Siyanda Resources and Mega Chrome Management as technical partners.

A feasibility study for the plant was completed in 2013 with approval for the project being given the following year. Construction of the plant was undertaken by Johannesburg-based LogiMan on an EPC basis with work on site starting in April 2014. Equipment suppliers included Multotec (spirals) and JB Switchgear

Seen here at the launch of the chrome plant are (from left to right, on the right of the photo) William Taylor, General Manager, Amandelbult Complex; Seaparo Sekoati, MEC for Economic Development, Environment and Tourism, Limpopo Provincial Government; and Gary Humphries, Executive Head, Process at Anglo American Platinum.



Solutions (motor control centres and variable speed drives).

The plant has two modules, each employing a multi-stage configuration of separators and spirals. It produces two final chromite concentrates, one a metallurgical grade concentrate and the other a chemical grade. The chrome content of the concentrates is approximately 42 %. The two concentrates are pumped to their respective stockpile areas via their own dewatering separators. At the stockpile facility, the chromite is loaded onto trucks (for delivery to domestic customers) or rail wagons (for delivery to international customers via Richards Bay).

Talking to members of the media at the launch, Etienne Espag, General Manager Projects at Anglo American Platinum, said the plant allows recovery of the chromite in the UG2 slurry generated by the two UG2 concentrator plants at Amandelbult.



at Amandelbult



“The practice of recovering the chromite in the UG2 ore is now more common in the platinum mining industry so we are certainly not pioneering the technology included in this new facility,” he said. “The technology being used is well established. The plant, however, is certainly one of the biggest in the country – it has 300 spirals – and incorporates the latest in management and control technology.”

The chrome-silica cyclone underflow from the two UG2 plants serves as the dedicated feed stream to the chrome recovery plant and is pumped to two agitated feed surge tanks. From the surge tanks the slurry is delivered to desliming/separator cyclones located prior to the spirals circuit. The cyclone underflow then reports to the spirals circuit by gravity feeding. The spiral nests have been arranged to ensure optimum and equal feed distribution between all individual spirals starts. Where possible, the various stages of rougher, cleaner and recleaner spirals are stacked vertically above one another to maximise gravity feed arrangements to each section.

The plant has provided approximately 110 new permanent jobs, with roughly 75 % of them being filled by people living in the Thabazimbi



area and, in particular, the Baphalane Ba Mantserre community.

Commenting at the launch, Anglo American Platinum’s Chief Executive Officer, Chris Griffith, said: “The joint venture with the Baphalane Ba Mantserre community is directly in line with Anglo American Platinum’s strategy of empowering surrounding communities through value-generating transactions. This transaction will create long-term, sustainable empowerment and aligns with our strategy of identifying capital-light projects to generate further value from existing assets.”

Siyanda Resources Chairperson Lindani Mthwa added: “We bring our proven expertise in chrome extraction to this exciting new venture. We are proud to partner with Anglo American Platinum and the community of Mantserre. We believe that this partnership has all the ingredients to succeed now and into the future.”

The Amandelbult complex consists of the two underground mines, Tumela and Dishaba, as well three concentrators, and is located 25 km south of the town of Thabazimbi. The current working mine infrastructure has five vertical and seven decline shaft systems and both the Merensky and UG2 reef horizons are mined. The complex provides employment for roughly 15 000 people (including contractors) and in 2015 produced 437 000 platinum ounces.

Photos (unless otherwise acknowledged) courtesy of Anglo American Platinum

Above: The stockpile area with chromite concentrate in the foreground (photo: Arthur Tassell).

Left: The new chrome recovery plant at Amandelbult. It has been designed to produce up to 700 000 t/a of commercial grade chromite concentrate.

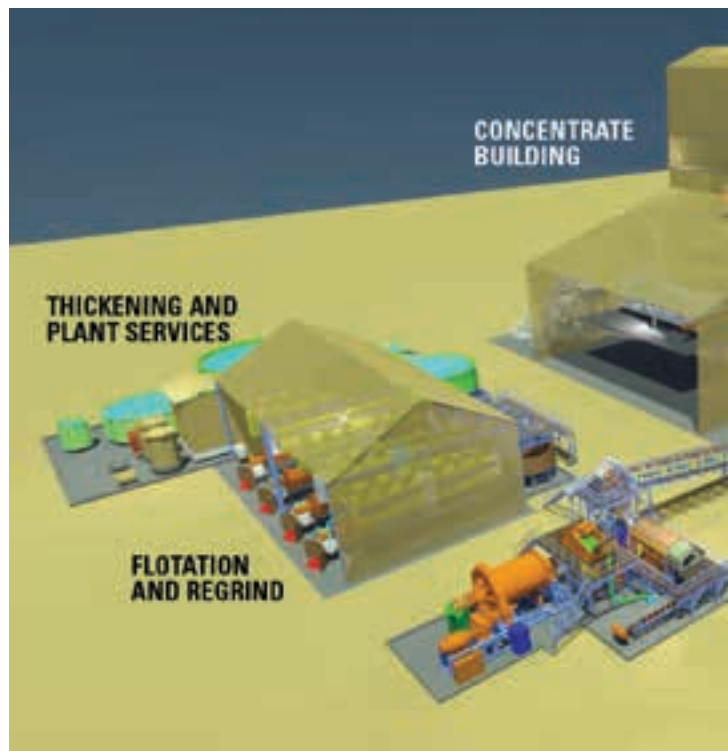
Walkabout targets early 2018

The first of the new wave of African graphite projects to come on stream is almost certainly going to be Balama in northern Mozambique, now just months away from commissioning. The second could well be the Lindi Jumbo graphite project of ASX-listed Walkabout Resources in Tanzania. Walkabout has just completed a Definitive Feasibility Study (DFS) on Lindi Jumbo and intends fast-tracking the project into production with the target for first concentrate being the first quarter of 2018.

The Lindi Jumbo project is located in south-east Tanzania approximately 60 km inland from the coast and 200 km from the Port of Mtwara. It adjoins the Nachu graphite project of Magnis Resources, also listed on the ASX. Lindi Jumbo was acquired by Walkabout in 2015 and is now the company's flagship project. Walkabout has a 70 % stake with an option to acquire the remaining 30 % from its Tanzanian partner.

Tom Murrell (left), Director, and Trevor Benson, Chairman, of Walkabout Resources pictured at the recent Mining Indaba (photo: Arthur Tassell).

Run by mining engineer Allan Mulligan, who has over 30 years of experience in mine management and production in Africa



and Australia, Walkabout also controls the Takatokwane coal project in Botswana and the Kigoma copper project in Tanzania.

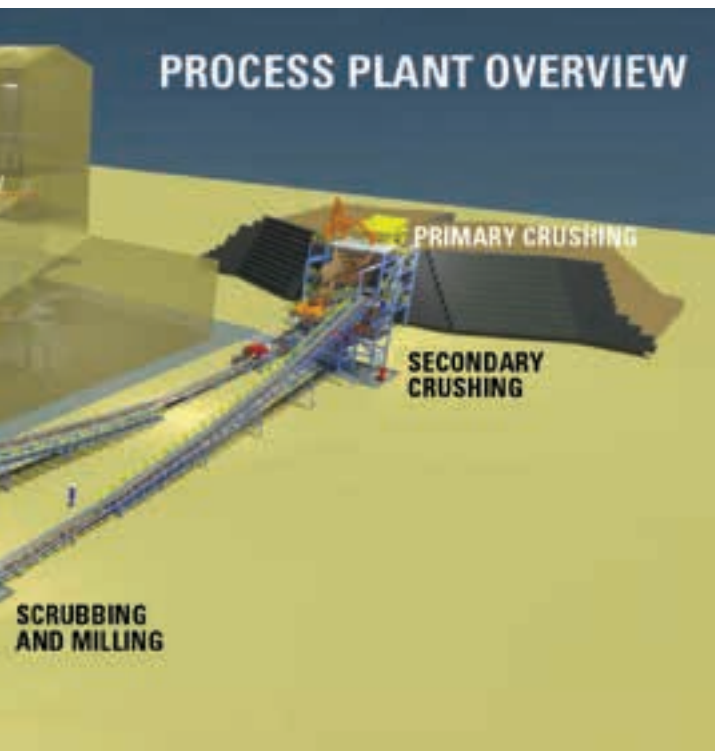
Walkabout is planning a relatively small mine at Lindi Jumbo. While Balama and Nachu, for example, will have nameplate capacities of 350 000 t/a and 240 000 t/a of graphite concentrate respectively, the equivalent figure for Lindi Jumbo is just 40 000 t/a (although this product will be of high value). The spin-off is that Lindi Jumbo will be straightforward to develop and will have a very low upfront capex of US\$38.7 million, with payback expected in 22 months. The DFS puts the pretax NPV₁₀ at US\$323 million with the pretax IRR estimated at 97 %.

The DFS estimates the on-mine cash cost at US\$292/tonne in concentrate delivered at the mine gate and US\$352/tonne FOB at the Port of Mtwara.

Modern Mining talked to one of Walkabout's directors, Tom Murrell, at the recent Mining Indaba in Cape Town. He said that Walkabout was totally committed to bringing Lindi Jumbo into early production. "We've gone from discovery to completion of a DFS in only 17 months, which is incredibly fast," he said. "We're now ready to start construction as soon as we obtain funding. This process is



start-up for graphite project



there is a risk of over-supply conditions developing but we anticipate demand remaining strong for large flake graphite.”

In implementing the project, Walkabout is adopting a fully outsourced model. “We will outsource the mining and plant operations, as well as functions such as power supply, to what we call ‘Specialist Partner Suppliers’ and we are already in advanced negotiations with various parties in this respect,” said Murrell. “The mine camp, for example, will be built, owned and operated by a suitable partner.”

He added that the process plant would be of modular design. “Our intention is that the plant will be trial assembled in the factory and then disassembled and shipped to the project in containers, allowing fast erection on site. The modular design will also allow the plant to be

well advanced and we are currently in discussions with several parties regarding funding options. We believe that if we secure the necessary funding by the end of April this year, then we will be able to complete construction of the mine and produce our first product by the end of the first quarter of 2018.”

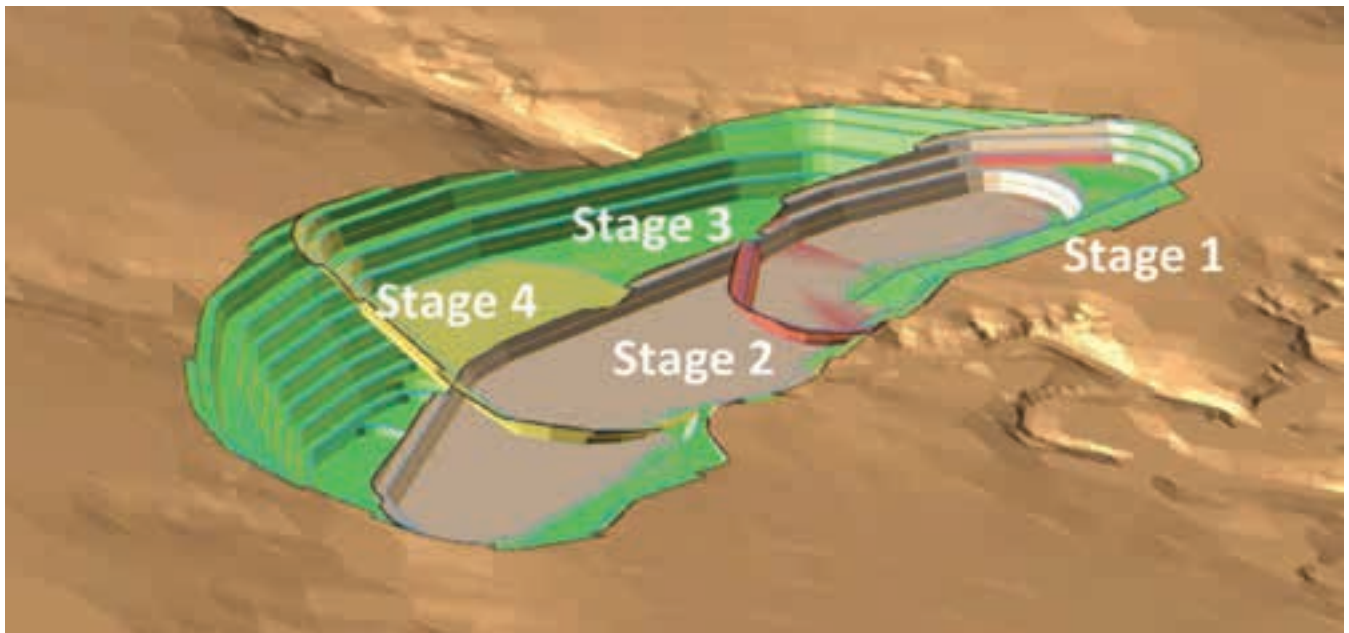
Elaborating on the Lindi Jumbo resource, Murrell told *Modern Mining* that it contained three very high-grade zones – known as Domains 7, 8 and 9 – extending to surface, which presented the opportunity for selective, high-grade mining. “As explained in our DFS, these zones can be extracted with minimum contamination from lower-grade material and will allow us to achieve a high-grade feed to the mill which will be in excess of 17,5 % Total Graphitic Content (TGC) for the first three years of the mine life – with the life of mine average mill feed grade being above 16 % TGC.”

Murrell said that another distinguishing feature of Lindi Jumbo was the project’s ability to produce a premium product. “Based on our testwork, we estimate that up to 50 % of the graphite in concentrate we produce will be in the Super Jumbo (+500 μm) or Jumbo (+300 μm) categories, which command much higher prices in the market. With so many new graphite projects under development,

easily expanded. This is an important consideration as we anticipate that the resource at Lindi Jumbo will grow as our exploration

Drilling at the Lindi Jumbo project in 2016.





Oblique view from the south-east of the Lindi Jumbo pit shell with four mining stages.

“We have four separate licences and we have thus far drilled in only one of the licence areas.”

proceeds. We have four separate licences and we have thus far drilled in only one of the licence areas.”

Murrell told *Modern Mining* that the plant flowsheet would incorporate Walkabout’s own in-house developed mill float regime designed to protect the integrity of the jumbo flakes during the liberation process.

The DFS on Lindi Jumbo was centrally managed from Johannesburg by independent mining consultancy Bara International. The study assesses the development of a mining and processing operation at Lindi Jumbo to produce an annual output of 40 000 t/a of four discrete products of graphite concentrate for sale FOB from the Port of Mtwara. This level of production will entail the milling of only 5 Mt over the 20-year life of mine, an average of 260 000 t/a (22 000 tonnes per month).

A geotechnical study was undertaken to determine the design criteria for the open-pit mine design and pit optimisation. The pit optimisation exercise was repeated with a range of cut-off grades in order to optimise the cost per tonne of product produced. A cut-off grade of 8 % TGC was selected. Additional factors used in selection of the ultimate pit shell were the production rate and life of mine.

It was specified that the production rate should be limited to 40 000 t/a of concentrate as this is limited by potential market constraints. In order to achieve a mine life of at least 20 years at the specified production rate, an in-pit resource of around 3 Mt is required. This guided the selection of the ultimate pit shell to use in the mining schedule.

According to the DFS, the key to de-risking the mine through the mining schedule is the

start-up zone in stages 1 and 2 where the ultra-high grades of resource domains 7, 8 and 9 are accessed to ‘sweeten’ the plant feed.

Weathered ore and waste will be excavated using a hydraulic shovel and loaded onto 30-t dump trucks for hauling out of the pit to the ROM stockpile, low grade stockpiles or waste dumps. Where the weathered material requires ripping by dozer before excavating, this will be done using a tracked dozer. Fresh ore and waste will be drilled and blasted before being loaded and hauled in a similar manner.

A graphite processing flowsheet was developed based on an extensive metallurgical test work programme. The focus of the test work programme, carried out under the supervision of Dr Evan Kirby of Metallurgical Management Services (MMS) at Nagrom Laboratories in Perth, has been the preservation of flake size into concentrate within a minimum concentrate grade of 95 % TGC.

This has been achieved across a range of ore grades and aligned with the proposed mining vertical profile. The Lindi Jumbo project boasts up to 85 % of natural flake sizes above 180 µm, the highest amongst its peer group.

Follow up test work has been carried out in Germany and China to confirm that the methodology employed is effective across bench scale operations and can be up-scaled. Confirmation of attritioning regimes, mill charges and speeds and retention times has been undertaken. Further test work will be undertaken prior to detailed design to be undertaken upon project commitment.

The proposed flowsheet includes primary and secondary crushing, scrubbing, milling (via a primary rod mill), sequential rougher/

scavenger flotation, regrind cleaner flotation, filtration and concentrate drying, screening of final product concentrate and bagging of concentrate.

The plant has been sized for a feed of 300 kt/a of ore with a grade of >16 % TGC to produce a graphite flake concentrate with an average grade of 97 % TGC. This corresponds to a graphitic carbon recovery of between 85 and 90 %.

The DFS says that much of the equipment is likely to be sourced from China where several decades of graphite processing IP is located.

Four high purity products (96 % to 98 % TGC) are planned to be produced at Lindi Jumbo and the life of mine average ratio includes a weathered allocation of ore and a fresh allocation with a cut off being determined to be 10 m below surface. The products are targeted towards the high end markets with an estimated 8 000 t/a of Super Jumbo (+500 μ m) and 14 000 t/a of Jumbo (+300 μ m) products suitable for the expandable natural flake markets.

Design for a tailings storage facility (TSF) has been progressed beyond the 20 % design stage. The proposed TSF will cover an area of approximately 17 hectares and consist of an initially engineered waste rock wall with a maximum height of 8 m (at the lowest point), sufficiently high to contain the tailings material during the initial period with a rate of rise greater than the specified maximum of 2 m per year. The TSF will be constructed in phases.

The bulk power supply will be provided by diesel driven generators pending connection to a high reticulation feed while the bulk water supply will be derived from a bore field in close proximity to the mine.

Photos (unless otherwise acknowledged) courtesy of Walkabout Resources



Trench mapping at Lindi Jumbo.

Lindi hosts the highest grade resource in Tanzania

The measured, indicated and inferred resources at Lindi Jumbo total 29,6 Mt at 11 % TGC. Approximately 40 % of the resource is in the measured (6,4 Mt at 12,2 % TGC) and indicated (5,5 Mt at 11 % TGC) categories for 1,38 Mt of contained flake graphite.

The resource includes 4,7 Mt of super high grade material at 22,8 % TGC in three discrete shallow zones of which 1,7 Mt are in the measured category – confirming this to be by far the highest grade resource in Tanzania, says Walkabout. ■



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Better mood at Mining Indaba

*While it would perhaps be over-stating matters to say that delegates at this year's Mining Indaba, held from 6-9 February in Cape Town, were highly optimistic about prospects for the mining industry, there was clearly a much better mood in evidence than at the 2015 and 2016 events. As **Modern Mining's** Arthur Tassell reports here, the consensus seemed to be that commodity prices were on an upward trend and that a recovery in mining activity was gathering strength.*

This was probably not a record-breaking Mining Indaba in terms of attendance and the number of exhibitors (official figures were not yet available as this article was being written) but the show was well organised and the 'quality' of the delegates seemed very high. While almost everyone that *Modern Mining* spoke to expressed broadly positive sentiments about the state of the mining industry in South Africa – and indeed Africa – there was also an acceptance that the levels of activity attained at the height of the resources 'super-cycle' roughly a decade ago were unlikely to be regained.

The scene in the exhibition hall at the Mining Indaba.



The positive mood was summed up by Mineral Resources Minister **Mosebenzi Zwane** who noted that a new balance was emerging in the demand and supply of mineral resources.



as commodity prices rebound



“There has been a remarkable recovery of prices during the latter part of 2016, more particularly with commodities such as coal, iron, ferromanganese and zinc,” he said. “These market dynamics need to be entrenched and supported by stakeholders working in concert to ensure the sustainability and resilience of the industry.”

On the subject of the Mineral and Petroleum Resources Development Act (MPRDA), the Minister said amendments to the legislation were being processed and finalised as a matter of urgency. “This process is well underway and public hearings are taking place towards the finalisation of the Bill. We expect it to be concluded by June 2017,” he stated. He also told delegates that the revised Mining Charter would be gazetted by March 2017 and would be “reflective of the views of stakeholders.”

He added that the government remained committed to enhancing the ease of doing business and retaining the country’s reputation as a preferred investment destination. “We have moved to improve regulatory efficiency through the integration of the applications for mining and related rights, water use and environmental permits.”

Looking at the future of the mining industry, Zwane said that “a new era of junior to mid-tier sized mines is upon us. The large mining

giants of today had their genesis in the junior mining sector. We further believe that most job opportunities lie with small to medium companies, hence in 2017 we will be focusing on the promotion of investment, with a special focus on junior miners. We will continue to give them the support to enable them to thrive.”

Although it was hardly a landmark speech, Zwane’s address was generally welcomed by industry commentators. For example, **Andrew Lane**, African Mining Leader for Deloitte, described it as “conciliatory” and “one of the more positive we’ve had from the ministry in the past few years” while **Jacques Barradas**, Partner and Head of Mining at Grant Thornton, welcomed the urgency with which the MPRDA amendment process was being tackled. As he pointed out, the Bill is regarded as a key factor in determining investment by the mining houses in current and new projects in South Africa.

Also reasonably optimistic on the prospects for mining was Anglo American’s Chief Executive, **Mark Cutifani**, who has presided over a remarkable transformation of the 100-year-old group over the past couple of years. Referring to Anglo’s performance, he revealed that productivity had improved by around 40 % since 2012 while unit costs were more than one-third lower. He noted that while

Above left: South Africa’s Mineral Resources Minister, Mosebenzi Zwane, delivers the welcoming address at the Mining Indaba.

Above centre: Anglo American’s Chief Executive, Mark Cutifani, at the podium.

Above right: Chamber of Mines President Mike Teke addresses delegates.



Ivanhoe's Robert Friedland presents at the Mining Indaba.

An innovation this year was the Investment Battlefield Competition, which attracted a good audience.

the number of assets in the group had decreased from 68 to 42 during his tenure as CEO, in 2016 Anglo had produced more product than back in 2012. He said critics of his strategy had claimed "we were trying to shrink ourselves to success. They didn't get it: what we were doing was upgrading the quality of our portfolio, shrinking our cost base, and transforming the contribution from our larger scale and more productive assets."

On technology, Cutifani told delegates that

Anglo was making progress in four key areas. Elaborating, he said the first was the concept of 'The Modern Mine', which he described as "a mine where continuous rock cutting machines safely extract the targeted ore – deep underground – without the need for explosive blasting." Second was the concept of 'Concentrate the Mine™', an initiative designed to find efficient ways to mine more metals and minerals and less waste rock. A third initiative was the 'water-less mine' and he noted that in 2015 around 64 % of Anglo's operational water requirements were met by recycling water. Finally, he referred to the 'intelligent mine', a drive to build more connected mines through smart use of data and integrated systems thinking.

Concluding his address, Cutifani sounded a note of caution. "While the worst for the industry may be passing, tough and uncertain times continue to lie ahead. The steep price declines in 2014 and 2015, China's growth slowdown, and the increased volatility of commodity pricing, no longer necessarily driven by supply and demand fundamentals, should be seen as the 'new normal' for mining."

Cutifani was just one of many speakers to address the issue of technology. Another



was Sibanye's **Neal Froneman**, who said at a Chamber of Mines media briefing that the South African mining industry was "one of great contrasts – in some cases having to be dragged, seemingly reluctantly, into the 21st Century and beyond, and in other areas, leading the way."

Froneman, who is Vice President of the Chamber, noted that most deep level underground mines were ageing with travel times to the face sometimes reaching an hour-and-a-half or more. "With increasing depth and distance from the shaft, actual drill time at the workface has contracted, health and safety challenges have increased, production has shrunk and has contributed to burgeoning costs. Volatile price environments, rising costs and decreased productivity have added to our woes."

He told journalists that without a shift in mining methodology, the industry would fail to mine South Africa's deep-level complex orebodies profitably, resulting in the sterilisation of resources, accelerated and premature mine closures, and accelerated job losses. "Research suggests 200 000 job losses by 2025 could affect 2 million people indirectly if we continue on the current trajectory," he added.

Froneman argued that mechanisation of mining operations was needed and noted that the Chamber had identified the products, technologies, people and infrastructure required to mechanise the stoping and development cycle with remotely operated equipment by 2020. Similar requirements had been developed for a 24/7 mechanised mining system that operates without explosives by 2025.

"Looked at as a whole, with conventional mining the industry can look forward to a sharp decline in gold production by 2019-20 and for mining to die out almost completely by 2033," he stated. "The picture changes radically with mechanisation: annual output persists at current levels until at least 2025 and until 2030 or even beyond with 24/7, mechanised operations."

Yet another speaker to highlight the role of technology in mining was Rio Tinto's **Bold Bataar**, Chief Executive Energy & Minerals, who is responsible for the group's African portfolio. He emphasised that Rio was committed to challenging the norm, from mine to market, and by way of illustration cited the group's iron ore operations in Australia. "In Perth, Western Australia, we have people operating drills, trains and trucks at an Operations Centre that is 1 500 km away from the actual mine sites," he told delegates. "That's like one of you in Cape Town operating the train that is going between



Neal Froneman, VP of the Chamber of Mines, makes a point at the Mining Indaba.

the O.R. Tambo airport and the downtown of Johannesburg right now."

Turning to the subject of exploration, he said Rio's exploration team was focused on improving discovery rates through a combination of legacy data and new ideas and technologies. "Each year about 5 % of our annual exploration budget is spent on innovation and development of new technology. Part of this investment includes digitising our large archive of data. We combine this 'big data' with new technologies to identify new opportunities. For example, we

Mark Parker of Andiamo Exploration presents at the Investment Battlefield Competition.





Winner of the Investment Battlefield Competition was Consolidated Nickel Mines (CNM), which is planning to restart the Munali mine in Zambia. The company's CEO, Simon Purkiss (right), is seen here with Harry Chapman, Director of Content for the Mining Indaba.

are using 3D modelling technology with our 'big data' to identify off-hole targets."

On public perception of the mining industry, the President of the Chamber of Mines, **Mike Teke**, acknowledged that the battle for hearts and minds was being lost despite the R2 billion a year that mining companies were channelling into Corporate Social Investment (CSI). He argued that the industry needed a business model that aggressively pursued value creation for all if it wanted to win social legitimacy and he urged mining leaders to engage with stakeholders in an open and honest way. "Engagement involves two-way communication," he maintained. "We need to listen to those who are speaking to us. Where we have had adverse impacts on the lives and livelihoods of stakeholders, let's work out how to avoid doing so in the future, and repair those things that can be repaired."

Teke also pointed out that the mining industry's apartheid history remained a huge obstacle and that it had done itself a disservice by not fully acknowledging this history. "That failure continues to burden the industry and its reputation in the eyes of many of its stakeholders. One of my greatest wishes is that the industry resolves to deal with this. And soon."

The issue of future demand for commodities was addressed by – among many others – **Robert Friedland**, Executive Chairman (and founder) of TSX-listed Ivanhoe Mines, who – in a typically forceful address – said the world's population was growing rapidly and would soon top 8 billion and that this was

driving the phenomenon of urbanisation. He predicted surging demand for copper, which he described as a 'bedrock metal', zinc and platinum as a result of this urbanisation. He also noted that there were specific drivers of demand such as – in the case of platinum – the growing move towards fuel cell vehicles. As he told his audience, fuel cell vehicles can use as much as ten times more platinum as conventional vehicles.

Friedland updated delegates on the progress being made by Ivanhoe at its three African projects – the Platreef project in South Africa, the Kamoia/Kakula copper project in the DRC and the Kipushi zinc project, also in the DRC.

Discussing Platreef, he said it would eventually be the biggest platinum mine in the world and that even in phase 1 – a 4 Mt/a operation – would rank as the third biggest in the world. He noted that Shaft 1, currently being sunk, was 210 m down and that Shaft 2, which will go into construction later this year, would be – with a hoisting capacity of 6 Mt/a, a diameter of 10 m and a depth of 1 100 m – the largest shaft on the African continent.

Moving to the DRC projects, he described Kamoia/Kakula as the "discovery of the century" in Africa and expressed the view that the mining complex that would be established at the site would ultimately challenge Escondida in Chile as a copper producer. Regarding Kipushi, he said its Big Zinc zone offered a spectacularly high zinc grade of over 35 % and told his audience that work was advancing rapidly on the refurbishment of the mine, which is involving the upgrading and modernisation of the shafts, pumping stations and underground infrastructure.

While most of the speakers mentioned above were 'main stage' presenters, there was plenty going on elsewhere at the Cape Town International Convention Centre and the neighbouring Westin Hotel, including the always popular African Ministerial Forum, with many mining ministers from around the continent in attendance, the Investment Discovery Forum, designed to bring together investors and mining companies, and a host of workshops, special information sessions, roundtable discussions and the like.

An innovation this year that *Modern Mining* particularly liked was the Investment Battlefield Competition, supported by the newly launched JSS Empowerment Mining Fund. This gave a platform to a number of low-cap junior miners to present their projects to a panel of investors. Among the companies presenting were Mustang Resources, which

has ruby and graphite projects in Mozambique, Andiamo Exploration, which is exploring for gold, copper and VMS deposits in Eritrea, Lake Victoria Gold, which has multiple licences in the Lake Victoria goldfield, and Sula Iron & Gold, focused on gold in Sierra Leone.

The company to take top honours was Consolidated Nickel Mines (CNM), which is planning to restart the Munali underground nickel mine located south-west of Lusaka in Zambia. The mine has been on care and maintenance since 2011. Originally commissioned in 2007 by Australian company Albidon, its facilities include a crush, mill, float plant with a capacity of 80 kt/month. According to CNM, the mine is dewatered and ready to operate with the infrastructure in good working order. The company hopes to have Munali up and running within 12 months and will target a production of 30 to 40 kt/a Ni

concentrate over a seven-year life of mine.

The Investment Battlefield Competition was a big success and one hopes that it will be retained at future events. It does, after all, typify what the Mining Indaba is all about – putting aspirant miners in touch with potential investors. This was the motivation for the original event held in the mid-1990s and the competition was just one of a number of innovations at this year's Mining Indaba which suggest that the organisers are determined to return the event to its roots and thus maintain its status as Africa's premier mining convention.

Editor's note: In reporting above on some of the presentations at the Mining Indaba, we are relying in some cases on the written versions of the presentations which might have varied slightly from the as-delivered versions.

Photos courtesy of Investing in African Mining Indaba

Cutting edge mining technology ready for roll out

In a launch held at the Mining Indaba, JSE-listed Master Drilling unveiled the latest version of its Horizontal Raise Boring (HRB) technology and announced that the technology was ready for international roll-out after a successful pilot test at the Cullinan Diamond Mine.

HRB can replace conventional drill-and-blast mining and promises to increase mining productivity thanks to its continuous process of rock boring, and in addition offers significant safety benefits. According to Master Drilling, this will enable more mining construction projects to meet the required hurdle and feasibility rates towards becoming producing mines. Projects with less safe access, such as deeper mining operations and higher stress zones, are also more likely to pass feasibility tests thanks

to the safety improvements that HRB brings.

"HRB is a locally developed, world-first technology that promises to change the very fundamentals of the global mining industry," said Danie Pretorius, CEO of Master Drilling. "The feedback from our multinational business partners from Southern Africa and Latin America on visits to the actual technology has been highly encouraging."

HRB will provide the mining industry with an excavation and construction tunnelling tool for the mechanical excavation of a tunnel between two existing access points, very similar to the standard form of raise boring. The steady progress of



Koos Jordaan, Executive Director of Master Drilling, at the unveiling of the HRB.

the reamer makes it possible to excavate an average 6 m per day, compared to 2 m in conventional drill-and-blast cycles. ■

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Maptek grows strongly in Africa

Maptek, the Australia-based company which can claim to have been one of the pioneers in applying computer technology to geological modelling and mapping and mine planning and design, has established a strong footprint throughout Africa, with many of the continent's major mines now counting as customers. Sales and support in the SADC region (which includes key countries such as the DRC and Tanzania) are handled by Maptek's South African office in Johannesburg, headed by Nick Venter, General Manager Africa. He says that Maptek is growing strongly across the continent with 2016 counting as one of its best-ever years.

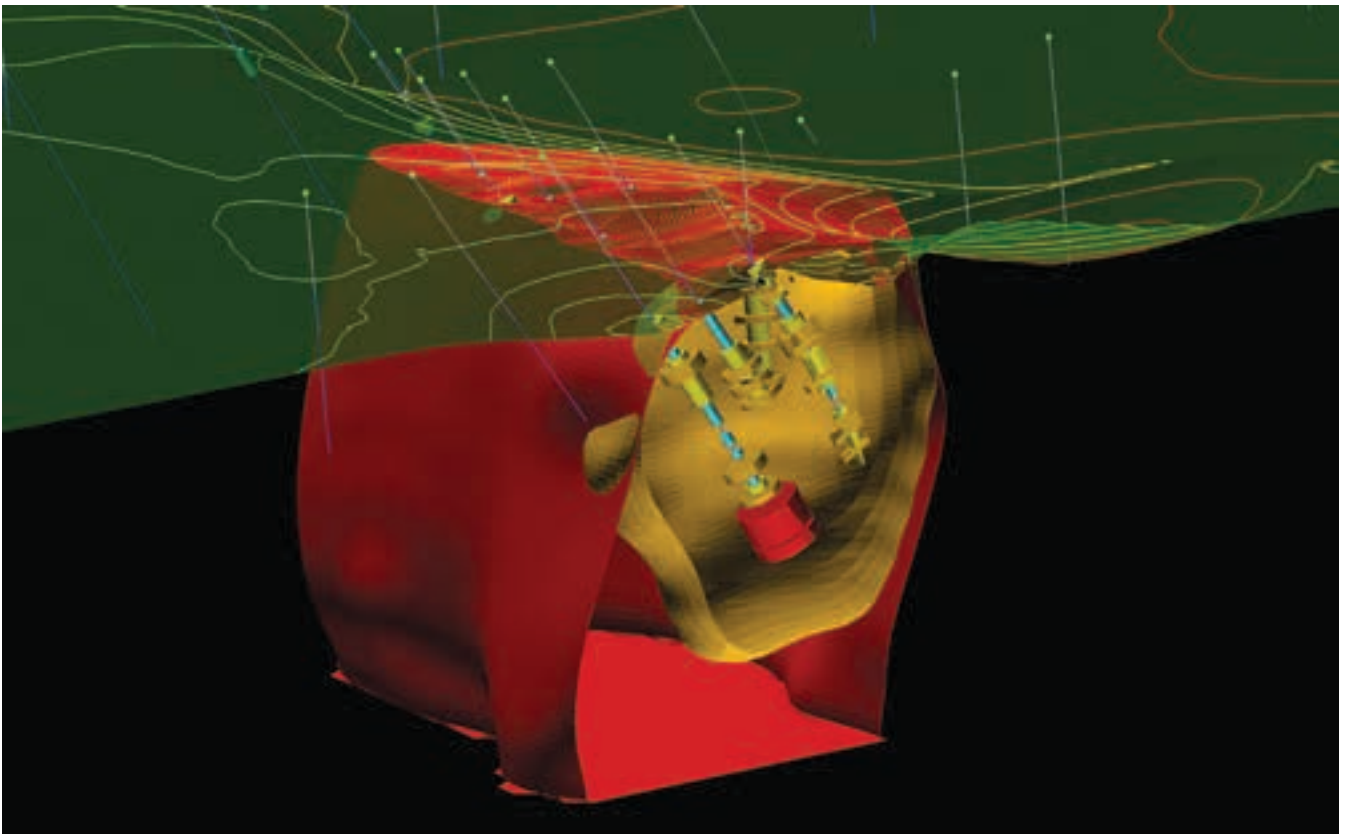
The South African office was established in 1989, roughly eight years after Maptek itself was founded in Australia by geologist Dr Bob Johnson, under the name K Robert Johnson & Associates. The name 'Maptek' was adopted in 1992, by which time the company was already expanding into global markets with offices having been established in several countries including the US and UK. Since then Maptek has expanded further with offices being opened in Canada and throughout South and Central America and with distributors in place in many other parts of the world.

Johnson – who was inducted into the International Mining Technology Hall of Fame in 2015 – started Maptek to develop mining

software that could be operated easily by geologists and mining engineers. The company's core product, Vulcan, was introduced in the mid-1980s and provided the foundation for the company's success. One of the first 3D modelling and mine design software packages in the world, Vulcan is still at the heart of Maptek's offering with more than 7 000 users worldwide.

Vulcan can play a role at every stage of mine development – starting with exploration and geological modelling and going through to mine design and scheduling and, ultimately, rehabilitation. It incorporates powerful block modelling and integrated tools for survey, drill and blast, grade control, geotechnical analysis, geostatistics, scheduling and optimisation. It is now in version 10, which is delivered within

Vulcan 10 includes a powerful Implicit Modelling tool.



a new platform, the Maptek Workbench. This provides an architectural backbone allowing enhanced workflows and data sharing between Maptek products.

Interestingly, Vulcan assisted in the dramatic rescue of the trapped Chilean miners in 2010, an event that captured the imagination of the world. An accurate topographic model and 3D representation of the complex underground workings at the San Jose mine where the 33 miners were trapped was created in Vulcan and was subsequently used to map and plan several drill holes that were a vital part of the rescue operation.

Today Vulcan is part of a comprehensive suite of products. It was joined in the Maptek lineup by I-Site Studio – designed for the modelling and analysis of 3D laser scan data – in 2000 with the MineSuite system for mine information and reporting being added in 2001. A drill and blast management system, BlastLogic, was added to the portfolio in 2011 and was followed by Eureka, which allows all geospatially located exploration data to be viewed in a single 3D environment, in 2012.

In 2013 PerfectDig, an easy-to-use system for rapidly evaluating and supporting design conformance, was introduced with Sentry, a flexible and cost effective solution for detecting surface change, following in 2014. The most recent product to be added to Maptek's line-up is Evolution, which the company describes as "a strategic and tactical mine planning tool for scheduling and optimisation in open-pit mines."

Although Maptek is primarily a software

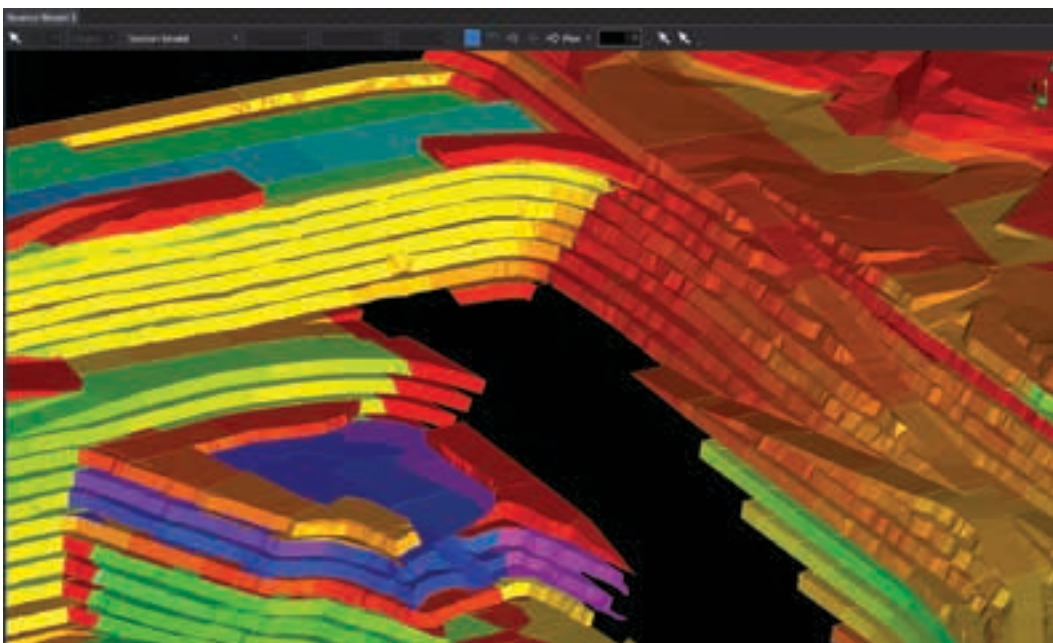


Maptek's I-Site 8800 laser scanner. It can be used in open-pit or underground mining applications.

company, it entered the surveying equipment market in 2004, when it introduced its own Australian-built 3D laser surveying and digital imaging hardware. The current range is the I-Site 8200 series, which can be used both on surface and underground. The hardware is optimised for use with Maptek's software and is used not only in the mining industry but also in civil engineering, agricultural and other applications.

Outlining Maptek's engagement with Africa, Venter – who leads a team numbering 14 people – says that when the South African office was originally founded the focus was more on Africa outside of South Africa than South Africa itself. "The result is that we have excellent penetration of the markets in countries

Vulcan assisted in the dramatic rescue of the trapped Chilean miners in 2010, an event that captured the imagination of the world.



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such as Zimbabwe, Zambia, the DRC and Tanzania,” he says. “In recent years, however, we have devoted considerable attention to South Africa and we now have a better balance, with the South African mining sector accounting for almost a third of our African business.”

According to Venter, Maptek’s scanning solutions are proving particularly popular in Africa with some notable successes being notched up. One case study he points to is the use by De Beers of the I-Site Studio software in combination with the I-Site 8800 laser scanning system at its Venetia diamond mine in Limpopo Province. In 2006 the mine began using I-Site laser scanning to survey the pit and stockpiles, upgrading to the I-Site 8800 laser scanner in 2012.

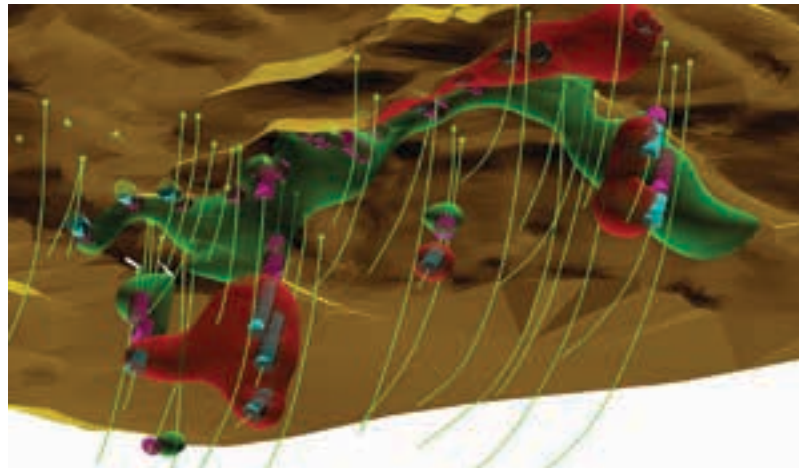
The I-Site Studio software is used to create a pit surface for month end production calculations. Toes and crests, and contours from this surface are applied to generate various plans for different departments. The pit surface is important for identifying the amount of waste and ore mined. This is measured by making the waste and ore block models part of the overall volume calculations.

Previously, surveyors had to enter every loading area to record material being loaded. The long range scanner requires far fewer setups, which saves time and minimises safety issues. Measuring the rehabilitated waste dumps with a GPS or Total Station typically took one day. This was cut to three hours with the I-Site 8800 long range scanner, with fewer setups reducing the physical effort as well.

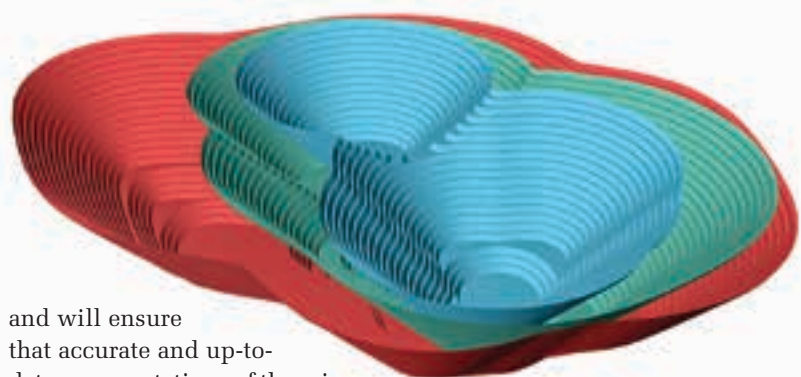
Venter notes that among Maptek’s clients across the continent are some of the biggest names in mining, including not only De Beers but many other ‘blue chip’ mining groups such as Randgold Resources, First Quantum, various Anglo group companies, Vedanta and Barrick. “Our employees travel widely in Africa in support of our customers and we are known for the quality of our technical support and our consulting services,” he says.

An interesting development in the mine ventilation field is Maptek’s collaboration with VUMA, a subsidiary of leading South Africa-based mine ventilation solution provider Bluhm Burton Engineering (BBE). The two companies executed a memorandum of understanding last year to facilitate the integration of Vulcan with VUMA’s software, developed for the analysis and design of underground mine ventilation and refrigeration systems.

“This integration will allow mine survey and design data to be used in ventilation and cooling analysis, without replication of data,



Implicit Modelling provides resource geologists with a new method for interpreting a deposit by generating automatic models of complex geological domains from drillhole information.



A pit design generated with the Automated Pit Designer in Vulcan 10.

and will ensure that accurate and up-to-date representations of the mine surface can be applied to the planning of mine ventilation systems,” says Venter.

Venter also mentions that the MineSuite software is now being marketed globally by MinLog. “We have a stake in MinLog’s South African operation and work very closely with them,” he notes. He adds that the partnership between Maptek and MinLog has seen MineSuite becoming ever more capable. “It is now one of the few products on the market able to integrate various business processes across a variety of disciplines into a single source of operational information spanning the entire mining value chain.”

Venter sees further growth for Maptek’s products in Africa. “Mines around the continent are looking to technology to enable them to work efficiently and contain costs,” he explains. “This provides huge opportunities for us as we have what is arguably one of the most complete suites of mining software available in the market and are well placed to be a mine solutions technology partner to the African mining industry. Our sales have seen good growth through the downturn in mining that has been experienced over the past two or three years. Now with a recovery underway, this trend can only strengthen and we are very positive about prospects.” ■

FLSmidth leverages software for smart control

Conveyors are the arteries of any bulk materials handling system. Irrespective of whether undertaking new conveyor construction or an upgrade, it is not only necessary to have access to in-depth engineering and design knowledge, it is critical to be able to execute a project no matter how remote the location.

With its customer centric approach, FLSmidth Roymec has a strong background in structural engineering, fabrication and successful project implementation for conveyor systems. The company's major differentiator is its use of a sophisticated proprietary software program which facili-

tates absolute control of all elements of the conveyor build and this innovative approach to managing project logistics has realised significant savings.

Patrick Smith, Manager for Scoping and Business Improvements at FLSmidth's South African operation, says that while many companies have the capability to fabricate conveyor structures and supply ancillary components for conveyor systems, none has access to this type of sophisticated process control.

"Being fully aware of the need to optimise project schedules, and still retain absolute control of all aspects of a project, FLSmidth made a significant investment in developing this resource," Smith says.

"It allows us to partner effectively with customers from concept to completion, and access information whenever needed, allowing an active responsive interface with all throughout the entire process. This allows significant productivity increases with associated cost reductions."

The FLSmidth smart numbering system uses the source information from the initial design through to the end of the project. Smith explains that it is a seamless process with the capability to handle revisions. There is no manual input required and tracking continues through design, in-house detailing, fabrication, galvanising, painting, trial assemblies, where relevant, through all logistics functions to final on-site installation.

"Each project is controlled from the design phase where the smart number is conceived and this makes it easier to control the flow of materials to site," Smith says.

Jaco van der Westhuizen, Senior Developer at FLSmidth's South African operation, has overseen the software design and implementation of the FLSmidth expedite system using an API interface to the Tekla drawing data. This allows the information to be made visible to all and facilitates the tracking process.

"The software stores all the information from the Tekla models in one single database allowing easy access at any stage. This is an important advantage as it allows everyone involved on the project to access the information, and mine the information using the API interface," van der Westhuizen says.

FLSmidth, tel (+27 10) 210-4820



A typical conveyor transfer point. FLSmidth Roymec uses a sophisticated proprietary software program which facilitates absolute control of all elements of the conveyor build.

Osborn to supply mineral sizer to kimberlite mine

South African mining equipment specialist Osborn has secured an export order to Kazakhstan for an Osborn mineral sizer that will be employed by Kazakhaltyn Mining-Metallurgical Concern (MMC) in its kimberlite mining operation.

Osborn Marketing Director Martin Botha reveals that this order is a significant one as it is the first Osborn mineral sizer to be exported to Kazakhstan. "It reflects our growing success in the region, where we already have numerous Osborn machines in operation."

Botha credits Osborn's very pro-active Russian and Kazakhstan agents with the inroads that the company is making in Kazakhstan.

Botha explains that Kazakhaltyn MMC currently has jaw crushers in operation at its kimberlite mine, but is replacing these with the new Osborn mineral sizer.

"In winter, which is very wet in this region, the jaw crushers are inefficient," he says. "They are unable to crush the muddy run of mine material, and production has come to a standstill as a result. Kazakhaltyn decided to replace the jaw crushers with a different machine, and identified the Osborn mineral sizer as the perfect primary crusher for this material and these conditions."

Osborn's range of mineral sizers boasts a design that can be configured to a range of twin shaft sizers. They have a heavy duty low profile design capable of handling high tonnages. "The low profile and small footprint of these machines makes them ideal for primary tips where the mine doesn't want a huge installation as is required by a big gyratory or jaw crusher," says Botha.

He says that one of the biggest advan-

tages of a mineral sizer is that it keeps most of the dynamic loads within the framework of the machine, which means much lighter foundations and much lower installation costs compared to a conventional crusher system.

The Osborn mineral sizer can be configured to operate in two ways, depending on the material output size required. "As a primary crusher, for example, as at Kazakhaltyn, rotation of the breaker shafts will be towards the centre of the machine, but by reversing the rotation of the breaker shafts towards the sides of the machine and changing the tooth or segment configuration, it can be used as a secondary or tertiary crusher," states Botha.

Osborn will ship Kazakhaltyn MMC's new mineral sizer in two pieces, and Osborn technicians will be on site to handle the assembly, installation and commissioning of the machine.

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

ELB Screening's range extended

Far from merely acting as a means of separating and sizing materials, the effective use of screening technologies can contribute to the overall efficiency of a plant and can significantly improve return on investment in term of processing costs.

So says screening specialist Dave Sibley of ELB Screening Technology Solutions. He was speaking during the announcement of the company's signing of an exclusive distribution agreement with one of the world's leading suppliers of screening systems, Haver and Boecker. The agreement adds to ELB's already comprehensive offering and enables it to provide advanced screening and related systems from Haver and Boecker and subsidiary company, Major Wire.

"We established the company in order to provide specialist services using the latest high-tech approaches and products from the world's best suppliers. With the addition of these new agencies, we can bring technology to bear that will help us analyse and provide the



Flex-Mat 3 Series D high frequency tension mats with side seals to prevent contamination of the undersize.

right solutions for our customers' screening requirements," says Sibley.

In addition to analytical systems and services available, the Haver and Boecker/Major Wire product line-up includes vibratory equipment, wear and ceramic linings, as well as a full range of screens. The company's new pulse vibration analysis technology also allows it to test existing screens and find solutions to optimise processes, equipment and systems on behalf of customers.

Dave Sibley, ELB Screening Technology Solutions, tel (+27 11) 306-0819

Medium density ceramic tile from Multotec

Multotec Wear Linings has developed a medium density (MD) alumina ceramic tile that can be used in low to medium wear applications. The company believes it will lead to real cost savings in coal and power generation plants.

"Proudly developed here in South Africa, this unique tile is strategically positioned between the less wear resistant capabilities of rubber or polyurethane on the one hand, and the high performance, high density alumina ceramic tile solutions on the other," says Mark Jarrett, National Sales Manager at Multotec Wear Linings.

The Multotec MD ceramic tile is a response to customer requirements for a more cost effective ceramic wear tile in industries such as coal and power generation, where the cost of high density alumina tiles proved prohibitive in the recent past.

"This new fit-for-purpose product is not a replacement for high density alumina tiles, but is rather application-specific and performs like basalt

tiles, with the advantage that the MD tile has a uniform wear rate throughout its life," Jarret explains.

The product brings a number of advantages in addition to its cost effectiveness. Its larger size, for example, facilitates faster installation time; while the traditional sizes require 67 tiles per square metre, there are only 45 MD tiles in a square metre.

"They are also substantially lighter than the high density tiles, creating less stress on the steel structures in which the tiles are installed," says Jarrett. "The non-standard size and colour of the Multotec MD tile ensures that it is easy to distinguish from the normal, white high density tile, and misapplication is prevented."

He adds that the tile work-polishes to a very smooth finish, lowering the friction coefficient; this improves product flow over the tiles and reduces product hang-up in critical areas.

Bernadette Wilson, Multotec Group, tel (+27 11) 923-6193

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CIF technology tackles AMD while generating returns

Mineral processing specialist Multotec says its continuous ionic filtration (CIF) process could change the mining sector's outlook on wastewater treatment and also offer an income stream while treating contaminated water to achieve potable water quality.

According to Multotec environmen-



Multotec's 1 m³/h DeSALx test rig that is used to do on site testwork at customer sites.

tal process engineer Carien van der Walt, the technology augments existing solutions such as reverse osmosis by achieving higher water recoveries and delivering a zero liquid discharge solution.

"It is a significantly improved version of the familiar and widely accepted ion exchange methodology," says van der Walt, "and has been tested and proven in treating wastewater in various applications around the world."

With local representation rights from Australian water treatment and metals recovery specialist Clean TeQ, Multotec sees the process as an ideal long term solution to Acid Mine Drainage (AMD) in South Africa, especially as options are being explored to upgrade the output of the three Witwatersrand AMD treatment plants to achieve a potable standard.

"Adding a secondary solution that fits onto the back end of the current treatment plants is not only cost effective, but also much faster to implement," she says.

Among the system's novel features is the continuous and counter-current movement

of resin – in contrast to a conventional fixed bed arrangement – that allows the process to operate closer to ideal equilibrium conditions to improve process efficiency. The movement of resin counter-current to the solution also creates a concentration gradient, which drives the ion exchange reaction, thereby reducing reagent consumptions and improving recovery.

"The movement of the resin also eliminates the potential for scaling and fouling," she says. "Any suspended particles in the feed water do not interfere with the primary desalination operation of the technology, and are filtered out."

Van der Walt notes that while a single-stage CIF module can be used for a range of treatment applications, Multotec focuses on the Dual-stage Ionic Desalination (DeSALx) process in South Africa to produce water with low total dissolved salts (TDS) and a neutral pH.

"The DeSALx process uses two stages of CIF to desalinate brackish water, and produce potable water," she says. "In the first stage, a cationic resin is used to remove cations from the water, while an anionic resin is used in the second stage to remove anions."

The resins are regenerated with sulphuric acid and lime respectively for the cation and anion sections. Due to the continuous movement of the resin through the system, the process is able to handle any in-column formation of precipitated gypsum, eliminating the need for expensive regeneration chemicals.

Using the same principles as CIF, the Clean-iX metals recovery technology is available to remove and recover metals present at low concentrations in mine-impacted waters – creating a revenue stream from a range of metals including gold, silver, platinum, nickel and copper.

Bernadette Wilson, Multotec Group, tel (+27 11) 923-6193

Umzamo opens lab at Overlooked Colliery

Coal analysis firm Umzamo Analytical Services (UAS) has opened a containerised analysis lab at Overlooked Colliery in Bethal. Umzamo offers coal sampling and analysis services including the commission and management of on-site laboratories that allow coal mining operations to benefit from rapid analysis and real time results.

"The opening of the on-site lab at Overlooked complements our existing footprint of laboratories in Mpumalanga, demonstrating our steadfast commitment to our clients in the region," says Audrey Ndlovu, CEO and founder of Umzamo.

The on-site laboratory at Overlooked will

be staffed by 14 lab technicians and client liaison personnel. The lab itself has been constructed within a container and its setup has been customised to meet the colliery's exact needs.

The lab was set up very quickly in order to try to meet Overlooked's immediate needs and is fully operational. "On site we are currently providing reports to the staff at Overlooked every three hours which is a remarkable improvement on turnaround time," says Ndlovu. "Off-site sampling and analysis can take up to a full working day due to various logistical factors."

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Mobile substation delivers power to copper project

The development of the world's largest high-grade copper deposit – the Kamo-Kakula copper project in the DRC – is now running on power from the DRC's national grid using a mobile substation recently commissioned by South Africa's Gauteng-based Zest Energy.

The 120/11 kV mobile substation will serve the construction of the planned initial mine at Kamo-Kakula, a project whose existing mineral resource has been independently verified as Africa's largest copper find. Kamo-Kakula's principal owners are Ivanhoe Mines, Zijin Mining and the DRC government.

"Due to the high cost of running on diesel generators, the mine developers decided to purchase a mobile substation to interface with the network of the DRC power utility SNEL to provide power during the construction phase of the project," Alastair Gerrard, MD at Zest Energy, says.

Although the substation will not be moved frequently, Gerrard says being mobile allowed for quick and hassle-free construction and commissioning, and gives the mine the added flexibility of deploying the substation to other areas of its operations when needed in the future.

Zest Energy – part of the Zest WEG Group – undertook the design, manufacture, supply, testing, delivery, installation and commissioning of the complete mobile substation, including the trailer, transformer and related electrical equipment. It also provided a protection system, earthing, site work (with full commissioning and testing) and site training.

The project began in February 2016, and the unit was commissioned and handed over to the mine developer in October 2016, in line with a challenging delivery deadline of nine months.

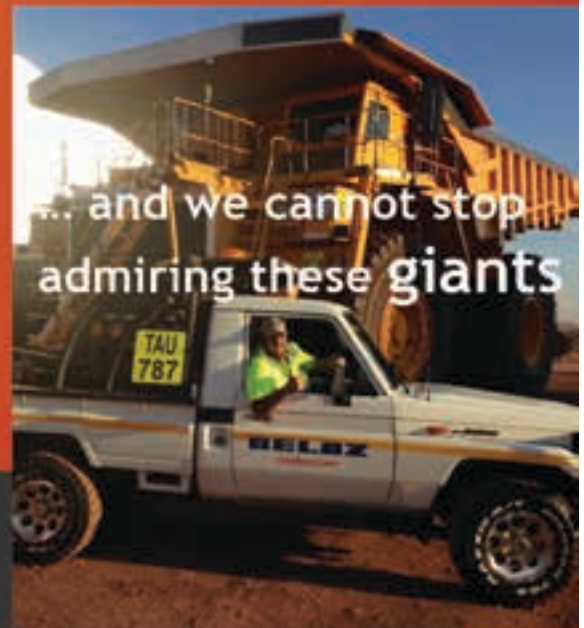
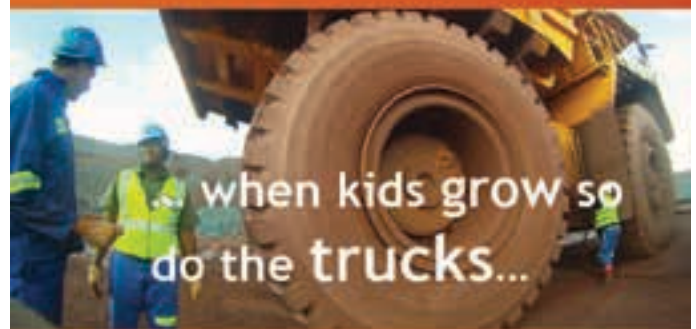
The commissioning process included final assembly of the transformer, oil filtration and purification, and conducting of a full spectrum of transformer tests, as well as on-site testing of all supporting substation equipment. To ensure strict compliance, all commissioning and testing was done in conjunction with SNEL to meet contractual and performance requirements.

Skills transfer was facilitated by operator training conducted by Zest Energy to all selected mine personnel, ensuring that the substation was left in safe hands, with a strong after-sales service to respond to any further customer requirements.

Zest WEG Group Africa, tel (+27 11) 723-6000



The mobile substation in position on site, with supporting ancillary components still to be installed.



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Versatile Furukawa rock drill can handle rough terrain

Finding a rock drill that is versatile enough to work in all areas, regardless of space constraints and underfoot conditions, is a top requirement of fleet owners who

additionally require power and reliability to ensure uninterrupted drilling when the pressure is on.

A rock drill which is said to meet all these needs is the Furukawa PCR200. It is compact yet powerful enough to undertake heavy drilling jobs in terrain that would be inaccessible to larger rigs. Simultaneously, due to its smaller footprint, it is also able to operate in the type of comparatively confined spaces that are often encountered in geotechnical and civils type applications.

According to James Linton, National Product Manager for ELB Equipment, the sole distributor of the Furukawa rock drill in Southern Africa, the reason for the success of the rig is its go-anywhere versatility and simplicity. "Today a contractor might be drilling for foundations in an urban environment and tomorrow may require drilling to be done on top of a rock outcrop

in a rural environment," he says.

He adds that the rig is a fully pneumatic crawler drill with a top hammer operation. Despite its size, it is a very powerful machine that has the ability to drill up to 102 mm (4 inch) holes up to 20 m in depth, which is ideal for smaller-scale blasting. It also has a manual rod feed up to 20 m with the ability to swing the boom horizontally and drill holes for foundation work and for pin bolts in ground stabilisation and similar applications.

The Furukawa PCR200 also features dual control systems, on the platform and on the mast, which enables the operator to control drilling without an assistant. This is claimed to make it ideal for a range of applications including civils, small opencast blasting, pipeline installations, geotechnical and oversize boulder drilling.

Hennie Louw, ELB Equipment, tel (+27 11) 306-0804



The Furukawa PCR200 is a versatile rock drill for a wide range of applications.

Allight lighting towers available from Vert Energy

Vert Energy, a specialist in electric power generation, reports that it is now distributing mobile LED lighting towers that provide dependable lighting exactly where it is needed, for optimum productivity and enhanced safety.

"The Allight range of trailer-mounted lighting towers can be easily moved from

site to site in diverse applications, including mining, construction, road and railroad works, as well as in agriculture and outdoor field events," says Ryan Robertson, Director, Vert Energy. "MSGEN2 LED lighting towers, which have been developed by Allight in Australia, offer over 50 000 hours of light per unit and only require re-fuelling every two weeks, on the basis of 12 hours of operation every night."

The flexibility of this range includes various mast options, a specially designed highwall overhang system and carefully selected light assemblies, for the exact lighting requirements of every project. Components, including lamps and lights, are integrated into the mast design for maximum output reach.

MSLED168K-9 lighting towers, with extra low voltage (DC), are powered by Perkins 2-cylinder water cooled diesel engines. Six 300 W LED low glare lamps produce 168 000 lumens, with no delay of warm-up or cool-down time. Each LED floodlight provides 28 000 effective lumens after stabilisation. Individually adjustable lamps enable precise focusing of the light.

The total control system encompasses an easy start/stop facility, location tracking and performance monitoring via a notepad or smart phone. These units have been designed for low maintenance requirements, with 500-hour service intervals. Large doors enable quick and easy service access and the plug-and-play system, with no hard wired componentry, ensures easy servicing and parts replacement.

Ryan Robertson, Vert Energy, tel (+27 11) 453-9669



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LOESCHE mills installed at cement plant

The United Cement Company of Nigeria (UNICEM) recently successfully commissioned its new cement plant 2 at Mfamosing in Cross River State, Nigeria.

The cement plant at Mfamosing has been fully operational since February 2009 and is equipped with the latest technology. With a capacity of 2,5 million tons of cement per year, it has now been extended by LOESCHE technology.

LOESCHE's order was for two LM 60.4 vertical roller mills (VRMs) for grinding cement raw material and an LM 70.4+4 CS, the biggest LOESCHE VRM, for grinding cement clinker.

This mill is designed for a capacity of more than 370 t/h and has required a new drive system offering an operational power up to 8 800 kW to be developed. This was undertaken by LOESCHE in close cooperation with RENK AG Augsburg with input from the end-user, LafargeHolcim, as well as from a renowned technical university in Germany, being taken into consideration.

The innovative result is the COPE

(Compact Planetary Electrical) drive. It is designed for gearboxes from 4 000 kW to 12 000 kW making a single and special motor obsolete, as well as eliminating the potential for failure in the fast running first stage gear of conventional gearboxes.

The system has the same footprint as a standard mill gearbox for VRMs and also represents the first time use of eight drive motors for a VRM gearbox. It is also the first multiple drive in a VRM to operate with or without VFD (Variable Frequency Drive). It allows easy removal of individual mill motor units to minimise down times (approximately two hours) and has an extremely compact design with motors directly attached to the gearbox housing.

According to LOESCHE, the distinguishing feature of this installation is that long mill downtimes (of up to seven months) as a result of repairs to conventional gearboxes are eliminated.

Implementing the COPE drive requires a standard foundation. The replacement of one of the eight small size motors is eas-



The LM 70.4+4 CS mill in operation with the new COPE drive at the cement plant in Mfamosing.

ily undertaken as they are readily available and easy to install.

LOESCHE South Africa, tel (+27 11) 482-2933



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Afrimat Limited has established a strong foothold in contracting services through its Contracting International division operating from the Western Cape and Gauteng. Services include mobile crushing, screening, drilling and blasting, which offers mobility beyond fixed areas of operation.

Afrimat offers blast designs for bulk blasting in quarry and opencast mining and specialised restricted blasting in built-up areas. The division operates internationally through a mobile hard rock crushing and screening service.

Contracting International uses its expertise in fields such as drilling and blasting, load and haul, crushing and readymix concrete processing to prepare bids for major clients in the construction industry.



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Contracting International is part of Afrimat Limited, a leading black empowered open pit mining company.

Gloria vent shaft fan contract successfully completed

Following the successful upgrade of the main ventilation fan system at Black Rock Mine Operations' Nchwaning Shaft in 2014, TLT ACTOM was awarded the main vent fan contract for the mine's new Gloria ventilation shaft in mid-2015.

Manganese producer Black Rock Mine

Operations, situated near Kathu in the Northern Cape, is operated by Assmang Limited, which is jointly owned by Assore Limited and African Rainbow Minerals Limited.

The Nchwaning contract, completed in mid-2014, involved the manufacture

and installation of a fourth centrifugal fan to meet increased ventilation requirements resulting from extension of mining operations since TLT ACTOM (then ACTOM Mechanical Equipment) installed a trifurcated system in 2007.

The R26-million Gloria shaft main ventilation fan contract, which was completed ahead of schedule in early-February 2016, involved installation of a trifurcated system that included the manufacture and installation of two of the three 2 430 mm diameter centrifugal fans for which it is designed – with the third fan due to be supplied and installed at a future date when additional ventilation is required.

The scope included earthworks, civils, mechanical, structural and electrical, control and instrumentation (EC&I). The fans, which are driven by 460 kW motors, each have an air-moving capacity of 110 m³/s.

Craig Johnston, TLT ACTOM, tel (+27 11) 878-3029



The main ventilation fan system at Black Rock Mine Operations' Gloria ventilation shaft.

Winding rope attachments delivered by Becker

Becker Mining South Africa has completed delivery of the first consignment of winding rope attachments to a client operating on the Western Limb of the Bushveld Complex.

"The scope of this contract encompasses the design, manufacture and delivery of rope attachments to suit three different winders on the mine, as well as a complete spare set," says Tom Searle, Senior General Manager: Mechanical, Becker Mining South Africa. "Becker has also supplied rope handling equipment, including WRC clamps, used during installation and maintenance of ropes. Sixty per cent of this order was delivered ahead of schedule and the balance of the equipment will be delivered early this year,

within the required time frames.

"All equipment, which is proof load tested by Becker Mining to two and a half times the safe working loads it will be subjected to in service, is suitable for the mine's winder duties. It also complies fully with all the relevant mine health and safety acts and mining regulations."

Four sets of head rope attachments and four sets of tail rope attachments are required for the 4,5 m drum diameter Koepe winder, which accommodates 38 mm head ropes and 40 mm tail ropes. Complete 30-ton Rocket type safety detaching hook sets were supplied for the man/material winder which has a 4,88 m drum and 51 mm ropes.

The contract also includes a set of 5-ton

Rocket type safety detaching hook sets to suit the service winder, which has a 26 mm rope fitted.

All hook sets were supplied complete with catch plates and jack catch boxes, which are mounted in the headgear as a critical safety feature to prevent injury to personnel and damage to the shaft infrastructure should an overwind occur.

Rocket safety detaching hooks are designed to detach the winding rope from the conveyance in the event of an overwind and arrest and suspend the conveyance in the headframe. This patented design caters for the prevention of partial detachments whilst in service.

Thomas Searle, Becker Mining South Africa, tel (+27 11) 617-6300

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