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ARTICLES

COVER

- 18** DRA diversifies into new markets as global mining activity wanes

PLATINUM

- 24** Sibanye Gold takes the plunge into platinum

COUNTRY FOCUS – NAMIBIA

- 26** Namibia's mining sector becomes more diversified
- 32** Otjikoto gold mine bursts out of the starting blocks
- 36** North River presses ahead with Namib lead-zinc project
- 42** Revival of past-producing graphite mine planned

DIAMONDS

- 45** Soil sampling the key to kimberlite exploration

CRUSHING / SCREENING

- 48** Dual power crushing/screening 'train' makes its African debut



REGULARS

MINING NEWS

- 4** New Liberty records its first gold sales
- 5** Banro reports on performance at DRC gold mines
- 6** PEA completed on Tongo diamond project
- 7** Platreef's presink winder commissions
- 9** Plant earthworks for Yanfolila completed
- 10** New technology pins down infrastructure location
- 11** Drill programme at New Luika prospect completed
- 12** MOD to acquire more ground around Mahumo
- 15** Contract mining for Boikarabelo under investigation
- 16** Vast commissions CIL plant at Pickstone-Peerless
- 17** Proposed joint venture will revive and operate Obuasi

PRODUCT NEWS

- 51** Zest brings mobile substation technology to Africa
- 51** Lerala mine now linked to the outside world
- 52** On-site testing and emulsions solution for reactive ground
- 53** Minimising the effects of acid mine drainage
- 54** Trend towards submersible pumps in mining
- 55** Repeat orders for chutes from gold mine
- 57** Material feeders delivered to Namdeb
- 58** Custom crushing solutions from Weir Minerals
- 60** Sampler provides correct sampling across tailings streams

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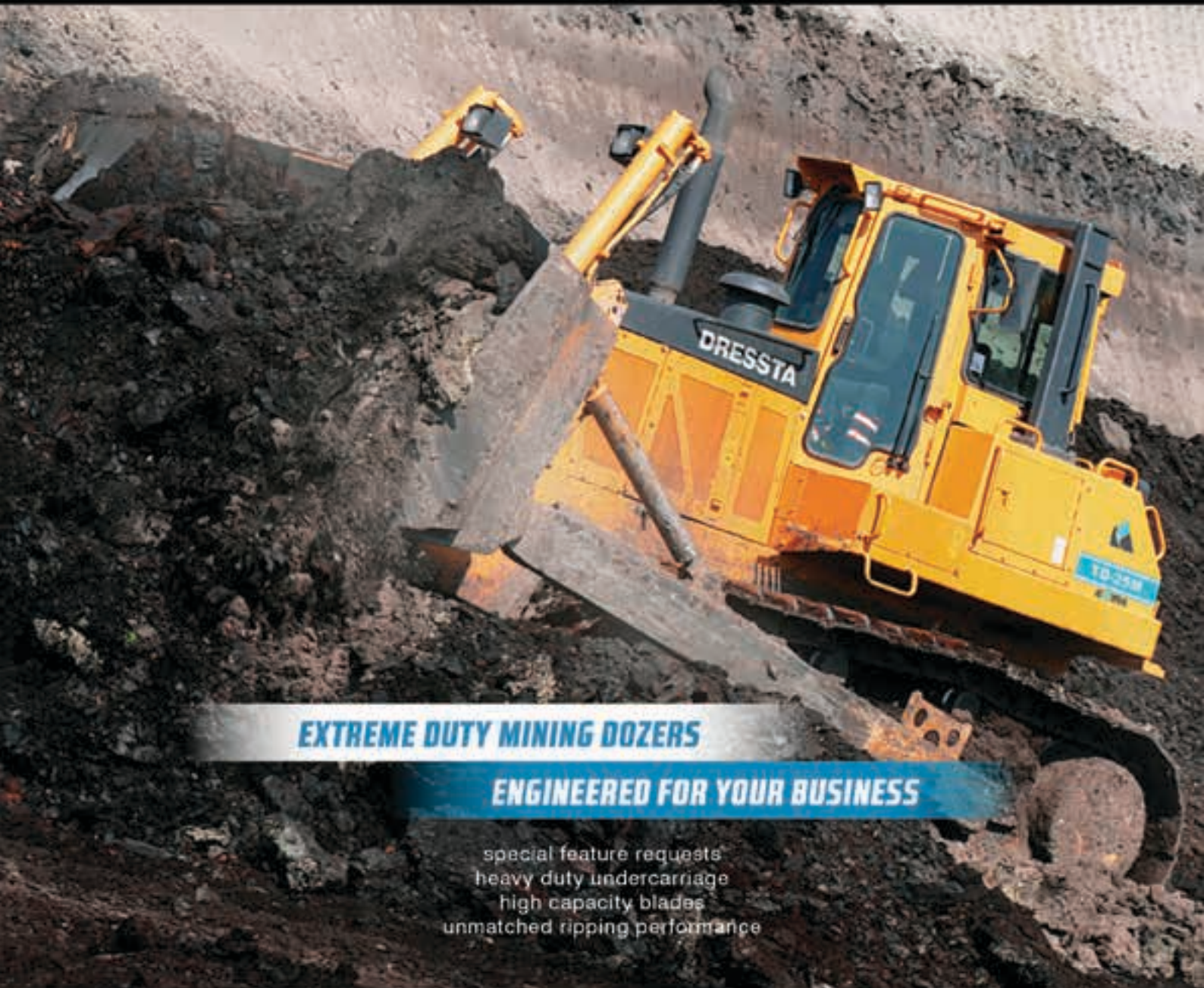
Cover

DRA was the contractor for the processing plant – and other elements of the mine's infrastructure – at the Kibali gold mine in the DRC. See page 18 for an article on some of DRA's recent achievements in Africa and its diversification strategy.



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African copper takes a tumble

As if power shortages caused by drought impacting on hydro schemes were not enough, the Zambian Copperbelt is now facing the prospect that operations at the Nkana and Mufulira mines of Glencore subsidiary Mopani Copper Mines (MCM) could be suspended for 18 months. Although now very mature, the two mines are still big producers – they accounted for about 14 % of Copperbelt production in 2014 – and their closure, even if only on a temporary basis, would represent a major setback for Zambia’s mining industry.

It is not at all clear to me – Glencore’s announcement of its plans to curtail production on 7 September was somewhat ambiguous – whether a definite decision to suspend operations has already been taken or whether this is merely an option that is being considered but most commentators seem to think that the two mines will indeed be closed.

I get the impression – but I could be wrong – that Glencore’s statement was released without consulting the Zambian government. The MCM operations employ around 10 000 people directly (and twice as many if personnel working for contractors are included) and I doubt that the government will be at all happy if large numbers of jobs are going to be lost (particularly as there have also been job losses recently at the Chinese-owned Baluba mine, which has been put on care and maintenance).

Across the border in the DRC, Katanga Mining, which is also controlled by Glencore, has said that it is suspending copper and cobalt production from its Kolwezi assets, also for 18 months, while it completes processing plant upgrades, which will see the commissioning of a new leach plant to replace the existing oxide concentration processes.

Although Katanga Mining has said that it will retain 80 % of the existing workforce, the loss for 18 months of Kolwezi production will be very damaging to the renaissance of the copper mining industry in the Congo. In the early 2000s, I made three trips to Kolwezi and I was staggered at the scale of the operations, which included the massive KOV pit and the underground Kamoto mine. When I was there most of the assets were in a state of utter disrepair, the KOV pit was flooded and copper production had virtually ceased. In fact, I think that around the year 2000 the DRC’s total copper production was no more than about 30 000 tonnes, down from a high of about 450 000 tonnes in the 1980s.

With Kolwezi (and other operations such as Tenke Fungurume) leading the way, the DRC’s

copper production has since recovered remarkably, pretty much doubling from the historic highs of the 1980s – to the point where the country is now Africa’s biggest copper producer, a title which Zambia previously held unchallenged.

Glencore’s decision to cut back on the Central African Copperbelt – which, if fully implemented, will see 400 000 tonnes of production being taken out of the market – has come pretty much as a bolt from the blue. As far as I can tell, none of the analysts who follow the copper market saw it coming. But perhaps they should have, as it has been apparent for some time that Glencore was taking strain as demand for commodities collapsed.

The company’s problems were highlighted in a recent (September 12) article in Britain’s ‘Daily Mail’ authored by Alex Brummer and Laura Chesters. Titled ‘Humbling of a Master of the Universe’, it takes a look at the history and fortunes of Glencore and the man who presently heads it, Ivan Glasenberg, who, of course, is South African and who is described as “a short, pugnacious man with receding hair and boundless energy.”

Brummer and Chesters write that “Glencore, the one-time money-making machine, is no longer a darling of the City. Quite the reverse, in fact: loaded down with debt, and with profits evaporating, it currently finds itself in deep trouble. The confidence with which Glasenberg once bestrode the corporate world is looking suspiciously like hubris.”

According to the article, the big institutional investors demanded “instant action” from Glasenberg at the beginning of September to protect their investments – hence the decision to suspend operations at the African mines.

Brummer and Chesters refer to Glasenberg’s bold claim – apparently made recently in a phone call with stock market analysts and journalists – that Glencore has structured its balance sheet so as to be able to ride out Armageddon. “The reality, however, is that for many Glencore investors, including Glasenberg himself, Armageddon has already arrived,” they conclude.

‘Armageddon’ is perhaps too strong a word for what is currently happening in commodity markets. Nevertheless, it is undeniable that the present recession in mining triggered by falling commodity prices is one of the worst ever and that the consequences reach from the boardrooms of London through to remote mining towns in the middle of Africa, affecting millionaires and simple workers alike.

Arthur Tassell



Glencore’s decision to cut back on the Central African Copperbelt – which, if fully implemented, will see 400 000 tonnes of production being taken out of the market – has come pretty much as a bolt from the blue.

New Liberty records its first gold sales



Ellen Johnson Sirleaf, President of the Republic of Liberia, David Reading, CEO of Aureus Mining, and Debar Allen, GM, Aureus Mining, with a gold bar at the official opening of New Liberty (photo: Aureus Mining).

Aureus Mining Inc, the TSX- and AIM-listed West African gold producer, has announced the commencement of gold sales and initial mining and processing operations from the New Liberty Gold Mine (NLGM) in Liberia.

From the time of the mine achieving nameplate capacity in mid-July to the end of August, there have been four gold doré shipments from New Liberty, resulting in sales of 4 881 ounces of gold at an average price of US\$1 119 per ounce.

According to Aureus, plant commissioning is progressing well with 52 310 tonnes of ore processed at an average feed grade

of 3,6 g/t, which is in line with expectations. Average gold recoveries of 89 % and recent recoveries as high as 92 % are ahead of expectations for this stage of commissioning. Optimisation work is ongoing towards the delivery of the steady state target of 93 %.

Mining operations were initially hampered due to the availability of explosives and this has now been addressed. To date, the company has mined 263 673 tonnes of ore and 6,23 Mt of waste with ore stockpiles totalling 211 363 tonnes.

The remaining staff of DRA Mineral Projects and other third party contractors

are beginning to demobilise from New Liberty with the Aureus owner team taking over full control of the process plant operations.

The company is on track to declare commercial production at New Liberty in Q4 2015 and this will be announced following the plant achieving an average of 60 % plant capacity over a 60-day period.

Commenting on the commencement of gold sales, David Reading, President and CEO of Aureus Mining, said: "The first commercial exporting and sales of gold from Liberia is yet another important milestone in the overall evolution of New Liberty and marks the beginning of revenue generation for the company. The progress being made is very encouraging with early operations confirming the high grades at New Liberty and good recoveries, despite the typical teething problems associated with commissioning a new gold mine. We look forward to updating stakeholders on further progress as we reach commercial production levels at New Liberty during Q4 2015."

A revised mining schedule is being enacted to enable Aureus to achieve its production targets for the first 12 months of operations. This updated plan will include the three-month acceleration of the delivery of an HD785 haul truck and a PC1250 excavator to January 2016, which will facilitate an increase in the mining rates enabling the mining team to catch up on the near term shortfall.

New Liberty was recently officially opened. The opening ceremony was attended by Ellen Johnson Sirleaf, President of the Republic of Liberia, who was accompanied by a governmental delegation, including Patrick Sendolo, Minister for Lands, Mines and Energy, other Liberian dignitaries and local community leaders.

The delegation was provided with a tour of the process plant facility, where a ribbon was cut to mark the official commissioning of the plant, followed by a ceremonial gold pour.

The delegation were also given a tour of the Hope for Tomorrow Agricultural Training Cooperative, a community cooperative set up by Aureus with financial support from a number of its partners. The Cooperative trains members of the local community in sustainable agricultural methods including fruit and vegetable production, fish farming and animal husbandry. ■

Change at the top at Tiger Resources

ASX-listed Tiger Resources has announced that Brad Marwood has retired as CEO. Marwood made a major contribution to Tiger over his five-and-a-half years as CEO, having played a pivotal role in bringing the company's flagship Kipoi copper project in the DRC from a grassroots exploration project into full copper cathode production in less than eight years.

He oversaw the delivery of the Stage 1 HMS operation and, subsequently, the Stage 2 solvent extraction electro-winning (SX/EW) plant, which was completed on time and on budget. According to Tiger, this was an outstanding achievement given the challenges

of bringing resource projects in developing countries such as the DRC on stream.

Michael Griffiths, a Director of Tiger since December 2012, has assumed the role of Interim CEO pending the identification of a successor to Marwood. Griffiths brings to Tiger over 30 years' experience in the minerals and energy sector in Australia and Africa. He has held a number of directorships of both ASX- and TSX-V-listed companies and, as CEO of ASX-listed Sub-Sahara Resources NL between 1998 and 2009, he led a team responsible for the discovery and development of significant gold deposits in Eritrea and Tanzania. ■



The processing plant at the Namoya gold mine in the DRC (photo: Banro).

Banro reports on performance at DRC gold mines

In its financial and operating results for the second quarter of 2015, Canada's Banro Corp, which operates the Twangiza and Namoya gold mines in the DRC, says that Twangiza continued to outperform expectations, resulting in a 60 % increase in gold production to 34 325 ounces from Q2 2014 production of 21 431 ounces.

During the second quarter of 2015, the plant at Twangiza processed 428 661 tonnes of ore (compared to 340 654 tonnes during the second quarter of 2014 and 428 844 tonnes in the first quarter of 2015), maintaining the first quarter of 2015 achievement of 101 % of design capacity.

Ongoing debottlenecking and incremental process improvements allowed for throughput levels to be maintained while increasing the proportion of non-oxide material to an average of 43 % for the quarter. Ore was processed during the second quarter of 2015 at an indicated head grade of 3,01 g/t Au (compared to 2,44 g/t Au during the second quarter of 2014 and 3,21 g/t Au during the first quarter of 2015) with a recovery rate of 82,2 % (compared to 84,3 % during the second quarter of 2014 and 80,7 % in first quarter 2015).

During the second quarter of 2015, the Namoya mine produced 10 525 ounces of gold from a total of 330 267 tonnes of ore, stacked and sprayed on the heap leach pads, at an indicated head grade of 1,53 g/t Au. Stacking levels at the beginning of the second quarter decreased substantially from those achieved in March 2015, as a result of the impact of modifying the mine plan to allow for earlier access

to the Kakula reserve pit, as well as the adverse impact of unseasonably high rains on the delivery of materials and supplies.

During the second half of June and early July, Namoya achieved stacking rates in excess of 5 000 tonnes per day (tpd) leading to material stacked in July of 151 026 tonnes. Further improvements are expected in August and September. Namoya's focus is on ore delivery in order to support the increases in the stacking

rate towards commercial levels as well as optimising the stacking process with the agglomerated heap leach in order to improve percolation and gold extraction.

For the third quarter of 2015, Namoya is preparing for the delivery of the Cat 777 mining fleet additions. The Namoya Summit deposit has been cleared for delineation and is planned to be ready for production activities during the fourth quarter of 2015. ■

BK11 kimberlite resource estimate updated

Tango Mining, listed on the TSX-V, has completed an updated NI 43-101 resource for the past-producing BK11 kimberlite diamond mine in Botswana. The mine is part of the Orapa/Letlhakane kimberlite district and the resource is contained in a diamond-bearing, champagne-glass shaped kimberlite pipe with a surface area of 8,7 hectares (revision based on new geophysical modelling).

The updated estimate comprises 17,4 Mt of inferred resource containing a total of 780 820 carats of which approximately 9,0 Mt averages 6,8 cphpt for a total of 608 000 ct with higher-grade areas being identified at 9,8 cphpt.

BK11 contains good quality white diamonds in the top 10 % of global gem diamond production in terms of value per carat. The recovery of a 1,5 ct high quality Type IIa D colour diamond is significant as it indicates the presence of top quality stones within the BK11 kimberlite, with the potential for large +100 ct stones.

Based on the 2015 market, diamond valuation experts advise a minimum average price of US\$236/ct, a modelled price of US\$260/ct and an upside price of US\$285/ct.

The resource is based on the evaluation of 6 392 m of core drilling and 1 473 m of large diameter drilling. Sampling and mining produced approximately 19 000 ct that was valued up until February 2012 and analysed in terms of size frequency distribution.

Tango has run feasibility studies in parallel with the resource work and is preparing a NI 43-101 Preliminary Economic Assessment report. As part of this work, recently completed rock hardness measurements have enabled autogenous mill sizing to be conducted. The deposit is considered as soft in the greater diamond industry and an autogenous mill retrofit to the existing plant is being assessed.

Botswana Power Corporation grid power has been installed to the site boundary and will be more cost effective than the historical and more expensive diesel generators. ■

Stellar completes PEA on Tongo diamond project

AIM-listed Stellar Diamonds plc has announced the results of the preliminary economic assessment (PEA) from its Tongo kimberlite diamond project in Sierra Leone.

Independent consulting company Paradigm Project Management (PPM) was retained by Stellar to conduct the PEA over the 1,45 million carat inferred resource of the Tongo Dyke-1 kimberlite, one of four kimberlite dykes at the project. The objective was to define updated project economics for both surface and underground mining of the diamond resource in support of the mining licence application.

The PEA has focused on the base case grade and resource model of 120 c/pt and

1,1 million carats to a depth of between 300 m and 400 m from surface over an initial 18-year life of mine. A detailed mine plan has been established that will allow for surface bench stope mining from years one to four. During the surface mining phase, the first underground shaft and infrastructure will be established such that underground ore production can commence in year three, and therefore allow for a seamless transition from surface to underground operations.

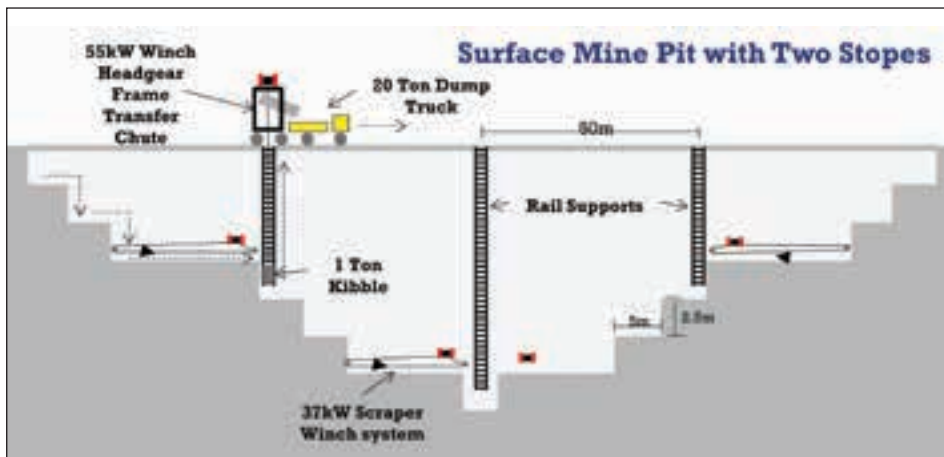
The capital requirement to establish production is estimated to be US\$24,2 million (years 1-3) which will enable both surface and underground mine infrastruc-

ture to be developed. With the sustaining capital included, total capital cost for the 18-year life of mine is US\$35 million. The previous capital figure reported in the Conceptual Economic Scoping study of 2013 was US\$16 million for just the underground mine (US\$21 million with sustaining capital), on a non-inflated basis. The increase in capital cost is a consequence of including surface mining in the model, the impact of inflation on capital costs sourced in South Africa, the assumption that all capital items are purchased brand new and applying annual inflation of 4,5% to the costs in the model.

Nominal life of mine operating cost before inflation is US\$73 per tonne, which includes mining costs of US\$34 per tonne for surface mining and US\$38 per tonne for underground mining. The escalated average operating cost over the life of the mine is estimated to be approximately US\$108 per tonne treated, taking into account inflation.

"The Tongo PEA has delivered robust economics which support the development of an open pit and subsequent underground mine," comments Stellar's Chief Executive, Karl Smithson. "Early cash flow is expected to be generated from the initial surface mining but the mine also represents a long-term and sustainable operation which has the potential to generate solid cash flows from the sale of its very high quality, high grade diamonds over many years. Stellar considers that the Tongo mine can be further improved and extended with the development of additional diamond resources from nearby high-grade kimberlites that we have previously identified and tested.

"Importantly for Sierra Leone, this mine will contribute significant employment and community development opportunities in an area that has been adversely affected by the Ebola crisis, which has now thankfully been eradicated from the area of operation for over six months. As such, we will work closely with all stakeholders to ensure the successful development of this mine for all concerned. We expect to formally submit our application for the mining licence in the near future, once our environmental impact assessment study has been completed and our environmental licence granted." ■



A detailed mine plan has been established that will allow for surface bench stope mining from surface to 40 m depth from years one to four. Ore will be extracted by winch and rail-mounted 1-t kibble.

Nachu has the ability to produce a premium product

ASX-listed Magnis Resources has further refined its metallurgical process to maximise the value of the product to be produced at its Nachu graphite project in Tanzania.

A -300 micron graphite concentrate at greater than 99% TGC (Total Graphitic Carbon) has been produced whilst maintaining the recovery and grade of the Super Jumbo (+500 microns) and Jumbo (+300 microns) product streams. The detailed design of the processing plant continues unabated with current refinements achieved through minor reconfiguration of the flotation process to ensure the necessary flexibility in future operations.

"The ability to produce a -300 micron graphite concentrate at greater than 99% TGC without chemical purification means that Magnis has the ability to supply a premium product at a substantially lower cost than other producers," says

Dr Frank Houllis, CEO of Magnis.

"This achievement is the result of current and potential offtake partners working closely with Magnis to satisfy themselves that Magnis can produce a premium quality graphite at the bottom cost quartile. Crucial to this outcome is the large graphite flake size at Nachu, which is a key ingredient in making premium products for emerging high technology applications."

Magnis has also announced that a Special Mining Licence (SML) for the Nachu project has been granted by the Ministry of Energy and Minerals (MEM) of Tanzania. This allows the company to move forward with finalising funding arrangements for the further development of the project. The SML has been granted to Uranex Tanzania, the 100%-owned Tanzanian subsidiary of Magnis. ■

Platreef's presink winder commissions

In its review of operations for the second quarter of 2015, TSX-listed Ivanhoe Mines, which is developing the Platreef project near Mokopane on the Northern Limb of the Bushveld Complex, says that commissioning is underway for the pre-sink winder that will be used to sink Platreef's Shaft 1 to a depth of approximately 60 m below surface. It also reports that (as of 12 August), construction of the foundations for the large winding equipment needed to sink the shaft below 60 m were almost complete.

Other work on site includes the construction of the primary terraces for Shaft 1 and the stormwater pond. A total of 73 % of the 611 permanent and contract workers presently employed by the company are from the local area.

The Platreef project is 64 %-owned by Ivanhoe through its subsidiary, Ivanplats, and 10 %-owned by a Japanese consortium of ITOCHU Corporation and its affiliate, ITC Platinum; Japan Oil, Gas and Metals National Corporation (JOGMEC); and Japan Gas Corporation. The remaining 26 % interest is held by B-BBEE partners, who include communities, employees and entrepreneurs.

Since 2007, Ivanhoe has focused its exploration activities on defining and advancing the down-dip extension of its original Platreef discovery, now known as

the Flatreef deposit, which is viewed as being amenable to highly mechanised, underground mining methods.

Ivanhoe completed a Pre-Feasibility Study (PFS) in January 2015 that covered the first phase of development that is expected to include construction of an underground mine, concentrator and other associated infrastructure to support initial concentrate production by 2019.

The shaft-sinking contractor for Shaft 1 – which will be used to extract a mineralised bulk sample for metallurgical testing from the 800-m level of the Flatreef deposit – is Aveng Mining. The shaft will have an internal diameter of 7,25 m and is projected to reach a total depth of 975 m in 2018. Aveng Mining is also responsible for the excavation of the boxcut access for the shaft collar and vent plenum. The fabrication of the temporary, sinking headframe and centre tower is well underway.

The mine's main production shaft, Shaft 2, will have an internal diameter of 10,0 m and will be capable of hoisting 6 Mt/a. Ivanhoe awarded the contract for the design and engineering of Shaft 2 to Murray & Roberts Cementation in June 2014. The boxcut designs are complete and the contract for the early engineering works for the winding equipment has been awarded to FLSmidth. ■



Shaft 1 winder ready for commissioning (photo: Ivanhoe).

Hatch Goba to conduct studies on potash projects

ASX-listed Elemental Minerals has appointed Hatch Goba (Hatch) to conduct the Bankable Feasibility Study (BFS) at its Kola sylvinitic project and the Pre Feasibility Study (PFS) at its Dougou carnallite project. Kola and Dougou are high grade and large potash deposits within Elemental's Sintoukola Permit in the Republic of Congo (RoC). In addition, the company says it is continuing to advance its discussions with potential strategic partners and is now at term sheet stage with some of these.

The Kola BFS is planned for completion in Q3 2016, with the start of construction foreseen in Q2 2017. The Dougou PFS and ESIA are both scheduled to be completed in Q2 2016.

Elemental's CEO, John Sanders, commented: "The commencement of the BFS at Kola, our flagship project, marks the final phase of project development for the company before construction, and is a major milestone achieved in what is clearly a difficult macro economic environment.

"We are delighted to have selected Hatch as our lead consultants for our projects, especially as they have a formidable track record in the design and construction of potash mining and infrastructure projects. Their comprehensive experience in the implementation of both potash projects and African pit-to-port mining projects should assist the company to ensure that the studies are prepared to the highest quality from a bankable perspective. Fieldwork for the Kola and Dougou studies has also started.

"We expect the BFS for Kola to further highlight the exceptional quality of this sylvinitic project and its ability to support very attractive returns on investment and an operating cost that is unparalleled, underpinned by the quality, shallow depth and location of the deposit. Similarly, we anticipate excellent results from the PFS for Dougou, taking advantage of the low gas price in the RoC and the suitability of this deposit to solution mining.

"Kola and Dougou are planned to produce a combined total of 3,2 Mt/a in the long term and should be the leading projects in an emerging and important potash province. In addition, we are progressing our strategic partnership discussions with various entities for off-take and sizeable investments." ■



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Plant earthworks for Yanfolila completed

Hummingbird Resources, which is developing the 1,8 Moz Yanfolila gold project in Mali, has announced that Taurus Funds Management has extended the US\$10 million bridge facility by a further US\$5 million for the on-going development work at Yanfolila. Additionally, plant earthworks are now complete ahead of commencing full-scale construction with the first gold pour targeted in 2016.

"The extension of the bridge facil-

ity allows Hummingbird to maintain its schedule as we conclude all the necessary technical, financial and legal due diligence prior to first draw on the main facility," comments Dan Betts, CEO of Hummingbird Resources.

"This extension demonstrates both Taurus' continued commitment to the development of the Yanfolila gold project and their belief in the robust nature of the project at a time when the gold mar-

ket appears to be suffering in confidence. Hummingbird is delighted to be working with such a supportive partner to develop this project.

"We have recently completed the plant earthworks which consisted of the excavation, landscaping and compaction of over 80 000 cubic metres of earth and we continue to believe that the development of Yanfolila during the downturn will set Hummingbird apart as a cash generative miner offering investors leveraged exposure into the gold space." ■



Earthmoving machinery at work at the Yanfolila site in Mali. The plant earthworks have recently been completed (photo: Hummingbird Resources).



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Marthinus Odendaal of WorleyParsons.

New technology pins down infrastructure location

Earlier this year professional services provider WorleyParsons RSA was commissioned to undertake a scoping study for the positioning of a new primary wet processing plant for Tronox's KZN Sands operation.

KZN Sands is one of two Tronox mining ventures in South Africa and concentrates on removing naturally occurring heavy minerals such as ilmenite and zircon from dune sand. The minerals are then either used as feedstock in their natural form or in an upgraded form such as synthetic rutile and titania slag which are produced through the secondary processing of ilmenite.

The scoping study, completed by WorleyParsons over a five-month period, set out to establish the most economically viable location for the proposed new processing plant at the Port Durnford greenfield site at KZN Sands. To identify the most optimal position for the new plant, WorleyParsons RSA developed an innovative methodology, dubbed 'OptiMap'.

Incorporating various cost relationships and value chain theory, OptiMap calculates

the optimal costs over the lifespan of a mine. As the name implies, OptiMap also provides a visual representation on a map of the most optimal location of the infrastructure. The tool has the functionality to identify cost implications immediately if the position is changed.

"We are exceptionally pleased with the development of OptiMap as the use of this tool gave the WorleyParsons team an edge. It is an optimisation model capable of handling the massive number of possible configurations available," says WorleyParsons RSA project manager Marthinus Odendaal.

Consulting economic-geologist Vanessa Clark-Mostert adds that locating infrastructure in terms of the cost impact it has on the mine is a common problem that OptiMap now addresses efficiently. The tool can be used in many locations and for any mining commodity, as the same theory and principles apply. Furthermore, OptiMap is also compatible with other existing WorleyParsons methodologies such as the EcoNomics™ DeltΔ tool to provide a truly unique value offering, especially in a discrete options evaluation environment.

Odendaal and Clark-Mostert go on to explain that the mineral deposits found in the sand represent only a small percentage

of the total sand mined. All the sand and associated mined minerals are transported to the processing plant. The heavy metal is separated and the residual sand then needs to be returned and rehabilitated which is why the positioning of the wet plant was so important.

"For the new Port Durnford site, we had to establish a position for the primary wet plant, and the position had a significant impact in terms of cost," says Odendaal. "We first of all had to determine the economical mining pit based on the geological block model using Whittle Optimisation software. The mine is then scheduled over the life of the mine and mining blocks determined. We define all the mining and process 'streams' and express them as a cost relationship relative to the distance in rand/tonne/km.

"The distance of the mining block to the process plant varies over time as mining progress. The total cost over the life of mine is minimised by determining the plant position using OptiMap. Here we did a lot of ground-breaking work for the client with the use of OptiMap. It was also possible to advise the client on what mining method to use as the model made it possible to determine the total incremental cost of mining and processing over the life of the mine." ■

Modifications to tungsten plant now installed

AIM-traded Premier African Minerals Limited, which operates and has a 49 % interest in the newly commissioned RHA tungsten project (RHA) in north-east Zimbabwe, says that previously announced process plant modifications have been installed and the operational benefits confirmed.

The modifications were designed to improve efficiency of the crushing circuits and allow better utilisation of the surplus capacity on the downstream concentration circuits. The immediate effect of the modifications was anticipated to be an increase in the percentage of higher grade fines concentrate over the coarse concentrate, with a probable overall increase of total tonnage of concentrate produced.

Prior to installation of the modifications, up to 40 per cent of feed ore was rejected as oversize and stockpiled.

Premier African Minerals says that feed

grade at the mine continues to improve as the more mineralised ore from within the resource model envelope is exposed. When run-of-mine feed grade reaches the planned grade, RHA expects that production targets will be achieved.

RHA is able to produce grade at any percentage of contained WO_3 (tungsten trioxide) from below 50 per cent to marginally in excess of 70 per cent. The company's analysis indicates that at the current pricing levels of APT (ammonium paratungstate), the financial returns are potentially improved by targeting output at the lower grade as any penalty for any lower grade concentrate is more than offset by the benefits of lower production costs and a greater tonnage of concentrate produced.

George Roach, CEO, commented: "I am pleased to report that the RHA process plant modifications notified in our

announcement published on 8 July 2015 have now been installed. This successful installation was completed simultaneously with a replacement of the tailings discharge system. The replacement of this element of the process plant became necessary due to design deficiencies only understood when production increased to the design throughput of the plant (of not less than 16 tons per hour of resource grade ore, a mean diluted feed grade target of 0,8 per cent contained WO_3 and target production of 5 800 metric ton units per month).

"The modified plant now accepts the design tonnage into the recovery circuits. Fine tuning and optimisation is continuing, both as we explore the upper tonnage limits of the plant in excess of 16 tons per hour and seek to achieve consistent material flow through the recovery circuits. We expect that as and when concentrate production reaches the design output of the plant, RHA will operate profitably." ■

Drill programme at New Luika prospect completed

AIM-listed Shanta Gold has provided an exploration update on its resource development programme at the New Luika Gold Mine (NLGM) in Tanzania.

A reverse circulation drilling programme comprising 3 784 m has been completed, targeting the Elizabeth Hill mineralised prospect. Intersections received include 14 m at 6,23 g/t from 66 m in hole CSR427; 4 m at 14,52 g/t from 61 m in hole CSR434; and 6 m at 6,75 g/t from 29 m in hole CSR415.

All reverse circulation holes drilled intersected the mineralised structure at Elizabeth Hill, in close proximity to initial ore wireframe positions, supporting the accuracy of their interpretations.

The drilling programme was commissioned in June and July 2015 with a view to obtaining improved definition of the nature and extent of near-surface ore development at this prospect. Elizabeth Hill sits within the existing mining licence at NLGM, approximately 4 km east of

the New Luika processing plant.

During previous drilling campaigns, Elizabeth Hill was tested by means of wide-spaced drilling at depth, resulting in a limited understanding of near-surface ore development and gold grade. The latest drilling campaign was designed to provide close-spaced (25 m x 25 m) ore intersections at shallow depths and has yielded encouraging assay results over portions of the strike extent tested.

Elizabeth Hill is a linear south-east trending topographic high which suggests that possible future opencast exploitation could be characterised by low stripping ratios.

A substantial portion of the 750 m strike expression tested (approximately 400 m) is characterised by encouraging gold mineralisation. Areas displaying elevated gold grades are located within two distinct zones.

With progressive process plant upgrades at NLGM enabling the company

to increase monthly ore tonnage throughput, the required head grade at NLGM has decreased. Shanta is therefore in a position to exploit lower grade satellite deposits within the NLGM tenement, identified during earlier drilling phases. Low-to-medium grade gold ore from satellite deposits can be blended with high grade ore from Shanta's Bauhinia Creek pit to ensure steady plant feed grades and optimise gold recoveries. It is envisaged that this may have a positive effect on the longer term sustainability of NLGM operations.

The company intends to integrate drill findings into an updated resource assessment for Elizabeth Hill, after which pit optimisation studies will be commissioned.

Shanta is considering expanding the resource development programme to other satellite deposits within and in the direct vicinity of the NLGM Licence. Target areas include the Black Tree Hill, Ilunga and Luika South mineralised prospects. ■

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MOD to acquire more ground around Mahumo

Australian explorer MOD Resources, listed on the ASX, reports it is finalising a proposed transaction to acquire a number of prospecting licences in the immediate area of MOD's 100%-owned Mahumo high grade copper/silver project in the Kalahari Copperbelt of Botswana. The acquisition is considered an important part of future

growth plans for the Mahumo area and covers any possible extensions to the deposit.

MOD's offer includes a commitment to support initiatives of the Botswana government including training and local employment in the Ghanzi region in the event a mine is established at Mahumo.

A Stage One mineral resource estimate for Mahumo of 2,7 Mt at 2,0 % copper and 50 g/t silver was announced in March this year. It is based on drilling completed by MOD in 2011/2012 and 2014/2015 along a 2,4 km strike length at Mahumo to an average depth of approximately 300 m.

The Mahumo resource has a copper equivalent grade of approximately 2,5 %, which MOD believes is the highest grade for an announced copper/silver resource in Botswana. The silver grade of 50 g/t is particularly impressive and is three times the silver grade of other announced resources for the Kalahari Copperbelt.

A scoping level 'base case' model based on the Stage One mineral resource indicates potential for an initial 4-5 year underground mine life assuming toll treatment of ore. A separate, conceptual 'expanded target case' model has been prepared assuming significant high grade copper/silver mineralisation extends below the Stage One Resource. This conceptual model is based on a potential doubling of mine life with a 500 000 t/a processing plant constructed on site.

The proposed Stage Two resource drilling programme is intended to test the potential for significant extensions below current drilling and will proceed as soon as possible, subject to availability of funding. The Stage One scoping study is nearing completion and if positive will form the basis for pre-feasibility and definitive feasibility studies at Mahumo. ■



Inspecting core at the Mahumo project. A Stage One mineral resource estimate for Mahumo of 2,7 Mt at 2,0 % copper and 50 g/t silver was announced in March this year (photo: MOD Resources).

Mark Scowcroft joins Tsodilo Resources board

Tsodilo Resources, an exploration company focused on Botswana and listed on the TSX-V, has announced the appointment of Mark Scowcroft to its board of directors as a non-executive director.

Scowcroft has 26 years' experience in managing and investing in diamond exploration projects in Botswana. He began his career in 1989 as a geologist with De Beers Prospecting Botswana, after graduating in 1988 from the Royal School of Mines, Imperial College, London with a BSc (Honours) degree in Mining Geology.

In 1995, Scowcroft left De Beers to pursue a career as an independent diamond exploration consultant. As a consulting geologist to the Auridium JV in the late 1990s, he

was the first geologist to highlight the economic potential of kimberlite BK16 in reports to the Botswana government. Soon thereafter, in collaboration with fellow diamond geologist, Dr Leon Daniels, Scowcroft spearheaded efforts to re-evaluate the geology and economic potential of known kimberlites in the Orapa Kimberlite Field. He was an early proponent of Botswana's now common practice of offering junior exploration companies the opportunity to re-explore kimberlites which had in earlier exploration been thought to have insufficient economic potential.

In 2002, Scowcroft co-founded African Diamonds, in which he was the largest shareholder and executive director respon-

sible for Botswana operations.

Scowcroft was a founding director of Boteti Mining, a joint venture between African Diamonds and De Beers, and personally negotiated the inclusion in the joint venture by De Beers of a number of kimberlites, including kimberlite AK6, which has since been developed into the Karowe diamond mine.

"I am delighted to have been invited onto the board of Tsodilo Resources and to assist with the further development of BK16, a kimberlite I know well and which I believe is the most prospective of the known, un-evaluated, diamondiferous kimberlites in Botswana," Scowcroft comments. "I firmly believe that BK16 has the potential to become the next hard-rock diamond mine in Botswana." ■

Record blast for AXXIS Down Under

In another record blast for BME's AXXIS digital initiation system, Omnia subsidiary Advanced Initiating Systems (AIS) recently successfully blasted 4 485 detonators in a coal mine in Australia's north-eastern state of Queensland.

"The blast broke 2,8 million cubic metres of overburden, and involved the drilling of 2 242 holes," says Trevor Grant, Managing Director of AIS. "A large blast like this has many benefits for the client, including less downtime for all equipment as stoppages related to blasting are less frequent. Typically an area of this magnitude would take three to four separate shocktube blasts to fire, which entails three or four mine stoppages."

The AXXIS system was developed in South Africa by BME. For safety, AXXIS offers a full two-way communication between the blasting box and detonators; during detonator logging, however, there is no direct communication with the detonators.

AIS's blast used 12 blasting boxes, including one master box, and more than 155 km of wire. Each hole contained a 15 m and 45 m AXXIS detonator. The robustness of the AXXIS detonators allowed the blastholes to be loaded without pillow decking which helps reduce overall loading time of the blast. The blast, which required just two AIS staff on site, was loaded in eight days.

The AXXIS system allows the programming of detonators to fire at one millisecond intervals. Up to 600 detonators can be fired from each box, or 500 detonators per multiple linked box.

"The blast was remote-fired from a kilometre away, within a 15 minute window," says Grant. "There were no problems with any of the detonators, with every one testing 100 % before the blast."

The system developed by BME also includes its AXXIS electronic delay detonators, which feature very high accuracy compared to traditional shocktube detonator systems.

"This accuracy and timing flexibility supports the detonation of small, multiple charges in each blasthole to keep vibration levels down," says Grant. "This further enhances safety in the opencast mining environment, as high vibration levels from blasting can trigger pit-wall failure."

As an integral part of its AXXIS system, BME has developed blast design software BlastMap III, which allows complex timing designs and analysis of the results for each blast. ■

Flake graphite zone identified at Nicanda Hill in Mozambique

ASX-listed Triton Minerals reports that, as a result of the current Definitive Feasibility Study (DFS) drilling programme, it has identified a substantial jumbo flake graphite zone, known as 'P66', at its Nicanda Hill deposit, part of its Balama North graphite project in northern Mozambique.

Diamond drill hole GBND0055 intersected strong graphitic mineralisation with extensive jumbo flake graphite present in the drill core. Triton has now completed a number of additional drill holes both north and south of the original P66 intersection, which have confirmed the continuity of jumbo flake graphite mineralisation over a considerable distance.

The P66 zone is located to the north-west and outside of the previously defined graphitic mineralisation at Nicanda Hill and was discovered whilst testing a geophysical anomaly located outside the known resource footprint.

"The discovery of jumbo flake graphite at Nicanda Hill is an exceptional outcome for Triton and further demonstrates the world class nature of the Nicanda Hill deposit and the likelihood that it will become the premier graphite deposit in Mozambique," comments Triton's MD and CEO, Brad Boyle. ■

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Contract mining for Boikarabelo coal mine under consideration

ASX-listed Resource Generation Limited, which is developing the Boikarabelo coal mine in the Waterberg coalfield of South Africa, says it has been negotiating with financiers for more than three years to secure the US\$400 million required to complete the mine and related infrastructure. The aim has been to fund construction through debt in order to avoid issuing additional equity and diluting shareholders' interest in the project. This – says the company – has proved to be difficult due to changing macro-economic factors resulting in changes to the financiers' requirements.

In June 2015 the company believed it was close to an in-principle agreement with a club of financiers on the term sheet for a multi-layered funding package. Together with other funding commitments, this would have provided the necessary finance.

Finalising negotiations since has been hampered by a weakened API4 coal price forecast. As a result, in order to determine if gearing levels can be lowered, the club of financiers has now asked Resource Generation to investigate whether a contract mining model could reduce the mine's costs and capital requirement. Consequently,

Resource Generation is seeking quotes from mining contractors and this process is likely to take several months to complete. Meanwhile, other sources of finance are being explored.

Nevertheless, development at the mine continues with construction of the 22 kilometre long, 132 kV power line, electrical substation and switch room, and MBET pipeline either finished or nearing completion.

Paul Jury, MD of Resource Generation, said: "With low production costs, transport arrangements in place and a number of years' production already underwritten by sales contracts, Boikarabelo is well placed to benefit from any improved growth in global demand for coal. While weakness in the coal price forecast has delayed our securing the remaining finance to build the mine, we believe the asset is valuable and once construction is financed on acceptable terms will provide value to shareholders. Sufficient cash reserves exist for the company to operate in the medium term whilst pursuing completion of the project funding."

Stage 1 of the Boikarabelo mine development targets saleable coal production of 6 million tonnes per annum. ■

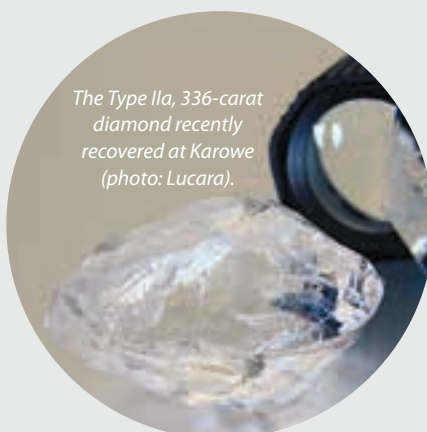
More big stones recovered at Karowe

Canada's Lucara Diamond Corp reports the recovery of a number of exceptional diamonds at its Karowe mine in Botswana. It says the resource is continuing to deliver according to expectations with the recovery of a spectacular Type IIa, 336-carat diamond. In addition to this, a further three exceptional diamonds were recovered recently – a 184-carat stone, a 94-carat stone and an 86-carat stone. The mine has also recently produced a 12-carat pale pink diamond, the colour of which will be confirmed post cleaning.

Over the past three years, since Karowe produced its first large diamond, Lucara has recovered 216 diamonds that have sold for more than US\$250 000 each. Twelve of these diamonds sold for more than US\$5,0 million each.

William Lamb, President and Chief Executive Officer, commented, "The

ongoing recovery of large exceptional diamonds from the Karowe mine continues to support the resource estimates. This resource has consistently produced significant value for the company and its shareholders and the ongoing recovery of high value stones sets Lucara apart from most other diamond producers." ■



The Type IIa, 336-carat diamond recently recovered at Karowe (photo: Lucara).

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Vast commissions CIL plant at Pickstone-Peerless

Vast Resources plc, the AIM-listed resource and development company with gold projects in Zimbabwe and Romania, reports it has commissioned the ball mill and the carbon in leach (CIL) plant at the Pickstone-Peerless gold mine in Zimbabwe, thus facilitating the start of gold adsorption and marking a further milestone in its transition into a cash generative mining company.

The mine is being commissioned with

a targeted initial annualised gold production of circa 10 000 oz Au – from an initial mining rate of 10 000 tonnes of ore per month – from the project’s opencast oxide gold cap.

Roy Pitchford, Chief Executive Officer, commented: “The commencement of gold production at Pickstone-Peerless gold mine in Zimbabwe, following the commencement of production at the Manaila polymetallic mine in Romania, will be a

further step in the process of transitioning Vast into an operating mining entity.”

Pickstone-Peerless is located 120 km south-west of Harare and 20 km from Chegutu. The project has an open-pit mineral reserve of approximately 1,0 Moz and approximately 2,2 Moz of underground potential. The Pickstone oxide pit is expected to be mined to a maximum depth of 80 m and the Peerless oxide pit to 40 m. ■



Mining operations underway at Pickstone-Peerless. The initial mining rate is 10 000 tonnes of ore per month (photo: Vast Resources).

Duwi Scoping Study results “highly encouraging”

Australian explorer Sovereign Metals has released the results of a Scoping Study on its Duwi flake graphite project located in central Malawi, 15 km east of the capital, Lilongwe. It says the project economics and technical viability are highly encouraging, highlighting its potential to become a low cost/high margin flake graphite producer.

The Base Case involves processing 30 Mt of indicated and inferred material at a rate of 1,5 Mt/a over a 20-year life to produce approximately 110 000 t/a of flake graphite concentrate (>95% Total Graphitic Content or TGC). The life of mine throughput of 30 Mt comprises 77 % in the indicated mineral resource category and 23 % in the inferred category.

The study estimates a life of mine

operating cost of US\$498 per tonne of concentrate (including transport costs FOB Nacala Port). It puts the initial capital investment at US\$112 million (before contingency) with a 1,7 year payback.

The proposed method of mining is by an open pit located on the Duwi Main deposit and a shallow satellite pit on the Duwi Bend deposit. A contract mining strategy was selected to mitigate project risk, although operational management will be retained by Sovereign personnel. Many of the design criteria inputs have been derived from earlier Malawian projects or studies with adjustments for time and the specifics of the Duwi project.

The Duwi Main open pit will be mined in several stages and will have eventual

dimensions of approximately 1 500 m (length) and 240 m (depth).

All processing will take place in a dedicated, purpose-built processing plant located close to the deposit. The flake graphite product will be packed and containerised on site and transported via road/rail and ship to the end-users.

The process flowsheet is based on flotation test-work carried out at SGS Canada (Lakefield). This constitutes a conventional flotation concentrator plant incorporating crushing, screening, flash flotation, milling, de-sanding and graphite flotation/polishing to recover commercial grade graphite flake. The estimated installed power for the process plant and services is 5,29 MW with annual power consumption of 29 235 MWh. Power will be supplied from a combination of grid power and on-site generation. ■

Proposed joint venture will revive and operate Obuasi

Randgold Resources and AngloGold Ashanti have concluded an investment agreement aimed at the formation of a joint venture to redevelop and operate AngloGold Ashanti's Obuasi gold mine in Ghana. In terms of the agreement, Randgold will lead and fund a development plan designed to rebuild Obuasi as a viable long-life mining business with an attractive cost structure and returns.

Located in the Ashanti region of Ghana 320 km north-west of the capital, Accra, Obuasi is a large, high-grade deposit with proven and probable ore reserves (as reported by AngloGold Ashanti in its 2014 Annual Report) of 24,53 Mt at 6,70 g/t for 5,29 Moz, part of a substantial mineral resource base.

In 2012, AngloGold Ashanti initiated a programme to modernise the mine, principally by starting to develop a ramp access that will ultimately run from surface to high-grade blocks of ore underground. The ramp will supplement current vertical hoisting infrastructure and help debottleneck the underground operation by allowing for greater ease in transporting people and materials underground, and transporting ore to surface. This is a necessary step ahead of the envisaged transformation of the mine into a modern, mechanised operation.

At the end of 2014, AngloGold Ashanti converted Obuasi to limited operations, ceasing underground production, retrenching the workforce, but continuing to process tailings and starting a feasibility study on the redevelopment of the mine. Development of the decline ramp has continued over this period.

The development plan will build on this feasibility study with the intention of establishing a more focused, efficient, mechanised high-grade operation and is expected to take about four months to complete. If the development plan meets both parties' investment criteria, and assuming all other conditions are satisfied, Randgold and AngloGold Ashanti will form a new joint venture company.

Randgold and AngloGold Ashanti will then be jointly responsible for funding the redevelopment of Obuasi in line with the agreed development plan. A Randgold group entity will be appointed as operator of the mine, and Randgold and AngloGold Ashanti will appoint an equal number of directors to the board of the joint venture company, with board and shareholder decisions to be approved by both parties. ■



AngloGold Ashanti and Randgold are planning the redevelopment of the more-than-100-year-old Obuasi gold mine in Ghana (photo: AngloGold Ashanti).



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DRA diversifies into new markets

*With the global commodities 'supercycle' now winding down as China's growth rate slows, companies providing services to the mining industry are having to face a future in which the high levels of mining activity of the past decade are unlikely to be seen again – at least in the short to medium term. DRA, one of South Africa's leading engineering and project management groups, is busy adapting to the 'new normal' by – amongst other strategies – expanding the range of markets it targets to reduce its dependence on mining, as Johann de Bruin, a Director of the company, recently explained to **Modern Mining**.*



DRA's Johann de Bruin.

De Bruin stresses that mining will remain DRA's core market providing the bulk of its turnover and revenue but says the group needs to continue diversifying as mining activity reduces around the globe. "If we rely purely on mining, there is little chance that we can continue to grow as vigorously as we have in recent years," he says. "So at the moment we are pushing into markets such as water, energy and infrastructure, even agriculture and general industry. The skills we have are easily deployed to these sectors. We've had one company ask us recently why we can't design and build a grease plant for them and the answer is that there's no reason in the world why not. After all, a facility of this type is not

too different from a minerals processing plant.

"As regards infrastructure, we've already been doing work of this type in the mining field for years – in fact, around R3 billion's worth over the past decade alone. Our strategy now will be to take this infrastructural expertise and apply it more widely. We've put a great deal of effort into understanding the infrastructure space and our conclusion is that the challenges are not so much technical in nature – it's easy enough to build projects of this type – but rather relate to issues such as financing and the legal and contractual arrangements adopted for project execution and operation. So we've been talking to players around the world, including funding agencies and equipment suppliers, to develop what we believe is a very compelling infrastructure offering."

In the water field, DRA intends pursuing an



DRA is the EPCM contractor for phase one of the Asanko gold mine of Asanko Gold Inc, presently under construction in Ghana. Phase 1 will be a low cost, long life mine producing 190 000 ounces of gold per annum at steady state, with – according to Asanko Gold – the first gold pour on track for Q1 2016 (photo: Asanko Gold).

as global mining activity wanes



aggressive strategy, driven mainly by acquisition. “This is an area perfectly matched to our skills. Not only do we have the capability to develop and build water and wastewater plants, and related facilities, but we can also run them. As you know, Minopex, which operates minerals plants on behalf of mining clients, is part of the DRA group and its expertise is readily transferable to the water space,” he observes. He adds that the growing problem of Acid Mine Drainage (AMD) also offers opportunities in the water field.

On energy, De Bruin says DRA is already talking to a number of potential clients. “The thrust is around renewables such as wind and

hydro but we also see huge scope for hybrid systems combining diesel generation and solar power, such as have already been installed on some mines,” he says. “Again, as with infrastructure, we already have considerable experience of energy projects as a result of our mining business. For example, we’ve recently designed and built two hydropower plants for the Kibali gold project in the north-eastern DRC. These will supply electricity to the new mine, which is being developed by Randgold Resources in conjunction with its partners, AngloGold Ashanti and Sokimo.”

The current diversification initiatives by DRA are nothing new. The company has a long

The 7,2 Mt/a processing plant at the Kibali gold mine in the north-eastern DRC. The plant, which has circuits for treating both oxide and sulphide ore, was commissioned in 2014.



The newly commissioned New Liberty gold mine in Liberia. DRA assisted its client, Aureus Mining, through all the study phases of the project and was the EPCM contractor for delivery of the plant. New Liberty is Liberia’s first commercial-scale gold mine (photo: Aureus Mining).

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history of expanding into new markets and disciplines. Founded in the 1980s, it was for many years tightly focused on designing and building processing plants for platinum and coal operations but has since extended its expertise to cover almost the entire spectrum of commodities. In addition, it has broadened its capabilities beyond minerals processing to include almost every aspect of mine development and mine design and is particularly recognised for its expertise in winders, winding systems and headgear design.

Says De Bruin: “Currently, we’re building up our capability around potash and phosphates as we see many opportunities in these areas. The mining methods are very different to those required for more mainstream commodities, so we’re having to learn about techniques such as solution mining, which are very specialised and hardly known in South Africa.

“Another area we’re looking at is marine mining and we’ve recently formed an association with a Dutch dredging company. We strongly believe that part of the future of mining is the exploitation of subsea resources. This is not just a distant prospect and a few weeks ago we were awarded a contract – by Nautilus Minerals Inc – for the design of a vessel-mounted 400 t/h plant which will screen seafloor massive sulphides into various size fractions and then dewater the product using centrifuges and filter presses. The contract is being undertaken by our Brisbane office but will incorporate the experience and technology we’ve gained from our participation in offshore diamond projects off the coast of South Africa and Namibia.”

DRA’s expanded Cape Town office, about to be officially opened as this article was being written, will play a key role in the group’s drive into marine work. “The office has a specific brief to target this sector,” says De Bruin. “It will also be focusing on increasing our involvement in Namibia’s mining industry and will handle a phosphate project we have in the Cape.”

In another development, De Bruin notes that DRA has rejuvenated its modular plant offering. “We’ve been involved in modular plants for a number of years, particularly in coal, but we’ve now extended the range to cater for the growing demand from clients for low cost modular solutions that offer ‘speed to market’ benefits which are not matched by fixed, high-capex permanent plants.”

DRA also has a strong drive currently around sustainable capital work. As De Bruin points out, the collapse of commodity prices has resulted in mine operators being under pressure to optimise their existing operations, especially their plants.



“We have all the skills needed to ensure that clients can get the efficiencies they need and we have several contracts in this field,” he says.

On the subject of geographical diversification, De Bruin – who runs DRA’s Central Region, which includes Africa – says that DRA has greatly increased its penetration of the African market over the past several years, achieving success not only in South Africa’s neighbouring states but also the DRC and West Africa. “We’ve really done well in Africa with some of the projects we’ve completed being very notable, even prestigious. In the DRC, we built the processing plant at Kibali, which is a major facility,” he states. “Not only is the plant working very well but we notched up 9 million LTI-free hours during the contract – which is a remarkable achievement, given that the project was undertaken in a very remote part of Africa using a labour force that was, when recruited, totally inexperienced and, for the most part, largely without even the most basic of skills.

“We’ve also just completed the New Liberty gold mine in Liberia, which is the first commercial-scale gold mine in that country. Here again, I think we can be proud of our performance, considering the remote location and the challenge of dealing with the Ebola outbreak. Our client was Aureus Mining, which is UK-based, and the project has raised our profile in London quite noticeably.”

Part of the reason for DRA’s success in Africa is that the company is extremely competitive – compared to, say, Canadian or Australian rivals – due to the fact that the engineering services it provides are mainly rand-based but it also reflects the company’s track record of delivering on time and within budget, proven in literally hundreds of projects around the globe over more than three decades. De Bruin also points

The new XRT (X-Ray Transmission) building at Lucara’s Karowe mine in the Orapa Kimberlite Field of Botswana. DRA built the original processing plant at the site, commissioned in 2012, and has now completed a major upgrade which includes the innovative XRT circuit (photo: Lucara Diamond Corp).

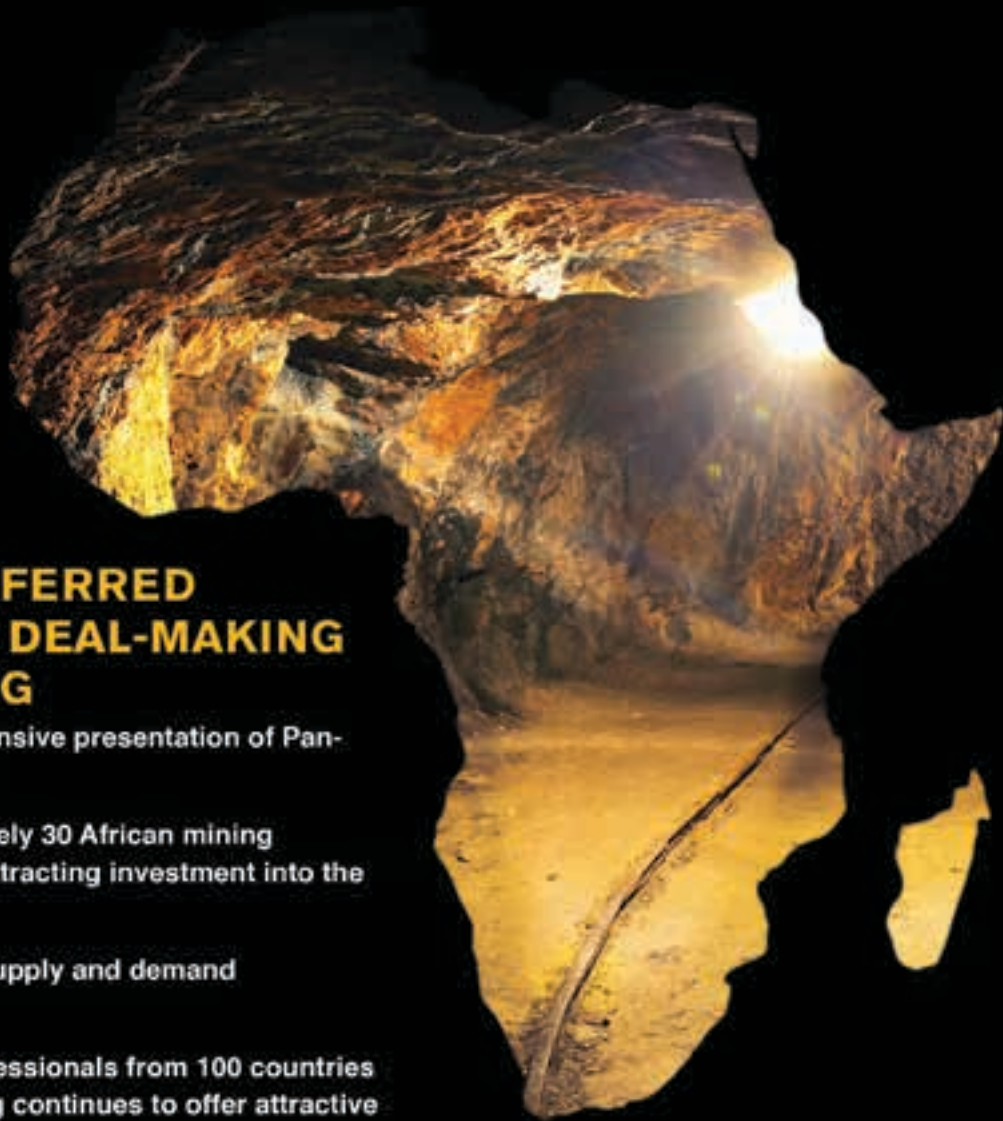


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to DRA's 'partnering' approach with not only its clients but also its own sub-contractors. "Since DRA was formed we've never been involved in any litigation with either our clients or our contractors," he says. "All projects have their problems but we would rather work constructively to solve them as opposed to relying on the small print in contracts and resorting to lawyers. We see no merit in an adversarial approach."

With many projects – such as Kibali, New Liberty, the Karowe upgrade in Botswana, and, soon, in South Africa, the Maseve platinum mine – exiting DRA's project pipeline, the hunt is on for new work to refill the order book. Notwithstanding the downturn, this effort has already met with considerable success with DRA picking up some key contracts over the past year to 18 months, including Phase 1 of Sierra Rutile's Gangama mineral sands project in Sierra Leone (DRA's first project in the country), the Yaramoko gold project of Roxgold in Burkina Faso (in joint venture with Group Five), the Asanko gold mine in Ghana and, in South Africa, Ivanhoe's potentially huge Platreef PGM project near Mokopane. Other bids are currently being adjudicated and De Bruin is confident that some contract awards will result. As he points out, DRA has historically been successful on more than half of the bids it puts in.

He also mentions that DRA has a healthy workload of study work around Africa – typical examples being the pre-feasibility on Platinum Group Metals' Waterberg project in South Africa and the DFS for Triton Minerals' Mozambique graphite project. Clearly, there is a good chance

that assignments of this type could eventually carry over into the project execution phase.

Finally, what of DRA's activities outside Africa? De Bruin responds by saying that DRA needs to be – and increasingly is – a global player, with offices in Canada, the US, Australia (in both Perth and Brisbane), China and India. "While we've always been a group that has grown organically, our thrust into overseas markets is necessarily driven by acquisition – it's the only way to build up a footprint fast. The key acquisition so far has been the Taggart deal, concluded last year, which has given us critical mass in North America. We're also forming partnerships where appropriate, an example being our recent link-up with Australian mine planning consultancy Orelogy. The main effect of this will be to strengthen our relationship with Australian miners and explorers working in Africa rather than our Australian business so we probably still need to make at least one acquisition if we're to establish ourselves as a really significant participant in the Australian market," he says.

"Generally, our philosophy is that the increasing size of projects and the globalisation of mining means that there is very little future in being a mid-tier regional player – you either need to find a niche and occupy it or go big and go international. We've chosen the latter option and we're well on our way to becoming the first South African engineering group and 'project house' to have a truly global standing and the ability to compete internationally."

Report by Arthur Tassell

The concentrator at Platinum Group Metals' WBJV Project 1 mine (also known as Maseve) in South Africa's Western Bushveld. DRA is responsible for the surface infrastructure, including the processing plant, at the new mine, which is now nearly complete (photo: Platinum Group Metals).

Sibanye Gold takes the plunge into platinum

Sibanye Gold has performed impressively in turning around the ageing, high-cost gold-mining operations which were previously part of Gold Fields' South African portfolio. With its much-anticipated acquisition of Anglo American Platinum's Rustenburg Operations now confirmed, the question is whether it can produce a similar 'miracle' in the platinum mining field and secure the future of low-margin assets which are considered non-core by the present owner.



Neal Froneman (left), CEO of Sibanye, and Chris Griffith, CEO of Anglo American Platinum, pictured at the presentation at the JSE announcing the acquisition (photo: Arthur Tassell).

In terms of the deal, Sibanye will acquire the Rustenburg Operations for a minimum consideration of R4,5 billion. This is made up of an upfront payment of R1,5 billion in cash or shares and a deferred consideration equal to 35 % of the distributable free cash flows generated by the Rustenburg Operations over a six-year period, subject to a minimum nominal payment of R3 billion.

The Rustenburg Operations are located centrally on the Western Limb of the Bushveld Complex near the town of Rustenburg. They comprise the Bathopele, Siphumelele and Thembelani (including Khuseleka) mining operations, two concentrating plants, an on-site chrome recovery plant, the western limb tailings retreatment plant and associated surface infrastructure, as well as approximately four months of working capital on a going concern basis. The lease area covers an extensive 28 km strike length with the orebody extending 8 km down dip.

Three of the mining operations covered by the deal are relatively old, with Khuseleka (now part of Thembelani) and Thembelani itself having started operations in the early 1970s and Siphumelele in the early 1980s. Bathopele is of more recent vintage, with mining having commenced in 1999. All are mined conventionally except for Bathopele which is a trackless mechanised operation.

The mining depth at Bathopele, a UG2 operation,

is between 40 m and 350 m below surface while at Thembelani and Khuseleka, which both mine Merensky and UG2 ore, operations take place between roughly 400 and 950 m. Siphumelele, which currently mines Merensky ore with UG2 planned for the future, is the deepest of the mines with the mining depth ranging from 600 m to 1 350 m below surface.

The transaction includes a Purchase of Concentrate (PoC) agreement for all concentrate produced at the Rustenburg Operations until 31 December 2018. Thereafter there will be a transition to a toll treatment arrangement to smelt and refine the concentrate from the Rustenburg Operations.

The acquisition will roughly double the size of Sibanye Gold – which will likely change its name to reflect the fact that it is now no longer purely focused on gold – and make it the world's fifth largest PGM producer. The Rustenburg Operations are capable of producing 800 000 PGM ounces annually. Current



PGM (4E) mineral reserves amount to approximately 9,7 Moz and mineral resources to 88,8 Moz.

Anyone expecting an immediate transformation of the assets will be disappointed as completion of the deal is not expected until the third quarter of next year. Until then the Rustenburg Operations will remain under the management of Anglo American Platinum (AAP). Management information and operational decisions will, however, be shared with Sibanye once the competition authorities have approved the acquisition.

The details of the transaction were revealed on 9 September by Chris Griffith, CEO of Anglo American Platinum, and Neal Froneman, CEO, of Sibanye, at a presentation held in a packed JSE auditorium in Sandton.

Commenting on the transaction, Froneman said: “We have for some time indicated our interest in participating in the PGM sector and believe that these assets provide an attractively priced entry at an advantageous moment in the price cycle. The Rustenburg Operations are similar in nature to Sibanye’s current gold operations and, after extensive engagement with AAP and completing a thorough due diligence, we are confident that we will be able to realise value for our stakeholders by leveraging our successful operating model.”

For his part, Griffith said the deal represented a significant milestone in the repositioning of AAP’s portfolio. “The Rustenburg Operations are quality assets with long-term and sustainable potential under Sibanye’s control, given their proven and successful track record of operating conventional mines in South Africa,” he said. “Our focus from the outset has been to identify the right option for the business, its stakeholders and shareholders and we believe



we have concluded a beneficial transaction for both parties, whilst also securing a sustainable future for the Rustenburg Operations.

“We remain committed to pursuing our strategy, continuing to reposition Anglo American Platinum as a high quality, largely mechanised operator yielding high margins. We are focusing on our core assets and exiting those assets we have identified as non-core in a responsible manner, consistent with the objectives of the Mining Charter.”

A positive for Sibanye, as pointed out by Froneman at the JSE presentation, is that much of the rationalising and restructuring deemed necessary for the health of the Rustenburg Operations has already taken place, with AAP having trimmed the workforce substantially and eliminated some loss-making production.

The Rustenburg assets will come under a new division of Sibanye – Sibanye Platinum. This will be run by a management team headed by Shadwick Bessit, currently Senior Vice President: Underground Operations – Kloof and Driefontein., Robert van Niekerk (Senior VP Organisational Effectiveness) and Justin Froneman (who will be CFO). They will be assisted by Barry Davidson as Non-Executive Director.

Bessit served as Executive Director of Operations at Impala Platinum from 2005 to 2010 after joining Implats in 2002 as General Manager. Previously, he was employed at AngloGold Ashanti from 1986 to 2002 where he moved through the ranks to GM level at the Deelkraal, Elandsrand and Savuka mines. Van Niekerk held various senior management positions at Anglo American Platinum Operations between 2009 and 2011. Davidson, of course, is a previous Executive Chairman of Anglo American Platinum. ■

Above: Siphumelele – seen here – currently mines the Merensky Reef (although UG2 will follow in future). Commissioned in 1983, it is conventionally mined (breast stoping with strike pillars) and its infrastructure includes one vertical shaft and a sub-decline (photo: AAP).

Above left: Underground at Bathopele. This is the newest of the mines that Sibanye will be acquiring. A trackless mechanised operation accessed by two decline shafts, it mines the UG2 horizon using low profile and extra-low profile equipment (photo: AAP).

Namibia's mining sector becomes more diversified

*While Namibia is not as dependent on mining as some other Southern African countries such as Botswana and Zambia, mining is nevertheless an important sector of the country's economy, accounting for around 13 % of GDP and providing more than 17 000 people with employment. Once heavily reliant on diamonds, the industry has become more diverse in recent years, with uranium in particular already contributing strongly to the economy – with an even bigger contribution still to come. In fact, it has been estimated that the new Husab uranium mine, once in full production, will contribute 6 % of the country's GDP. In this article, **Modern Mining's** Arthur Tassell gives an overview of the Namibian industry and its prospects.*

The new Tschudi copper mine and processing plant in northern Namibia is currently ramping up to an annual capacity of 17 000 tonnes of copper (photo: LogiMan).

The Namibian mining sector has been no more immune to the global downturn than the mining industries in most other countries and – according to the Chamber of Mines of Namibia – contracted in 2014 by 4,6 %. During 2014 one mine – the **Okorusu fluorspar mine** – suspended operations (mainly as a result of the orebody being exhausted)

while other mines scaled back their operations. Balancing this, however, has been the commissioning of three new mines over the past year, namely the Otjikoto gold mine, the Tschudi copper mine and the Sendelingsdrif diamond mine.

Looking at Namibia's mining industry by commodity, it is probably appropriate to start with diamonds, as the discovery of the first stone in 1908 set off a diamond rush along Namibia's southern coast and put the country on the map as a mining destination. Today diamond mining accounts for roughly half the value of Namibia's mining industry by revenue with virtually all production in the hands of Namdeb, a descendant of Sir Ernest Oppenheimer's Consolidated Diamond Mines of South West Africa (CDM), which was formed in 1920. CDM morphed into **Namdeb**, a joint venture between De Beers and the Namibian government, in 1994. Its main land-based operations are in Oranjemund although the company also operates satellite mines near Lüderitz and along the Orange River.

In 2014 Namdeb Diamond Corp, responsible for mining Namdeb Holding's land and shallow water offshore concessions, produced



612 265 carats against a budget of 570 427 carats. Debmarine Namibia, Namdeb's deep-water offshore arm, also performed well, producing 1,27 million carats. Commenting on this achievement in its 2014 Annual Review, the Chamber of Mines of Namibia says this was the largest annual production recorded to date by Debmarine Namibia, breaking the production record for the third year in a row.

A highlight for Namdeb in 2014 was the opening of the **Sendelingsdrif** mine on the Orange River in November, constructed at a cost of N\$360 million, which will replace production from Daberas. The associated Red Area Complex in Oranjemund, a recovery and sorting facility commissioned earlier in 2014, treats the concentrate from Sendelingsdrif. It was inaugurated at the same time as Sendelingsdrif.

Along with diamonds, the other main pillar of Namibia's mining industry is uranium, although the hope of four or five new uranium mines being developed in the near term – a real prospect a few years back – has receded in the post-Fukushima era and there is currently only one new uranium project – Husab – under construction.

The country's first uranium mine, **Rössing**, was developed by Rio Tinto 70 km inland from Swakopmund in the 1970s and is still operating today, although at much below its nameplate capacity of 4 500 t/a of uranium oxide (U₃O₈). A decision was taken by Rössing management last year to curtail operations from August 2014 onwards. Commenting on this decision in a recent report to stakeholders, MD Werner Duvenhage said: "Naturally, curtailed



operations impacted on our production figures for the year. Thus, during 2014, we produced 1 543 tonnes of uranium oxide, compared with 2 409 tonnes in 2013. Our revenue decreased accordingly, i.e. by 19 per cent compared with the previous year. This drop was due to significantly lower market prices and sales volumes, which in turn led to a net loss after tax of N\$91 million (2013: net profit after tax of N\$32 million) from normal operations."

Rössing ranks as one of the world's great open-pit operations, with the main (SJ) pit measuring 3 km by 1,5 km by 390 m deep. However, with operations having been curtailed, volumes are declining – 23 Mt of rock were mined during 2014 compared to 36 Mt in the previous year.

Namibia got its second uranium mine in 2007

The new acid plant at the Tsumeb smelter in Namibia, part of a US\$350 million investment by Dundee Precious Metals to expand and upgrade the Tsumeb facilities. The acid plant is now being commissioned and will be officially opened early next year (photo: Dundee Precious Metals).

The metallurgical plant of the new Otjikoto gold mine, which is also covered on page 32 of this issue (photo: B2Gold Namibia).





The Langer Heinrich uranium mine, which produced just over 5 Mlb (roughly 2 268 tonnes) of uranium oxide in the year to 30 June 2015 (photo: Paladin Energy).

when operations started at **Langer Heinrich** to the south-east of Rössing. Developed by Australia's Paladin Energy (although partly owned today by China National Nuclear Corp, which has a 25 % stake), Langer Heinrich is said to be the lowest-cost open-pit uranium mine in the world. Since being commissioned, it has been expanded twice, taking its capacity to well over 5 Mlb/a, and a fourth expansion is planned once uranium prices recover sufficiently. In the year to 30 June 2015, the mine produced just over 5 Mlb (roughly 2 268 tonnes) of uranium oxide, bigger than the figure for Rössing.

Between them, Rössing and Langer Heinrich accounted for 5,8 % of world uranium production in 2014, making Namibia the world's fifth biggest producer behind Kazakhstan (40,64 % of the total), Canada (15,77 %), Australia (9,12 %) and Niger (7,99 %) but ahead of Russia (5,35 %) and Uzbekistan (4,29 %). The country is expected to lift its ranking once the new US\$2 billion **Husab** mine, which has a design capacity of 15 million pounds (6 800 tonnes) of uranium oxide a year, enters full production. A large-scale, open-pit mine, Husab is employing a formidable earthmoving fleet including three giant Cat 7495 electric rope shovels. It is being developed by Swakop Uranium, which in turn is controlled by China Guangdong Nuclear Power Holdings Company Limited (CGNPC) and the China-Africa Development Fund (CADFund). The plant is due to start commissioning later this year with first production expected in 2016 and full production being attained in 2017.

The area to the east of Swakopmund is also host to a fourth mine, Areva's **Trekkopje**, which was at an advanced stage of development (with a pilot phase in operation) when a decision was taken to mothball it in 2012 as a result of the downward trend in the uranium price. Designed as a low-grade, open pit operation and with processing (unusually) via an alkaline leach process, Trekkopje will have the capacity to produce up to 3 200 t/a of U_3O_8 . Interestingly, Namibia's first desalination plant was built to supply water to the mine and was opened in 2010.

No overview of uranium in Namibia would be complete without at least mentioning the fact that there is a host of uranium projects at various stages of development in the country's 'uranium belt' to the east of Swakopmund, among them Bannerman's **Etango** project, Marenica Energy's **Marenica** project and Forsys Metals' **Norasa** project. Bannerman appears to be the most active of the development stage companies with a very comprehensive DFS in place and with a heap leach demonstration plant having recently been successfully completed on site. If it does eventually go into construction, Etango will be a very big mine. The DFS envisages that the project will produce 7-9 Mlb U_3O_8 per year for the first five years and 6-8 Mlb U_3O_8 per year thereafter.

Turning to copper, Namibia is only a minor producer, with the Tsumeb and Kombat mines long closed. All of the country's primary copper production is from Weatherly International, whose shares trade on London's AIM. Earlier this year, Weatherly commissioned its **Tschudi**



project, an open-pit mine which uses acid leaching and solvent extraction/electrowinning (SX/EW) technology to produce high-quality copper cathodes. South Africa's LogiMan was the EPC contractor for the plant and related facilities.

Located 26 km by road from the historic mining centre of Tsumeb, Tschudi will exploit a proven and probable JORC reserve of 22,7 Mt of ore at a grade of 0,95 % copper and is expected to produce 19 Mt of ore and waste – at a stripping ratio of 7,45 to 1 – over its 11-year mine life.

In an operations update issued very recently, Weatherly's CEO, Craig Thomas, notes that the company is maintaining its focus on Tschudi and that the ramp up is progressing well ahead of schedule. "I am pleased to confirm our previous commitment that, before year end, Weatherly will be operating a new 17 000 tonnes of copper metal per annum open-pit copper mine in the best mining country in Africa, producing some of the highest quality copper cathode in the world."

On the downside and in response to the falling copper price, Weatherly says it will convert its **Otjihase** and **Matchless** mines in the Windhoek area (its Central Operations) to a project development status "in order to prepare the mines for future production of larger volumes of copper concentrate at lower unit costs, when market conditions improve." Both mines are small producers with their combined production amounting to between 5 000 and 5 500 t/a of copper.

Several companies are involved in copper exploration. These include not only Weatherly but also Cupric Canyon (which is also developing the Khoemaçau mine in neighbouring Botswana), Kombat Copper, whose activities are centered on the Kombat copper mine (no longer producing) in northern Namibia, and IBML with its Omitiomire project.

While it may not be a major copper producer,

Namibia does have a sophisticated smelter, **Tsumeb**. It was constructed in the early 1960s to process concentrate from the Tsumeb copper mine and is one of only five commercial-scale smelters in Africa and one of only a few in the world which is able to treat arsenic and lead bearing copper concentrates. It is now owned and operated by Canada's Dundee Precious Metals (which purchased it from Weatherly in 2010) and roughly half of its business comes from Dundee's Chelopech mine in Bulgaria. Dundee is currently busy with a US\$350 million investment to expand and upgrade the Tsumeb facilities and bring them into line with modern environmental standards.

Another base metal which Namibia produces is zinc, with the two producers being the **Rosh Pinah** mine (purchased by Glencore from Exxaro in 2011) and **Skorpion Zinc** (owned by Vedanta). The two operations are both in the far south of the country (and just 25 km apart). An underground mine, Rosh Pinah produced 104 046 tonnes of zinc in concentrate (as well as 22 317 tonnes of lead in concentrate) in 2014 while Skorpion Zinc, an open-pit mine allied to a refinery, produced 102 188 tonnes of Special

Mining operations are already underway at the giant Husab uranium project. Seen here are some of the Komatsu 960E-TK (327-t capacity) electric dump trucks that have been deployed at the mine.

The 100 t/h jig plant installed at the Otjo manganese project (photo: Shaw River Manganese).



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High Grade (SHG) zinc. As part of Vedanta's recently announced Gamsberg project (which will see the Gamsberg zinc mine being developed in the Northern Cape), Skorpion's refinery will be converted (at a cost of about US\$152 million) to allow it to refine zinc concentrates from Gamsberg.

In respect of gold, Namibia was for long regarded as a 'one-trick pony', its only gold mine being **Navachab**, located near the town of Karibib, which AngloGold Ashanti commissioned in 1989. The country now has a second – and bigger – gold mine in the shape of B2Gold's **Otjikoto** mine north of Otiwarongo, which poured its first gold in December last year and has thus far – as we explain in an article on page 32 – proven a big success.

Navachab, which produced 57 700 ounces of gold in 2013 and 62 300 ounces in 2014, was bought last year by QKR Corp, a mining fund backed by Qatari interests and headed by former JP Morgan executive Lloyd Pengilly (well-known in South African mining circles). Since the deal was concluded, QKR has released little information on the mine but the Chamber of Mines' Annual Review does mention that a major waste pushback on the western side of the open pit started in 2014.

Another metal that Namibia produces (albeit in small quantities so far) is manganese, with Australian junior Shaw River Manganese producing manganese ore from several pits at its **Otjonzodu (Otjo)** project, located 150 km north-east of Windhoek in an historic manganese field. In the June quarter of this year Shaw River shipped just over 8 000 tonnes of product, the final destination being China. The company has been building up its processing capabilities at Otjo and, with the recent commissioning of a 100 t/h jig plant, now has all the plant and equipment required for crushing, screening and beneficiation of ore on site.

Finally, what of the future for Namibian mining? With diamond mining unlikely to



Exploration drilling by Kombat Copper Inc, a Canadian company which is hoping to restart mining at the Kombat copper mine in northern Namibia, possibly starting with an open-pit operation (photo: Kombat Copper).

grow strongly (Namdeb's onshore resources have only a limited life left) and with the country having very little chance of ever becoming a really major gold or copper producer, probably the best prospect for growth is uranium. The Fukushima incident was a devastating blow to uranium miners – and explorers – worldwide but there is every likelihood that the price of the commodity will eventually recover. If it does, Namibia will be a major beneficiary and could easily emerge as the world's second biggest U_3O_8 producer.

Certainly, the Namibian government seems determined to grow not just uranium mining but all sectors of the mining industry and has ensured that mining investment in Namibia – whether for exploration or new mines – is an attractive proposition. Its efforts paid off earlier this year when Namibia emerged as Africa's most attractive mining investment destination in the annual Fraser Institute *Survey of Mining Companies*, which – despite its title – essentially ranks mining jurisdictions worldwide. Combine this ranking with the country's stability, its good prospectivity and its generally excellent infrastructure and the inescapable conclusion is that mining in Namibia has a very bright future ahead of it. ■

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Otjikoto gold mine bursts out of the

The new Otjikoto gold mine in Namibia, which achieved commercial production – one month ahead of schedule – at the end of February this year, is performing strongly, justifying the decision of Canadian gold miner B2Gold Corp to invest US\$244 million in its development. Otjikoto is one of only two gold mines in Namibia – and by far the biggest – and can justly claim to have rejuvenated Namibia’s gold mining sector.

Located 300 km north of Windhoek and 70 km north of the town of Otjiwarongo, the Otjikoto deposit, which was overlain by calcrete, was discovered in the late 1990s by Anglovaal Mining which was exploring for base metals. The pace of development, however, was slow until B2Gold – the sixth company to be involved at Otjikoto – acquired the project in 2011 with a determination to bring the deposit to account as fast as possible. The company received its mining licence in December 2012, bush clearing started in January 2013 and in April of the same year the official groundbreaking ceremony was held, marking the start of the construction phase. Just 20 months later (in December 2014), the mine was able to pour its first gold, well within schedule.

The project’s development was led by Bill

Lytle as MD of B2Gold Namibia, who has now moved on to fresh duties within B2Gold (as VP, Africa). His successor is Mark Dawe, who has huge experience of mining in Namibia as he was previously MD of the Okorusu fluor-spar mine, Namibia’s sole fluor-spar operation. Okorusu – located quite close to Otjikoto – operated successfully for many years but was recently closed due to the depletion of the orebody. Dawe is also a past-President of the Chamber of Mines of Namibia.

An entirely conventional open-pit operation, Otjikoto currently operates a fleet of 12 Cat 777D (100-ton capacity) haul trucks loaded by a Liebherr 9250 hydraulic excavator, a Liebherr 984 hydraulic excavator and a Cat 6018 hydraulic face shovel. Additional ancillary equipment such as Cat D9 and D10 dozers, Cat 834K rubber tyre dozers, and Cat 16M motor graders supports the load and haul activities. Drilling is currently being undertaken by one Cat 6240 drill, two Sandvik DK25 drills, one Cat 5125 drill and a Sandvik DP1500i drill. As the mine continues to expand and go deeper, the mining fleet will also expand to meet required production targets.

On the processing side, the mine uses gravity circuits and leach/CIP processes to recover the gold. The plant was built with a 2,5 Mt/a capacity but B2Gold announced last year that it would be expanded to allow it to treat 3 Mt/a.



Regarding safety, Otjikoto has maintained a generally good record. In fact, the construction phase (which included the mill expansion that ran concurrently with operations in 2015) was completed in August 2015 with a record of 900 LTI-free days. Two minor LTIs, however, have been sustained during operations at the mine, one in October 2014 and the second in August this year.

The excellent performance of Otjikoto can be judged from the figures for the second quarter of 2015, the first full quarter of commercial production. Over the three-month period, the mine produced 36 963 ounces of gold compared to its budget of 35 106 ounces and the 31 134 ounces (including 18 815 ounces of pre-commercial production) produced in the first quarter of 2015. Higher than budgeted gold production was mainly the result of better than expected mill throughput (711 462 tonnes processed versus 624 112 tonnes budgeted) and higher mill recoveries than projected (98,7 % versus 95,6 % budgeted).

During the quarter, the average daily mill throughput was approximately 7 900 tonnes of ore per day, exceeding the design capacity of approximately 6 800 tonnes of ore per day. The average gold grade processed was 1,63 g/t compared to the budget of 1,83 g/t.

The processed gold grade continues to increase towards budget as the mine optimises mining grade control to reduce ore loss

Left: The processing plant at Otjikoto, which has now been expanded to take its capacity to 3 Mt/a.

Below: A very recent view of the Otjikoto pit. The mine operates a fleet of 12 Cat 777D haul trucks which are loaded by Liebherr excavators and a Cat hydraulic face shovel.

starting blocks

This has involved the installation of additional leach tanks, a pebble crusher and associated piping and pumping components. The work has just been completed and the plant is now working at its full 3 Mt/a capacity.



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and dilution and continues to fine tune the new on-site assay lab. This improvement is expected to continue as the mine gets below the complex upper oxide portion of the orebody and reaches primary ore.

The DFS on Otjikoto – which was based on the Otjikoto deposit alone and its probable mineral reserves of 29,4 million tonnes at a grade of 1,42 g/t – estimated a mine life of 12,5 years with an average annual production of 112 000 ounces. While the mine life is still estimated at 12,5 years, annual production is likely to be much higher but the exact

figures will only be known once an updated mine plan is completed by the end of this year. B2Gold, however, has already said that annual gold production will be approximately 200 000 ounces per annum in 2016 and 2017.

The increased production (which is catered for by the mill expansion) reflects the growing potential of the Wolfshag zone, located directly adjacent to the east and north-east of Otjikoto, which was discovered in late 2011. In January this year B2Gold announced a significantly higher grade updated gold mineral resource estimate for Wolfshag. The updated inferred mineral resource contains 675 000 ounces of gold within 2,58 Mt grading 8,14 g/t utilising a 3 g/t cut-off. This inferred resource is below a pit shell containing an additional 1,03 Mt at 2,81 g/t gold (93 000 ounces gold) in the indicated category. The previously released initial inferred resource estimate for the Wolfshag zone was 6,8 Mt at 3,2 g/t gold containing 703 000 ounces of gold.

B2Gold Namibia currently plans to commence open-pit mining at Wolfshag in 2016. The conceptual plan would be to blend higher grade material from Wolfshag with ore from the Otjikoto pit resulting in an increase in annual gold production at Otjikoto and improved project economics.

The updated mine plan will further evaluate open-pit and underground mining at Wolfshag. The Wolfshag zone remains open down plunge to the south-west. In addition, historic Otjikoto deposit holes such as OT98, with 16,0 m at 5,07 g/t gold, and OT126, with



3,0 m at 45,84 g/t gold and 26 m at 3,74 g/t gold including 7,0 m at 11,15 g/t gold (true width unknown), indicate the exploration potential of the main Otjikoto high grade shoots below the existing pit. These shoots could possibly be mined by underground methods in conjunction with the Wolfshag resource reported above a cut-off grade of 3,0 g/t gold.

Otjikoto, of course, has been a major boost for employment in the Otjiwarongo-Otavi area. As of the end of July this year, B2Gold Namibia had 685 employees, of whom 462 were on a permanent employment contract. Some 97 % were classed as historically disadvantaged, 17 % were female and less than 1 % were non-Namibian.

Thus far, according to B2Gold Namibia, labour relations have been positive. On 27 July this year, B2Gold Namibia and the Mineworkers' Union of Namibia (MUN) signed a Recognition and Procedural Agreement after the trade union met the required provision of the 50 % + 1 member representation.

"I am delighted that the MUN and the company have solidified these structures that will pave the way towards an honest and mutually beneficial dialogue," Mark Dawe said recently, commenting on the agreement. "Realising the importance of the Recognition and Procedural Agreement, both parties went to great lengths to ensure that it is a fair and comprehensive document that will govern and guide this crucial relationship for the life of Namibia's newest mine – the Otjikoto gold mine."

Photos courtesy of B2Gold Namibia

Otjikoto poured its first gold in December last year. Members of the project team are seen here with the first gold bar.

The updated mine plan will further evaluate open-pit and underground mining at Wolfshag.

North River presses ahead with

*Notwithstanding a sharp fall-off in recent months in the price of both zinc and lead, AIM-listed North River Resources remains committed to its Namib project (which involves reopening a past-producing, lead-zinc underground mine in Namibia) and is hoping to make a final investment decision by early next year. In the meantime, as CEO James Beams recently explained to **Modern Mining's** Arthur Tassell, the company is continuing its ongoing underground development programme at Namib and is also poised to start the Front End Engineering & Design (FEED) phase of the low-capex, brownfield project.*



Namibia's Minister of Mines and Energy, Obeth Kandjoze, pictured on site with North River's CEO, James Beams.

The mine, located 28 km to the east of Swakopmund, was operated as the Deblin mine (not to be confused, incidentally, with the Deblin copper prospect in northern Namibia) from the late 1960s through to 1991. Initially only lead was extracted from the mine but it was later realised that the orebody could also support a zinc mining operation and a zinc flotation circuit was added to the plant in 1974. During its final years of operation (1986 to 1991) the mine milled around 356 000 tonnes of ore (grading around 5,3 % zinc and 1,6 % lead) to produce approximately 38 000 tonnes of zinc concentrate and 14 000 tonnes of lead concentrate.

Deblin was abandoned by the owners in 1992, apparently due to a combination of low



metal prices at the time and some labour problems. Since acquiring the project in 2009, North River has dewatered the mine (whose two lowest levels had flooded) and returned it to a serviceable state. On surface, it has removed the old plant, which used technology that is now outdated – and which, in any event, had been vandalised subsequent to the mine's closure and was beyond any refurbishment.

A major plus for the project is that it is located in an area which has excellent infrastructure – in terms of water, power and transport links – and a long history of mining, with all that this implies in terms of the availability of mining skills and engineering support. The operating mines in the area are Rössing and Langer Heinrich, both large-scale uranium mining operations, and they will soon be joined by the US\$2 billion Husab uranium mine, now well into the construction phase.

North River completed a Definitive Feasibility Study (DFS) on the project late last year, which detailed a mining/processing operation with annual throughput of 250 000 tonnes at an average grade of 9 % (Pb + Zn) producing 19 100 tonnes of metal in concentrate, as well as 280 000 ounces per annum of silver as a byproduct. It estimated a 13-month schedule to bring the mine into production and an initial mine life of three-and-a-half years (including ramp up and ramp down) based on a life of mine plan of 813 000 tonnes (including inferred resources) at 6,2 % zinc, 2,7 % lead and 44 ppm silver.

The original Deblin operation was very shallow – the orebody was mined to a depth of

Namib lead-zinc project



210 m below surface – and was accessed initially by a 150 m deep vertical shaft. A 1,45 km long decline (the Junction decline) was developed in 1986 and a start was made on a second decline (the North decline) designed to access the northern part of the orebody. Mining methods were traditional and relatively labour intensive.

As outlined in the DFS, the new mine will make use of the existing underground infrastructure and broadly follow the mining practices of the original owners, with longhole open stoping and shrinkage stoping being the primary extraction methods. However, there will be an element of mechanisation with truck and loader haulage being utilised. As regards processing, the proposed flowsheet comprises simple bulk crushing and milling, followed by lead and then zinc flotation. The DFS estimated the cost of the plant at just over US\$18 million.

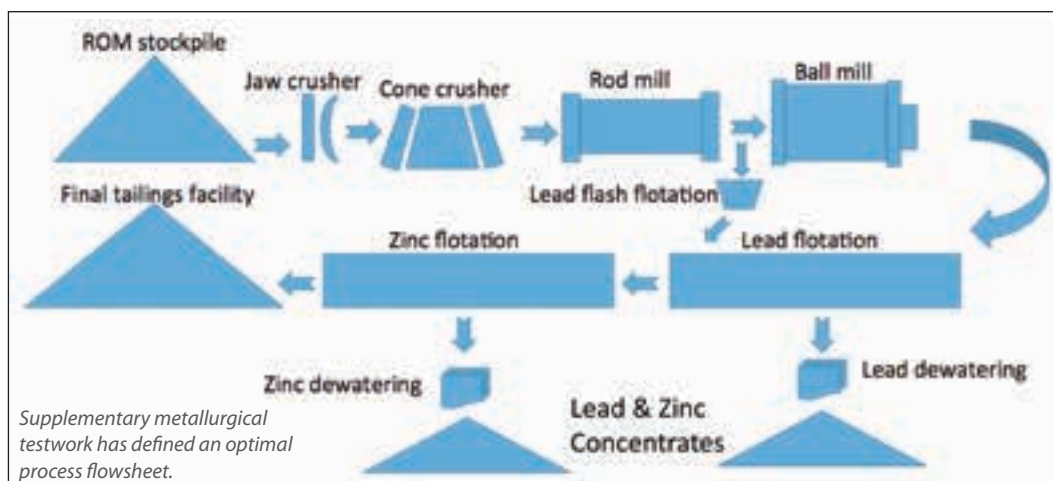
Announcing the results of the DFS in November last year, North River said the study demonstrated the “robust economics” of the project, with the payback period estimated at just 15 months. The DFS, however, assumed a zinc price of US\$2 400/tonne, a lead price of US\$2 300/tonne and a silver price of US\$21/oz. Current prices are well below these levels and, as this article was being written, zinc was trading at approximately US\$1 850/tonne and lead at US\$1 700/tonne. Silver – as high as US\$48/oz in 2011 – was also weak at around US\$15/oz.

Given the decline in the prices of these metals, does the project still make economic sense?

The Namib project site with a drill rig at work in the foreground and the tailings dump in the background.



This core sample illustrates typical high-grade mineralisation.





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According to Beams, very much so. “The driver of the project is zinc, which will account for around 65 % of revenue, and the consensus view is that its price will be in line with the DFS figure by 2017 – which is probably the year in which Namib will come into full production, assuming we do make a positive investment decision,” he says. “Quite a bit of zinc production is leaving the market – I’m thinking of the closure of the big Century mine in Australia, Lisheen in Ireland and a couple of the Canadian mines – and is not being fully replaced by production from new projects. The outlook for lead is not quite as positive but certainly no worse than for any of the other base metals while silver is not really an issue for Namib, as it is a minor part of the projected revenue stream.”

Outlining the progress made on the project since publication of the DFS, Beams – a former CFO of Anglo American’s copper division – says a decision was taken at the beginning of this year to change the board and senior management structure to reflect the transition of Namib into the implementation phase. “I was appointed as MD, replacing Martin French, who had decided to step down after doing sterling work in developing the project, while Keith Marshall, who used to be MD of Palabora Mining, and Ken Sangster, a hugely experienced metallurgist and mining executive, who was with Rio Tinto for 15 years, joined the board as non-executive directors. In addition, Andy Little, a mining engineer with over 30 years’ experience in constructing and commissioning mines, was appointed as Project Director.”

The past few months have also seen an optimisation of the DFS to enhance the economics. “In respect of the mining side of the project, we’ve run a number of scenarios to see how we can develop and run the mine more efficiently,” says Beams. “We’ve come out of that with essentially the same mine plan but slightly different equipment choices and with a recognition that mine development is on the critical path to production. So we’re pushing forward with the early development of the second decline – the North decline – and we already have a mining crew and loader on site working on this. The North decline will give us access to the northern section of the orebody, which was hardly exploited historically and which hosts over two-thirds of our reserves.”

Beams also says that supplementary metallurgical testwork undertaken by ALS Laboratories since the release of the DFS has allowed North River to define an optimal process flowsheet for the Namib project and, in



Geologists working in the field at the Namib project.

particular, has addressed the problem of the expected build-up of the iron sulphide mineral, pyrrhotite, in the zinc cleaner circuit.

“The DFS proposed the use of magnetic separation as a means of removing some of the pyrrhotite from the circuit,” Beams explains. “However, the results of tests which were only completed after we published the DFS indicated that this approach would not be effective and led to our decision to embark on the supplementary testwork programme. This testwork has proved very valuable and has allowed us to refine the flowsheet to allow the plant to treat effectively a wide range of ores of varying mineral composition and to handle, in particular, the pyrrhotite content. In essence, we’ve introduced a separate zinc regrind circuit and also selected an optimal reagent regime. Although we will be getting accurate figures on costing during the FEED phase, we believe the impact on the plant capex will be minimal.”

Beams adds that the revised flowsheet provides a high level of confidence that the plant will be able to deliver the required recoveries and concentrate grades on a consistent basis. He says it also greatly enhances the project’s bankability as North River moves forward with its financing plans and, in particular, its discussions with debt financiers.

On the subject of mine life, Beams makes the point that there is every prospect of the Namib mine operating well beyond the three-and-half years projected in the DFS. “In the northern part of the orebody, we’ve only drilled the resource down to 150 m – there’s not a single hole below that,” he notes. “We’re currently putting in an exploration drive from the south orebody – we’re about a third complete – which will allow deeper drilling of the northern orebody and we have every expectation that this will result in a significant expansion of our

“In respect of the mining side of the project, we’ve run a number of scenarios to see how we can develop and run the mine more efficiently.”

**James Beams, CEO,
North River**

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resource base. We also have a wider exploration programme underway on the Namib property.”

The Namib project does not yet have a mining licence but North River’s application has been with the authorities since April last year and the company is optimistic that it will soon be approved. “Our belief is that the Namibian government is very supportive of this project and indeed we recently hosted a very successful visit to the site – including a tour of the underground mine – by the new Minister of Mines and Energy in Namibia, Obeth Kandjoze, and the Governor of Erongo Region, Cleophas Mutjavikua,” says Beams. “They were accompanied by a large delegation from the Directorate of Mines. The visit formed part of a wider programme of mine visits by the Minister and we were honoured that Namib was one of the projects included in his tour.”

Looking ahead, Beams says North River envisages a two-phase approach to implementation of the project in terms of funding. “With the backing and participation of our biggest shareholder, Greenstone Resources, we’re currently engaged in an equity fund-raising to cover the short term working capital required

to cover the FEED phase, the ongoing development of the North decline and the exploration drive, as well as the sourcing of plant and equipment,” he states. “Our expectation is that all this work will be completed by the end of this year, clearing the way for our board to make a final investment decision on the project. This would then trigger a second debt and equity fund-raising – subject, of course, to our having received the mining licence – to cover the cost of constructing the project.

“In all, we’re going to need to raise US\$25 to US\$30 million. This is not going to be easy given current market conditions but balancing this is the fact that this is a very modest capex figure for a new mine. Also, I think there is an awareness that the commodities market is cyclical and that it’s just a question of time before prices recover at least some of the ground they’ve lost over the past year or two. Certainly we’ve been encouraged by the response we’ve had in initial discussions with potential lenders and I believe there is an excellent chance that we will be able to raise the money and that the project will enter construction in 2016.”

Photos courtesy of North River Resources

feature

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Revival of past-producing graphite

The only historical graphite mine in Namibia, the Aukam mine in the south of the country, could soon be revived. Two North American companies, Next Graphite Inc and Caribou King Resources, are planning to process the tailings heaps on surface while pursuing in parallel an exploration and assessment programme on the in-situ resources at the site.

The Aukam mine was established in 1940 and was mined on a small-scale till 1974. Production was focused on the extraction of ‘surface visible’ vein graphite ore and high grade underground vein lodes. Mining was generally undertaken from surface, but adits and stopes were developed from 1954 to 1957, when the mine was – according to Next Graphite, which has studied the surviving records – disabled by a fire which broke out in the lower adit. It is not clear how the fire was ignited but it was probably fuelled by the concentration of pyrite minerals hosted in the deposit.

Aukam’s production peaked at 2 600 plus tonnes per year from an area measuring approximately 350 m x 150 m x 100 m and, in all, approximately 25 000 tonnes of graphite was produced over the more than 30 years of operation. Next Graphite estimates that in today’s terms this production was worth US\$30 million.

Next Graphite, whose shares are traded on the OTC Markets under ticker GPNEQB, has been involved with the project since late 2013. Talking by phone to *Modern Mining* recently, its CEO, Cliff Bream, who is based in the US, said the project was highly attractive on two counts. “Firstly, it has an estimated 140 000 tonnes of graphite contained in the three major tailings heaps on the property. This is material that has already been mined, which is a huge cost saving, and can be processed in a relatively simple plant. Secondly, our geological experts estimate that the shear zone hosting the deposit could contain significant quantities of graphite ore. Moreover, the mine is located on a 90 000-plus acre property which is highly prospective for graphite.”

He added that the project – located 50 km south-west of Goageb, which is on the road between Keetmanhoop and the port of Luderitz – is well served by infrastructure. “The site can be accessed throughout the year by a good gravel road which links to a



tar road,” he told *Modern Mining*. “Water is available from natural aquifers – there is still an old pump station on site – and a national power line passes close to the property. So the project, unlike so many in Africa, faces no significant infrastructural issues.”

In August last year, Next Graphite reported that a 500-t bulk sample extracted from the tailings heaps produced a total of 150 tonnes of high grade lumps at a 3:1 lump-to-waste ratio with an average grade of 42 % graphite. Subsequent flotation tests on composite samples drawn from the 150 tonnes of pre-screened graphitic lump, residual and waste material delivered a result of 97,1 % pure graphite after a single rougher float. An average of 96,2 % graphite was recorded in the concentrates across all samples, including waste material.

Commenting at that time, Bream said: “We could not be more pleased by these results. Our flotation tests at 212 micron grind size produced a very high purity of graphite after just one flotation, which is a strong indicator of the quality of the graphite at Aukam. The test results also provide us with the ability to begin positioning ourselves for off-take agreements with graphite consumers around the world.”

More recently (in August this year) Next Graphite announced that it had completed a 25-tonne bulk sample extracted from one of the three adits on the property. The lump graphite

mine planned



obtained is currently being tested for quality and purity.

Next Graphite released a Preliminary Economic Analysis (PEA) on the above-ground assets in April this year. This estimated a 17-year lifespan for an operation targeting the tailings with the production level being 2 500 tonnes per annum (t/a) at a mining/processing cost of US\$487 per tonne. The PEA further estimated that this level of production could be increased to 5 000 and 10 000 t/a by installing parallel processing lines. The PEA estimated the initial capex for the plant at just US\$1 million.

Next Graphite's technical programmes at Aukam have been devised and managed by a technical team led by Ian Flint, Chief Metallurgist of E12, a consultancy specialising in evaluating graphite projects. According to Bream, Flint and his colleagues are among the leading graphite experts in the world. They were largely responsible for identifying the potential of Aukam and putting together the land package for the project.

While Next Graphite currently has 100 % of the ownership rights to Aukam, this is in the process of changing. A private Namibian company, Micron Investments, concluded a joint venture agreement with Next Graphite in July this year which, in essence, allows for Micron to earn up to 63 % of the licence in return for funding the screening and processing facility

required to treat the tailings material, as well as certain operational costs and cash to Next Graphite. Micron, in turn, has been acquired by Caribou King Resources, listed on the TSX-V, which already owns three graphite projects in Canada.

Announcing the agreement with Micron in late July this year, Caribou King's President, Mike England, said, "We see this acquisition as an opportunity to diversify our asset base into a jurisdiction that is considered by many to be one of the most mining-friendly areas in the world. Aukam is the only past producer of graphite in Namibia and we look forward to redeveloping the site using modern technology and knowledge."

The timeline for project development going forward is tentative at this stage, but Bream is optimistic that production from the tailings is less than a year away. "This is an excellent project, with a low capex and with all the permitting required to start mining and processing operations valid and in good standing. Moreover, our joint venture partner, Caribou King, has in-depth experience in developing graphite projects and is as determined as we are to see Aukam re-launched. Summing up, I believe there is every chance that we'll break ground on the project this year and be in production in 2016," he said.

Photos courtesy of Next Graphite

Above: Bagged graphitic rock after screening.

Left: Screening the heaps at the Aukam site.

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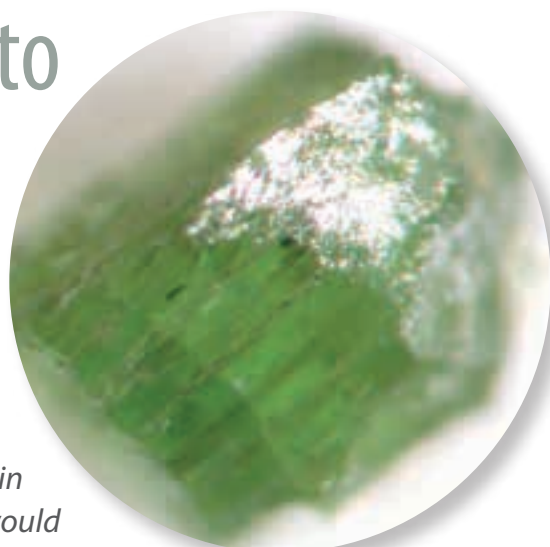


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Soil sampling the key to kimberlite exploration

At the recent Botswana Resource Sector Conference in Gaborone, Botswana, Dr Leon Daniels, founder and CEO of TSX-V-listed diamond explorer Pangolin Diamonds, gave an intriguing presentation on the history of soil sampling in Botswana, demonstrating how changes in the methodology applied over the past 60 years had resulted in new diamond discoveries. He argued that soil sampling would prove a more effective technique in future diamond exploration programmes than either drilling or geophysics.



Chrome diopside from Malatswae with dense cleavage planes showing alteration.

A veteran of diamond exploration in Southern Africa, Daniels has several discoveries to his name, including the Klipfontein kimberlite pipe in South Africa and the DK4 kimberlite in the Orapa Kimberlite Field (OKF), reportedly the only kimberlite in the area not to have been discovered by De Beers. Companies he has worked for over his career have included Falconbridge Exploration, Botswana (for whom he evaluated the 180 ha crater facies M1 kimberlite) and Trans Hex (where he was a senior member of the team which evaluated and subsequently developed the Dokolwayo kimberlite mine in Swaziland).

In Angola he was Chief Geologist for Roan Selection Trust and oversaw production from five alluvial diamond deposits, his duties encompassing grade control and predictions, production and mining reconciliations, and the monitoring of diamond population distributions. He also has extensive experience of Zimbabwe – he consulted on the River Ranch kimberlite and also discovered (while working for Trillion Resources) the Mambali Kimberlite Field.

More recently, he was a co-founder of African Diamonds, which was responsible for much of the early development work on the AK6 project in Botswana, AK6 being the kimberlite which now underpins Lucara's spectacularly successful Karowe mine. Pangolin, now in existence for several years, is his latest venture in the diamond field and is the holder of several projects in Botswana, among them Malatswae in the centre of the country, Tsabong North in the south-west, and Jwaneng South, about 50 km to

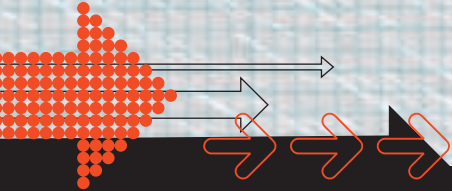


A Pangolin soil sampling team at the Malatswae project.



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the south of the Jwaneng diamond mine.

In his presentation at the conference, Daniels recounted how De Beers in the 1950s and 60s, under the guidance of the late Dr Gavin Lamont, changed from panning samples to grid samples. This change, he said, initially resulted in the discovery of Orapa and Jwaneng. Falconbridge introduced aeromagnetic surveys over areas where there were indicator anomalies but with thick sand, an approach which subsequently resulted in the discovery of the Tsabong and Kokong kimberlite fields. This was followed up by large scale regional soil sampling using a helicopter over the central parts of Botswana which resulted in the discovery of the Gope (GO25) pipe in 1981 (which has now been developed by Gem Diamonds as the Ghaghoo diamond mine).

According to Daniels, the discoveries of the KX36 kimberlite in the Central Kalahari (by Petra) and the Thankane-01 kimberlite to the west of Jwaneng (by De Beers) were a result of increasing the sample sizes from the standard 20 litres to 200 litres and 100 litres respectively. He pointed out that the easy days of finding significant concentrations of kimberlite indicator minerals (KIMs) were probably over. He also showed (using examples from Botswana) that the minimum lead time from commencing an exploration programme to making a kimberlite discovery was five years, and often much longer. The only exceptions to this were GO25 and the Martin's Drift (Lerala) kimberlites.

Refuting the conventional wisdom that geophysics and drilling were the most significant aspects of diamond exploration, Daniels predicted that future kimberlite discoveries would largely depend on soil sampling rather than the application of regional geophysics. The key to future discoveries he said would be a greater understanding of the surface textures of individual KIMs as opposed to significant numbers of KIMs in individual samples. He commented that a single KIM with primary surface textures constituted an anomaly that warranted following up.

Four historical KIM soil anomalies of significance in Botswana remained unexplained, said Daniels. He told conference delegates that Pangolin Diamonds held the exploration rights



Selection of *microilmenite* from a single Malatswae soil sample, showing fragile reaction rims partially to completely preserved on the grains. The largest grains exceed 2 mm.

over three of these anomalies and was currently conducting extensive soil sample programmes over these areas. He noted that Pangolin had announced the recovery of four diamonds, numerous *micro-ilmenites*, garnets, clinoproxenes and a mantle xenolith fragment from soil samples from the Malatswae project, which is situated to the south-east of the OKF.

The recovery of diamonds from soil samples in Botswana is a rare occurrence and Pangolin believes it is on the right track for the discovery of diamondiferous kimberlites. Speaking to *Modern Mining* at the conference and elaborating on his presentation, Daniels said that a large number of the KIMs recently reported had primary surface textures suggesting close proximity to source. He said the chemical composition of the *ilmenites* recovered from the Malatswae area was distinct from the *ilmenites* from Orapa and indicated that Pangolin was sampling a different kimberlite field. He told *Modern Mining* that he was "quietly confident" that the detailed sampling grids currently underway at the Malatswae project would lead to several kimberlite discoveries in the near future for Pangolin.

Since the Gaborone conference was held, Pangolin has provided further updates of its progress at Malatswae, the latest (dated 12 August) reporting that it has received positive results from a ground penetrating radar (GPR) survey over its palaeo-alluvial diamond target within the project area and from two GPR surveys over two kimberlite targets.

Photos courtesy of Pangolin Diamonds

The key to future discoveries will be a greater understanding of the surface textures of individual KIMs as opposed to significant numbers of KIMs in individual samples.

Dual power crushing/screening

Bell Equipment recently launched the first Finlay dual power crushing and screening 'train' in Africa at a two-day event in Johannesburg which included a trip to Afrimat's Glen Douglas quarry in the Vaal area to see the machines in action. Over 100 customers and Bell staff attended the launch, with some of the customers coming from as far afield as the DRC, Zambia, Namibia and Mozambique. Bell has represented Finlay – based in Omagh, Northern Ireland – for the past two years, during which time it has recorded excellent sales of the Finlay range.

While the machines making up the 'train' – the J-1175 jaw crusher, the C-1540 cone crusher and the 694+ inclined screen – are established models within the Finlay range, the units on show at the launch were the new dual powered versions, offering end-users the flexibility to operate a fully mobile crushing and screening plant able to run either on a self-powered basis or from an external electric power source.

The dual powered crushers are electrically driven allowing them to be powered from either an external electrical supply or from their on-board gensets. In applications where a full train is powered by the on-board genset configuration, the crushers generate sufficient energy to enable the operator to run the Finlay 694+ dual power inclined screen for 'free' when used in conjunction with the J-1175 dual power jaw crusher.

The entire dual power crushing and screening 'train' is seen in this photo.



Terry Gillham (left), Bell Equipment's Director, Sales & Marketing, and Paul Chappel, Finlay's Regional Sales Manager, pictured at the launch.

Talking to *Modern Mining* at the launch, Paul Chappel, Finlay's Regional Sales manager, said that the dual power concept offered very significant cost savings. "We estimate that in South Africa these savings could amount to up to 30% when the on-board gensets are used and up to 60% if external power sources are available as compared to the running costs of conventional diesel/hydraulic machines," he said.

He added that the machines were well suited to a range of applications in mining, construction and quarrying and that phenomenal interest in the range had been shown by the customers attending the launch.



'train' makes its African debut

The dual powered **J-1175 jaw crusher** incorporates the robust JW42 high performance electrically driven single toggle jaw chamber and a heavy duty VGF feeder to give optimum production. Additional benefits are said to include rapid set up time, ease of maintenance, high reduction ratio, high output capacity and an advanced electronic control system.

The jaw chamber is hydrostatically driven which offers operators reversible operation for clearing blockages that may be experienced in demolition and recycling applications.

The hydrostatic system also provides variable chamber speed to suit given applications. Chamber CSS (Closed Side Setting) adjustment is fully hydraulic and can be changed in a matter of minutes.

The dual powered **C-1540 cone crusher** incorporates the proven Terex® 1000 cone crusher with direct electric drive, automatic tramp relief and hydraulic closed side setting (CSS) adjustment. The C-1540 can be fitted with an optional patented pre-screen module which allows fines materials to bypass prior to being fed to the crushing chamber offering better wear rates in the crushing chamber.

The large hopper/feeder has an automated metal detection and purge system to protect the cone and reduce downtime by removing metal contaminants via the purge chute.

The **694+ dual power inclined screen** uses as standard two 37 kW IE2 electric motors which operate at 50 Hz; however, a 60 Hz and/or IE3 set-up can be configured to suit particular regions.

The intuitive and user friendly electrical and

hydraulic system allows the customer to switch between diesel and electric mode at the flick of a switch. The primary operation and controls of the machine remain the same regardless of the selected power.

The unit features a large 6,1 m x 1,525 m triple deck inclined screen giving a total screening area of 28 m² to provide efficient screening and high capacity.

Among the customers at the launch was Kinyua Gachoki, owner of Umhlali quarry in KwaZulu-Natal. "I love the idea of dual power, especially in our current South African context," he said. "I will definitely look to buy one of these units when replacing my current Finlay cone crusher in the near future."

His view was echoed by Johann van Heerden of Sand Van Heerden in the Free State goldfield. "With the price of diesel being what it is, the option to run the machines on electricity is bound to lower our production costs, and a lower cost per tonne is what any machine owner should be aiming at."

Looking at the outlook for the dual powered concept, Terry Gillham, Bell Equipment's Director, Sales & Marketing, said that Bell was expecting to see good demand for the new models. "We may be the 'new kids on the block' as far as screens and crushers go but – in the two years or so that we've been in alliance with Finlay – we've sold 60 units – 48 screens and 12 crushers. This probably makes us the dominant player in the field. We anticipate that this success will continue with the dual powered machines."

Photos courtesy of Bell Equipment

The 694+ dual power inclined screen delivering four products.



feature

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Zest brings mobile substation technology to Africa

Mobile substation technology has been used in South America for many years and WEG Brazil has an established reputation for the supply of this technology with an extensive footprint of successful installations. Zest Energy was responsible for bringing this technology to the African continent and – since its first units were supplied to Eskom in South Africa – the company has expanded its solutions to include a wide range of mobile substations and mobile switching stations.

Coenraad Vrey, MD of Zest Energy, says that the first mobile units engineered by the company in South Africa were mobile diesel generators and the company used this experience, together with the application of WEG’s advanced technology, to engineer a mobile substation solution suitable for the harsh and demanding African conditions.

“What is particularly significant is that, with this mobile substation technology, it is possible to move these units to wherever they are required. This provides optimum flexibility, not just to power utilities, but also to other operations such as mines, quarries and rural areas,” he adds.

Zest Energy leveraged WEG’s 20 years of experience in engineering transformers to develop a transformer that has significant weight reduction. “This re-engineering was necessary to minimise both the weight and the physical size of the transformers. One way that we were able to achieve this



Overall dimensions and weight distribution are critical requirements in any mobile substation design. Zest Energy utilised a combination of a dolly trailer and the main substation trailer to conform to all legislative requirements stipulated by the South Africa Road Ordinance.

requirement was by employing ODAF (oil direct air force) cooling,” says Vrey.

He explains that an intimate understanding and knowledge of various applications means that the company is able to meet very specific requirements. “As an example, for a particular mobile substation for Eskom, we engineered a transformer with a low impedance value to comply with the project specifications, while still ensuring that the overall substation weight remained within the South African road ordinance requirements.

“We worked closely with the utility and, in an effort to assist with the unit’s operation, we made use of offload selector switches to select the primary and secondary ratios. This was essential as previous technologies in place required that the transformer be opened and the links

manually changed inside the transformer. Our solutions resulted in savings in time and enhanced safety, with increased ease of operation,” says Vrey.

“Because these units are multi ratio and will be connected to different network operational voltages, we built technology into the control system that will ensure the correct voltage is selected, thus reducing any human error. The equipment has a comprehensive earthing system incorporating copper bars with connectors. This provides Eskom with different earthing interfacing points to which connections to the local earth system can be made. Similar, customised mobile substation solutions can be developed for utilities throughout Africa, all with an emphasis on fit for purpose practicality and safety,” Vrey concludes.

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

Lerala mine now linked to the outside world

ASX-listed Kimberley Diamonds Ltd (KDL) has taken steps to upgrade the IT and communications facilities at its Lerala diamond mine in Botswana to provide more appropriate services for the increasing level of activity on site. KDL is upgrading the processing plant at Lerala and is planning a resumption of production at the mine, which has been care and maintenance, early next year.

The Lerala site – near the Martin’s Drift border post – is relatively isolated with no access to fixed line telecommunications or internet facilities and limited mobile coverage with very weak signal strength. In order to overcome these challenges, Shevon Holdings (Pty) Ltd was engaged to develop an appropriate solution to improve

access to communications. Shevon, which specialises in remote communication installations throughout Africa, developed a system utilising the Ku Band satellite network as the medium of communication linking Lerala to the outside world.

The raw satellite feed is converted into an internet signal and distributed around the offices at Lerala using both a hardwired and WiFi network. The WiFi network is also beamed via point to point wireless transmitters and receivers to other remote facilities on site including workshops, the first aid station, process plant and the camp facilities. In addition, a new VoIP PABX telephone exchange has



Satellite receiver, network switches and VoIP PABX installed in the Lerala office are the ‘brains’ of the new communications system.

been installed with VoIP telephone extensions installed in the offices as well as at critical points throughout the site via the WiFi network.

Shevon Holdings, website: www.shevon.co.za

On-site testing and emulsions solution for reactive ground



BME has developed a double-edged solution that allows customers to quickly identify reactive ground and apply the appropriate product.

Rock that reacts with emulsion explosives can cause real headaches for blasting personnel but BME's double-edged solution allows customers to quickly identify reactive ground and apply the appropriate product.

"Among the range of cold emulsions we have developed over the past 30 years is a

product suitable for use in reactive ground – an emulsion that is not affected by the sulphides encountered under such conditions," said BME GM (South Africa) Albie Visser.

The problem of reactive ground is often encountered when drilling in shale overburden on coal deposits and in the coal seams themselves. Fine sulphides created by drilling can dissolve in the water in the drill-hole, raising its acidity. This acidic water can in turn react with normal emulsion explosive, causing it to heat up and potentially risk the performance of the blast – perhaps even resulting in unplanned detonation.

The first prong of BME's response was therefore to develop an emulsion that would not react under these conditions, further enhancing the safety of the blast environment. Emulsion products already boast a safety advantage, as they are not explosive until sensitised in the drill-hole;

up to that point, their status as a 5.1 oxidiser makes them safe to transport and handle.

"To establish whether there is reactive ground on the drill site, our customers must be able to test the ground conditions, but sending material for testing can be time-consuming," said Visser. "So the second prong of our solution is a service that saves customers valuable time; we have developed our own in-house 'tech-truck', which includes mobile laboratory facilities that can be employed on site for testing of the ground to be blasted."

The BME team members first conduct a visual inspection of the site, applying their extensive experience of blasting in a range of different conditions. The possibility of reactive ground can often be indicated by white patches around the drill holes – resulting from the high acidity of water dissolving the sulphide fines.

"If we suspect that the ground may be reactive, the tech-truck can be brought in to conduct laboratory testing on site," Visser said.

Results from these tests can indicate where reactive ground may present challenges, avoiding the risk of discovering the problem only after the emulsion has been pumped into the drill holes. This ensures that blast planning schedules are met and production is not delayed by unforeseen blast-related challenges.

BME's innovative 'portable laboratory' has been developed based on research by universities in South Africa and Australia, to design and verify a testing procedure that is effective for dealing with reactive ground.

BME, tel (+27 11) 709-8765

MCCs ordered for Lesotho diamond project

JB Switchgear Solutions (JBSS) was recently awarded a multi-million rand contract for the design, manufacture and supply of motor control centres (MCCs) for the Lihobong diamond mine in Lesotho. Well-known project house DRA placed the order on behalf of the client and manufacturing is expected to be completed by March 2016.

The Lihobong mine is located at the head of the Lihobong valley in the Maloti mountains of northern Lesotho. Ownership of the mine is held by Firestone Diamonds (75%) and the Lesotho Government (25%).

JBSS's scope of supply includes eleven 'Eagle Series' motor control centres, seven of which will be installed into modified marine containers and three on outdoor skids. Incomers are typically rated for 2 500 A at 525 V, and fault levels up to 50 kA. Intelligent electronic overloads are used, and the communication protocol is Ethernet. Starter sizes vary between 4 kW and 250 kW.

In addition, 16 remote I/O panels, 30 VSDs, 15 soft-starters, 14 DBs, 70 field isolators and a PLC panel will also be supplied by JBSS.

JB Switchgear, tel (+27 11) 027-5804

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Minimising the effects of acid mine drainage

The harmful effects of acid mine drainage on the environment are being successfully combatted by a large acid mine drainage plant in Germiston, Gauteng.

The acid mine drainage plant consists of a combination of 53 specialised Mixtec mixers, which are in turn individually powered by the same number of gearboxes manufactured and supplied by SEW-EURODRIVE.

Mixtec Sales Manager Brian Paxton states that the agitators' role in the process can be split into different sections. "In simple terms, the first is the make-up of lime into a slurry, which is in turn introduced to reaction vessels where the lime slurry comes into contact with the acid mine drainage. By mixing the lime slurry with the acid mine water in this area, the lime reacts with the acid to cause a neutralising effect."

The by-product produced is gypsum, a soft sulphate mineral composed of calcium sulphate dihydrate, which can be used as a fertiliser, and is the main constituent in many forms of plaster and chalk.

The mixing system had to be designed to accommodate the highly-corrosive pH levels found in water contaminated by acid mine drainage. SEW-EURODRIVE Contracts Engineer Rudi Swanepoel notes that the gearboxes were covered with OS2 paint work.

"The 210 µm paint work is specially-designed for acidic environments. Viton seals were also fitted on the high speed shaft and low speed shaft, which is standard for these environments. Without these extra precautions, the seals would perish and the paint would peel off."

SEW-EURODRIVE's scope of work included the supply of 36 MC mixing units fitted with EBD (extended bearing distance) to absorb the radial forces encountered in mixing. A further 17 helical gear units were supplied, some of which were assembled with AM adapters.

According to Swanepoel, the bearings on the system should last more than nine years. "Based on our calculations, the bearing life should be in excess of 100 000



The acid mine drainage plant consists of a combination of 53 specialised Mixtec mixers.

hours if they are properly maintained. This ensures high-efficiency and minimal downtime," he adds.

SEW-EURODRIVE, tel (+27 11) 248-7000



"Hydropowered Mining Can Meet SA Mining Challenges"

Hydropowered mining technology is now more appropriate to SA's hardrock mining sector than ever before, due to ever-rising power and labour costs.

Originally developed as a gravity-powered system for SA's deep gold mines, hydropower has evolved and is also serving shallow gold, platinum and chrome mines. High pressure pumps powering localised systems provide efficient power to the rockdrills and mining equipment.

Productive, safe and relatively simple, these localised hydropower systems provide significant cost savings and the reduced power footprint is often the difference that makes a new mining project viable.

Hydropower is able to help labour-intensive operations improve productivity. The technology and drilling equipment is also capable of being progressively mechanised using the same basic infrastructure. This allows mines to pace their changeover to more mechanised mining, staying within their available skills and infrastructure whilst maintaining continuity of production. Contrast this with the organisational

shock of step-changing from compressed air systems to trackless mining.

Hydropowered mining has evolved to be even more appropriate in dealing with SA's mining challenges. It is time to talk to Novatek!



Trend towards submersible pumps in mining

The growing need to reduce costs without impacting on operational efficiencies or reliability has reportedly seen a marked trend in the mining sector towards the use of submersible pumps instead of vertical spindle pumps.

Submersible dewatering pumps reportedly offer major advantages over vertical spindle pumps with one of the most important being that the submersible pump will

operate directly in the slurry removing the need for costly infrastructure construction.

Klint Bawden, General Manager: Sales & Marketing at Integrated Pump Technology, explains that this ease of installation allows customers to begin pumping operations virtually immediately. "And the cost savings achieved are extended to the actual operation as submersible pumps are known to be more efficient when compared to vertical spindle units," he adds.

"Slurry handling is considered one of the most demanding pumping applications and where an inappropriate pump selection has been made there is often insufficient agitation in the sump. This leads to a build-up of solids which then settle out and a vertical spindle pump is not capable of dealing with this as it will then only pump out the water component in the sump," Bawden explains.

"Removing excess sediment or silt from a sump can become labour intensive and costly, and this situation is easily avoided by using a submersible pump in the first place."

The range of Grindex Bravo submersible pumps is engineered to pump slurry

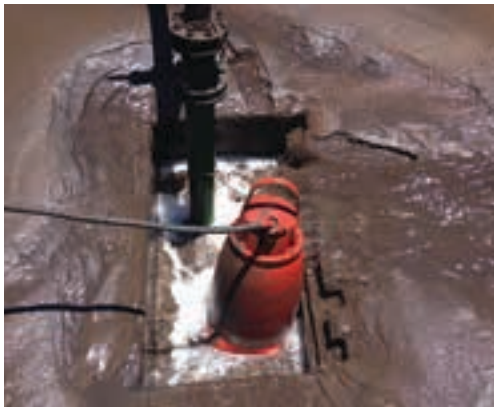
and fluids with a high content of abrasive solids and with particle sizes up to 50 mm. The range offers reliable pumping performance and the pumps are fitted with a cooling jacket and an agitator for effective slurry handling, eliminating the issue of silt build-up.

The Grindex Bravo pumps are engineered to operate over the complete pump curve, not just on specific duty, and can handle from 30 litres per second up to 130 litres per second at a maximum head of 45 m.

Bawden says that lower operating costs are achieved due to the design with an integrated pump starter which protects the unit from dry run conditions and allows optimum control of the pumping operation.

"Our most recent installations where a Grindex submersible pump has replaced a vertical spindle pump are in a gold mine dewatering application and in a sand aggregate operation. Both customers needed to increase the reliability of their dewatering application while reducing the associated costs in terms of unplanned downtime and nuisance issues such as silt build-up," Bawden says.

Integrated Pump Technology, tel (+27 76) 840-6527



Submersible dewatering pumps offer major advantages over vertical spindle pumps with one of the most important being that the submersible pump will operate directly in the slurry removing the need for costly infrastructure construction.

Aviteq electromagnetic drives available locally

In addition to importing a range of electromagnetic drives exclusively from Aviteq of Germany, vibrating equipment supplier Joest Kwatani also supports its own range of locally, in-house manufactured SFH electromagnetic super feeder drives.

Kim Schoepflin, MD of Joest Kwatani, says the company has built its reputation on developing an in-depth understanding of its customers' specific application needs, and this has ensured that customised solu-

tions which reduce downtime are provided.

The SFH range of electromagnetic vibrating drives is designed for feeding bulk materials at a controlled rate from stockpiles and hoppers to bulk materials handling equipment such as belt conveyors, crushers and screens. Joest Kwatani acquired this product range through its purchase of Lockers Engineers over two years ago.

"These are designed for use in medium to heavy applications such as quarries, coal

plants, steel works and the chemical and food and beverage industries, as well as food processing plants," says Theresa Walton, General Manager: Service, Joest Kwatani.

"The Aviteq range of electromagnetic drives is particularly suited to standard volumes where a high dosing accuracy is required," Walton adds.

Joest Kwatani has been appointed the exclusive distributor for Aviteq, formerly AEG, products in Africa, including electromagnetic drives and controllers.

Joest Kwatani, tel (+27 11) 923-9000



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Repeat orders for chutes from Turkish gold mine

The mining industry is hard pushed globally to reduce operating costs. Therefore, repeat orders are a clear indication that a product is contributing towards lower total cost of ownership.

"Reducing maintenance costs while increasing operational output requires skill, planning and the selection of the most appropriate OEM suppliers of equipment. This is particularly pertinent with regard to custom-engineered products such as transfer points or chute systems," says Mark Baller, MD of Weba Chute Systems.

Kisladag gold mine in Turkey is considered a flagship operation for Eldorado Gold and its Turkish subsidiary so this lends even more credence to the recent repeat order awarded to Weba Chute Systems. Situated between the centres of Izmir and Ankara, Kisladag is the largest gold mine in Turkey and has been developed as a low grade, bulk tonnage open-pit operation using heap leaching for gold recovery.

Weba Chute Systems, a South African-based OEM of custom engineered chute systems and transfer point solutions, first supplied its innovative chute systems to this gold mine in 2009. At this stage eight Weba Chutes were installed under the fine and coarse ore bins discharging onto conveyors in the plant. Following the successful operation of these transfer systems, the company secured a second order for three additional chutes. The first was a belt feeder head chute which feeds an incline conveyor, the second was a screen oversize chute and the remaining transfer points are from conveyor to conveyor.

The most recent order received is for two replacement chutes and two new chutes. "The mine is replacing the incoming conveyor to facilitate the transportation of a higher tonnage. The new belt will be wider than the existing belt and it is therefore necessary to replace portions of the chute to accommodate increased incoming feed. This will entail the replacement of the top half of the chute to accommodate the larger conveyor as well as some adjustments to account for the height differential," Baller explains.

The outgoing conveyor is also being replaced and relocated due to the upgrade on the plant. While the width of this belt will remain the same, there is now a need to facilitate the new profile and the direction of the outgoing feed, as well as to accommodate the increased tonnage. The third chute in this order is a new chute, responsible for transferring feed from belt to belt.

M & J Engineering, tel (+27 11) 827-9372



Controlling the flow of material using Weba Chute Systems reduces maintenance for Kisladag gold mine in Turkey.



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Hyundai backhoe loader proves popular

The Hyundai range of earthmoving equipment, available exclusively in Southern Africa from HPE Africa, includes backhoe loaders which have reportedly been well received by the local market.

“The robust H930s backhoe loader series is particularly well liked by businesses that need smaller machines, without having to make a substantial capital investment in large excavators and loaders,” says Alex Ackron, HPE Africa’s MD. “Hyundai backhoe loaders, with a

reputation for efficient performance, low operating costs and minimal maintenance requirements, are also popular with plant hire companies. The company supports this range with a two-year/3 000 hour warranty.”

Hyundai H930s backhoe loaders are fitted with fuel efficient, low noise, environmentally friendly Perkins tier 2 diesel engines. Standard power shift transmission and a convenient gear/shift selector enable fast, easy and efficient operation

and precise control, even in arduous operating conditions.

The backhoe boom allows for a clear line of site into a trench when the operator is digging around buried constructions such as water mains, sewer pipes and utility lines. An optional extendable dipper increases versatility.

Optional features for enhanced performance include the four-wheel drive system that improves mobility and an ‘automatic return to dig’ function on the loader attachment that reduces loading cycle times. The ‘ride control system’ – also optional – has a shock absorbing accumulator that cushions the boom, reduces material loss and improves operator comfort. The operator is able to turn this system on or off with an overhead switch.

Standard features are complemented by a choice of hydraulic systems that incorporate the latest technologies for improved efficiency. These options include a load sensing hydraulic system that matches the engine power to the appropriate hydraulic flow, based on the load demand required.

HPE Africa, tel (+27 11) 397-4670



The Hyundai H930s backhoe loader, available from HPE Africa.

Slurry pumps designed for optimum efficiency

Becker Mining South Africa’s extensive range of light, medium and heavy duty slurry pumps includes the HS range, available in vertical, horizontal and submersible configurations. These pumps are designed for optimum efficiency, low maintenance and extended service life in diverse industries, and under harsh operating conditions.

The HS pump range, which is manufactured locally to stringent OEM specifications, includes four different models, in various sizes – from two to eight inch units. HS (horizontal hydro solids), VHS (vertical hydro solids), PVS (pump vertical solids) and HTMS (submersible) pumps are said to be ideally suited to applications in

many industries, including mining.

“These hydro solid vortex pumps are designed to pump sludge and slurries containing large abrasive solids, trapped air and fibrous materials in light, medium and heavy service industries,” says Theo Cambanis, Becker Mining South Africa. “Due to the recessed, non-clog impeller of this range, solids and fibrous materials up to 200 mm (depending on pump size) can enter the suction inlet and be expelled through the pump discharge, without damaging the impeller.

“The PVS pump has a slightly different design, with a locknut locking the impeller to the shaft. This method prevents the impeller from turning off if the motor is started in the wrong rotation direction.”

In all models, a robust one piece casing facilitates the flow of all types of solids and fibrous materials and an easily accessible stuffing box minimises blow-back of media around the shaft sleeve, without actual sealing contact.

Another advantage of these pumps is that spares are completely interchangeable. Becker Mining South Africa, tel (+27 57) 396-2704

Huge GRP tank manufactured for uranium mine

IWC recently completed the construction of one of its largest-ever glass-fibre reinforced plastics (GRP) tanks measuring 6 m in diameter and 11 m in height and capable of holding up to 254 000 litres. The length of the cylinder of this tank was set at 9 m. IWC’s GRP manufacturing facility in Isando, Gauteng, can manufacture up to 14 m using a single filament wound process.

The GRP tank was designed for Swakop Uranium’s new Husab uranium mine, near Swakopmund, Namibia, and will be used in the mine’s acid leach process plant as part of the uranium solvent extraction (SX) procedure. The GRP tank

will store highly-corrosive chemical contents, including sulphuric acid.

“IWC has already designed and manufactured 8 km of GRP piping and 17 GRP tanks for the mine’s process plant, but none as big as this one,” says Roger Rusch, CEO of IWC. “It took six weeks to manufacture the tank and the IWC team will now supervise its installation at the Husab uranium mine’s process facility in Namibia.”

GRP is a composite material that is highly resistant to all forms of corrosion, making it suited to solvent extraction processes.

IWC, tel (+27 11) 466-0699

Material feeders delivered to Namdeb

BLT SA – exclusive distributor in sub-Saharan Africa for Samson bulk materials handling equipment – has recently delivered two 85 t material feeders to Namdeb Diamond Corporation’s mine in Orangemund, Namibia.

These mobile surface material feeders, based on Samson’s MF 1610W series, were modified especially for Namdeb to efficiently handle bulk aggregates, including dune sand and rock, as well as desert sand, gravel and tailings.

“Samson’s automated handling systems, which require minimal civil works, are designed to join together fixed and mobile equipment, providing a cost efficient and highly productive alternative to fixed bulk handling installations,” says Charity Gumede, BLT SA’s Marketing Director. “These surface material feeders, which receive materials directly from 40 t dump trucks, have a buffer holding capacity of up to 66,2 t. These feeders have a regulated output feed rate of 1 000 tonnes per hour, direct to an on-going conveyor system. Material is drawn from the tipping

truck in a controlled stream, which means dust generation is significantly reduced, minimising environmental pollution.

“A special design feature of these units was the incorporation of a reject grille that prevents over-sized material passing from the feeder to the on-going conveyor. These grilles, which are fully supported by the feeder, can be manually adjusted for different lump sizes.”

Each material feeder is mounted on a chassis with four pneumatic polyurethane filled tyres and has been provided with a heavy duty removable towing frame for repositioning of the feeder around the site.

The units have a deflected chassis design with an inclined discharge section to raise the material to the discharge height, providing simplified transfer to the conveyor system. A hori-

zontal loading section enables the feeder to receive material direct from tipping trucks. This design maximises holding capacity and minimises vehicle access ramp requirements.

The feeders were manufactured in Vredendal, Western Cape, with original Samson components, according to stringent UK engineering specifications. They were transported over 500 km by road to Namibia and are now fully operational on the mine.

BLT SA, tel (+27 31) 274-8270



BLT SA has recently delivered two 85 t material feeders to Namdeb Diamond Corporation’s mine in Orangemund, Namibia.

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Custom crushing solutions from Weir Minerals

Weir Minerals Africa is able to offer a fit-for-purpose complete custom crushing solution which is engineered to customers' specific application requirements. Significantly, Weir Minerals Africa is able to not only address the crushing plant requirements, but can also provide product solutions for wet plant needs including slurry pumps, hydrocyclones, rubber hoses, dewatering screens and slurry valves.

The Weir Group PLC acquired Trio Engineered Products®, an OEM of crushing and separation equipment for the mining and aggregates markets, in 2014. "Coupled with Weir Minerals Africa's local experience

and understanding of local operating conditions, Trio Engineered Products® has years of global application and service experience in the crushing equipment sector," says JD Singleton, GM – Trio products at Weir Minerals Africa.

The extensive range of Trio® equipment allows Weir Minerals Africa to offer either a standard or custom crushing solution directly from the Trio® manufacturing facilities. The product range includes grizzly, apron and belt feeders, gyratory, jaw and cone crushers, horizontal impact and vertical shaft impact crushers, circular motion screens, horizontal incline screens and complete material handling solutions.

"We analyse a number of factors when assessing an operation. These include the source or raw material, specific gravity of the material, the bulk density of the feed, the hardness of the material, the throughput requirement, the top size of the feed and the final product size requirement," Singleton points out.

"In addition, site specific requirements including the footprint

available to accommodate the plant and the infrastructure would dictate what options are possible in terms of the plant itself. Thereafter, Weir Minerals Africa will produce an engineered solution tailored specifically to the required outcome, for optimised throughput, as well as maximised uptime," Singleton explains.

Once the plant has been installed, the Trio® field service team will undertake the commissioning and optimisation of the plant and customers are provided with immediate access to a dedicated support facility.

Solutions can range from individual pieces of equipment and fixed plants to skid mounted modular units which can be used between sites and mobile wheel and tracked plants. Throughput capabilities range from 50 up to 1 500 t/h crushing capacity.

Similar to the emphasis on customised crushing solutions, assessing the pumping system requirements of a wet plant is important to ensure that the most appropriate elements are selected for the application. This would typically include the pumps, piping and valves.

According to Rui Gomes, Slurry Pumps Product Manager for Africa and Middle East, local manufacture of pumps ensures a quick turnaround on supply and after-market service.

An example of where new technology can play a role in reducing costs for an



The extensive range of Trio equipment allows Weir Minerals Africa to offer customer crushing solutions.

'Green' hydraulic fluid solution from Caterpillar

Developed for use in a wide range of applications and conditions where environmental impacts are a key consideration, Cat Bio HYDO™ Advanced is said to provide superior performance across a wide temperature range.

A green solution, Cat Bio HYDO Advanced is a synthetic ester-based hydraulic fluid with >90 % bio-based content (per ASTM D6866 test method). Unlike fossil carbon, bio-based carbons are derived from renewable sources: fluid biodegradability to OECD 301B is estimated at around 80 % after 28 days.

Comparable to premium mineral-based hydraulic oils, Cat Bio HYDO Advanced has been awarded a number of eco-labels, including the EU Flower. (The EU Flower is

the only eco-label that covers all aspects of sustainability, including product performance, toxicology, pollution mitigation, and the utilisation of renewable resources.) The product is also listed in the US Department of Agriculture's BioPreferred® programme.

Key product features include superior, consistent wear protection throughout the entire temperature range from -30°C to 45°C, excellent corrosion resistance, and fast air release. Good foam control and fast air release are important properties of any hydraulic fluid.

Air trapped in hydraulic oil reduces system response and causes 'sponginess' at the controls. Trapped air also accelerates oil degradation.

"Excessive air and foam can lead to cavitation (collapsing air bubbles) and damage to hydraulic components," comments Barloworld Equipment Group Product Specialist Reuben Phasha. (Barloworld Equipment is the Cat dealer for Southern Africa.)

Cat Bio HYDO Advanced releases air very quickly and special additives keep the hydraulic fluid clear of foam, even when it becomes contaminated with engine oil.

Due to the oil's excellent oxidation stability, extended drain intervals up to 6 000 hours are achievable when combined with Cat S•O•SSM fluid analysis monitoring.

"In the past, switching from a premium mineral-based hydraulic fluid to a synthetic ester fluid meant shorter drain intervals and increased operating cost," Phasha adds.

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

operation is the Warman® MCR® range of mill circuit pumps, which offers improved mill discharge performance. These pumps easily manage the large size particles in dense abrasive slurries and are suitable for applications ranging from the most difficult mill discharge to water flushed crushing.

The recent expansion of the Warman® WBH® range of pumps gives customer access to an improvement in wear life, with a subsequent reduction in maintenance and operating costs. The Warman® WBH® heavy duty slurry pump is typically used in mill discharge, slurry transfer and process pumping applications with the added flexibility of either a metal volute or rubber liners, depending on the application.

Developed specifically for slurry handling duties in the mining and chemical industries, the Warman® SLR pump range features a moulded high efficiency elastomer impeller. The deep side sealing vanes are designed to reduce wear and improve dynamic sealing.

Weir Minerals Africa, tel (+27 11) 929-2622

Osborn crushing equipment supplied to Karowe

A R6-million order awarded to Osborn for new crushers, including a modular jaw crusher plant, reflects the continued success of the Karowe diamond mine in Botswana, where a number of exceptional diamond recoveries have made headlines.

The new Osborn machines form part of an expansion project at Karowe, reports East Africa Area Manager Chris Slade.

Osborn secured this order from long-standing customer ADP Marine & Modular, which is supplying process and design services to the diamond mine, he adds.

Slade says the quality of Osborn's equipment contributed to this contract win. "Osborn modular crushing and screening plants have been supplied to clients in South Africa, as well as Lesotho, Guinea, Namibia, Zambia, Mozambique, China and Russia. They are making their mark around the world."

He notes that customers are increasingly recognising the value of Osborn's modular crushing plant, which, he explains, requires very little civils work. "Only a concrete slab is

needed to stabilise the modular structure. It can be easily transported and re-assembled on site in a relatively short time."

In addition to the 20 x 32 primary modular jaw crusher plant, Osborn's order for Karowe also included a 12 x 8 secondary jaw crusher and two 245 gyrasphere cone crushers, for tertiary crushing applications at the mine. The scope of Osborn's contract encompassed the supply and commissioning of all of the equipment.

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



Gyrasphere cone crushers from Osborn installed at the Karowe diamond mine.

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Sampler provides correct sampling across tailings streams

Although there has always been the need to obtain representative samples in mineral particulate systems, until recently there has not been a proven technology that can take a representative sample from pipelines for horizontally pressurised tailings streams.

This is according to Rolf Steinhaus, sampling specialist at Multotec Process Equipment, who says that incorrect sampling solutions are often employed on the tailings section of mineral process plants.

“Metallurgical accounting is very difficult when the data or results produced are from these inaccurate arbitrary material collections. Meaningful metallurgical accounting is essential, as plant operators need to have accurate information as to what comes into and leaves a plant in order to establish how efficient the actual beneficiation process is and what yields or recovery can be expected of the metal or precious mineral. Reliable reporting and corporate governance calls for representative sampling, using correctly designed

sampling equipment and implemented protocols that will produce accurate data,” Steinhaus points out.

Multotec has developed a mechanical design for the True Pipe® sampler and, together with Dr Paul Roberts, has taken out a patent on the product. The prototype has been extensively laboratory tested and the results compared favourably with a correctly designed vezin sampler used as a control. Data generated has been very encouraging and Multotec is now in a position to consider industrialising the unit together with a partner.

This sampling system comprises pipe-work and valves that will isolate and correctly delineate a sample increment under controlled conditions. Operation of the valves is synchronised, resulting in symmetry between two separate biasing mechanisms occurring in the vicinity of the two relevant valves which will cancel each other out. What is misplaced into the sample at one end is displaced from the sample at the other.

“The principle of symmetry was statistically proven for this particular design. The True Pipe® sampler will ultimately have application in high pressure slurry lines with pressures of up to 2 000 kPa and slurry line velocities of up to 6 m/s; however, testing for less challenging applications needs to be done,” says Steinhaus.

During the development stage and as a separate investigation, the stream was carefully split into two 50 % streams. “Statistically the results reconfirmed that due to segregation effects, partial stream sampling is not advisable and that splitting the main stream into partial streams is once again (like any sample stream diversion) never an acceptable shortcut when sampling representatively.

“Prior to the development of this innovative sampling system for tailings pipelines, all measurements taken would be considered as non-representative and would therefore have been biased,” Steinhaus adds.

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

New range of scraper winch electric motors

Robust reliability, high specification and efficiency are said to be intrinsic to the new range of scraper winch electric motors from Regal Beloit South Africa. These heavy industrial motors have been specially designed and engineered to withstand the extremely aggressive underground mining environment.

“Scraper winch motors probably take more abuse than any other type of electric motor,” says Regal Beloit’s Sales & Marketing Director, Hilton Fortmann. “The removal of rocks and other materials loosened by blasting places tremendous strain on these motors; frequent

stop-starts lead to overheating which drastically reduces the motor’s life cycle. In addition, motors take quite a beating when hauled out of the mine for repairs. This is also a costly process in terms of labour, maintenance, downtime and production losses.”

Designed to meet high efficiency IE1 and IE2 specifications and available in 37 kW 4-pole, 55 kW 6-pole and 75 kW 6-pole configurations, the new motors perform reliably, require little maintenance and are competitively priced.

All motors are vacuum pressure impregnated (VPI) and stators are fully wedged throughout the range to protect against premature winding failures. The motors are fitted with premium brand bearings and feature a Variable Speed Drive (VSD) compatible insulation system.

Regal Beloit South Africa, tel (+27 11) 453-1930



The scraper winch motor from Regal Beloit.

Index to advertisers

AEL Mining Services	OBC	De Beers	13	Novatek	53
Allied Crane Hire	52	DRA Projects SA	OFC	Robor	50
Ash Resources	IFC	Dressta	2	Sandvik Mining	38
Barloworld Equipment	9	Flexicon Africa	11	Simantel	34
Beka Schröder	30	FLSmidth	14	Tega Industries	15
Bell Equipment Company	40	JOY Global	54	Torre Lifting Solutions	31
Booyco Electronics	55	M & J Engineering	41	Wearcheck	57
Brelko Conveyor Products	59	MDM Engineering	46	WorleyParsons	17
Condra Cranes	20	Metso Minerals	IBC	Zest WEG Group	44
ContiTech	8	Mining Indaba	22		



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