

MODERN MINING

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- The Flatreef – a 28,5 million ounce resource





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Cover

The Shaft 1 headgear at Ivanplats’ Platreef project near Mokopane. Shaft 1 – which will be 975 m deep – is poised to enter the main sinking phase. See page 20 for a full report on the project (photo: Arthur Tassell).



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West Africa's gold mining sector defies the downturn

I don't think anyone would disagree with the statement that the global mining industry is suffering one of the worst downturns in living memory. And yet there is one region, West Africa, that seems to be bucking the trend with its gold mining sector not just buoyant but arguably enjoying something of a boom.

Mali and Burkina Faso are the countries with the most activity with several mines either commissioning or under construction. For example, in Mali B2Gold is busy building its US\$395 million Fekola project (see page 16), which will produce about 350 000 ounces a year in its first seven years of operation, while in neighbouring Burkina Faso True Gold's Karma gold mine – a 4 Mt/a heap leach operation – has just produced its first gold. Fekola, incidentally, is being built by the same team that acquitted itself so well at Otjikoto in Namibia.

Projects that are in development include the Yaramoko underground mine in Burkina Faso, which developer Roxgold says has now entered the commissioning phase, and Hummingbird's Yanfolila open-pit project in Mali, where plant earthworks have been completed ahead of mine construction. Endeavour Mining has also just announced that construction of its US\$328 million Houndé open-pit mine – which will be a substantial 190 000 ounce a year producer – has been approved by its board (see page 34).

In both countries there are a number of projects that are in – or emerging from – the feasibility stage. Avnel Gold has just completed a DFS on its Kalana Main project (see page 18) in south-west Mali which, if implemented, would see Kalana becoming a 148 000 ounce a year producer while African Gold Group, as we report on page 30 of this issue, has recently released the results of its feasibility study on Kobada, planned as a low capex open-pit mine producing just over 50 000 ounces a year. In Burkina Faso, Oreone is concentrating on getting its Bomboré project 'shovel ready' after completing a full feasibility in April last year.

In Ghana, historically West Africa's biggest gold producer, the gold mining scene is not quite as buoyant as in Mali and Burkina Faso but the country does have one brand new gold mine, Asanko, which has just declared commercial production and which will ultimately become a 400 000 ounce a year producer once phase one is doubled up (see page 39). Also in Ghana, Golden Star Resources is going underground at both its Wassa and Prestea mines, with production starting later this year in the case of Wassa and next year at Prestea.

As regards exploration in Ghana, it's probably worth mentioning that Australia's Cardinal Resources is continuing to get spectacular results at its Namdini project, with every hole drilled since discovery having intersected wide zones of gold mineralisation, with high-grade intervals. The interesting point about Namdini is that it is located in the far north of the country, well away from Ghana's normal gold-producing areas.

Moving on to Mauritania, the big news here (see page 6) is that Kinross has finally decided to invest in expanding its Tasiast mine, with the US\$300 million first phase boosting production to a very respectable 400 000 ounces a year and a proposed second phase of expansion lifting this to a truly impressive 777 000 ounces a year. Tasiast, as a matter of interest, was acquired by Kinross when it purchased Red Back Mining back in 2010 in a US\$7.2 billion deal which I've seen described "as the most over-priced in the history of gold mining."

An interesting point about the current gold mining scene in West Africa is the consolidation taking place in the industry, with Perseus Mining, an ASX/TSX-listed company in the process of absorbing AIM-listed Amara Mining (founded by mining entrepreneur Algy Cluff and originally known as Cluff Gold) and TSX-listed Endeavour taking over True Gold, listed on the TSX-V.

These mergers will create two groups with the critical mass to become the dominant players in West African gold. Perseus already has the operating Edikan mine in Ghana and holds the advanced Sissingué project in Côte d'Ivoire – to which will be added Amara's Yaouré project, also in Côte d'Ivoire, which has a 5.2 Moz resource, and the Baomahun project in Sierra Leone.

As for the combination of Endeavour and True Gold, this will bring together Endeavour's operating mines – Agbaou and Ity in Côte d'Ivoire, Tabakoto in Mali and Nzema in Ghana – with True Gold's Karma with several other projects offering 'blue sky' for the future.

Finally, one can't help observing that most West African countries have policies in place which incentivise investment in mining. Could it possibly be that there is a lesson here for South Africa's policy-makers who have saddled the country with mining legislation which seems almost designed to deter investors and who have singularly failed to 'grow' our mining industry over the past decade?

Arthur Tassell



Australia's Cardinal Resources is continuing to get spectacular results at its Namdini project, with every hole drilled since discovery having intersected wide zones of gold mineralisation, with high-grade intervals.



The processing plant at Tasiast. The Phase One expansion is expected to increase mill throughput capacity from the current 8 000 tonnes per day (t/d) to 12 000 t/d (photo: Kinross Gold Corp).

Kinross Gold to proceed with Tasiast expansion

Canada's Kinross Gold Corporation, listed on the TSX and NYSE, has announced that it is proceeding with the Phase One expansion of its Tasiast gold mine in Mauritania.

Phase One is expected to increase mill throughput capacity from the current 8 000 tonnes per day (t/d) to 12 000 t/d, while significantly reducing Tasiast's operating costs and increasing production. Preparations for Phase One construction to install incremental crushing and grinding capacity to the existing carbon-in-leach (CIL) circuit, which includes an oversized semi-autogenous grinding (SAG) mill and gyratory crusher, will begin immediately. Phase One is expected to reach full production by the end of Q1 2018 with estimated capital expenditures of approximately US\$300 million.

Kinross has also released details of a prefeasibility study on a combined potential Phase One and Phase Two expansion based on installing additional mill throughput of 18 000 t/d for a total combined capacity of 30 000 t/d. The expansion would

replace the two current ball mills with a new larger ball mill, and add new leaching, thickening and refinery capacity. An additional 60 MW of capacity would be added to the existing power plant to power the 30 000 t/d mill, which is forecast to have an average production of approximately

777 000 gold ounces a year from 2020-2026, with a forecast cumulative gold production of 6,4 million ounces to 2030.

Production cost of sales is estimated to average US\$535 per ounce for the life of project, with a forecast all-in sustaining cost of US\$720 per ounce. Mill grades are



The Tasiast open-pit gold mine of Kinross in Mauritania (photo: Kinross Gold Corp).

expected to average 1,9 g/t. Capital costs for the additional 18 000 t/d expansion are forecast to be US\$620 million, plus incremental estimated capitalised stripping of US\$119 million (2016-2019). The combined estimated total capital expenditure for Phase One and Phase Two will be approximately US\$920 million.

A feasibility study of Phase Two is expected to be initiated in the second half of 2016, with a potential go-ahead decision targeted for the end of 2017 and construction anticipated to commence in early 2018. Based on this timeline, Phase Two could potentially reach full production in early 2020.

"This phased approach allows Kinross to transform Tasiast into a lower cost, cash flow positive operation in the near term while preserving the operation's significant growth potential," comments J Paul Rollinson, President and CEO of Kinross. "Phase One, which is expected to reach full production by the end of Q1 2018, will require an estimated initial capital investment of approximately US\$300 million, to be self-financed by the company. The expansion is forecast to reduce Tasiast's production cost of sales per ounce by an estimated 48 % while increasing annual production by an estimated 87 % compared with 2015. The Phase One expansion has robust standalone economics, including a positive 20 % expected internal rate of return.

"Phase Two, which anticipates increasing total throughput to 30 000 t/d, underscores Kinross' focus on financial discipline. The forecast total capital expenditure for the combined Phase One and Two has been significantly lowered compared to previous expansion studies. With lower capital required, the expected benefits remain compelling, with a 30 000 t/d Tasiast expected to be the company's largest and lowest cost operation with a long estimated mine life.

"The two-phased approach strikes the right balance between growth and preserving balance sheet strength and is well-suited to the current gold price environment. Phase One achieves Kinross' near term goals with a manageable investment while allowing the company to reassess market conditions and further optimise the project before deciding to proceed with Phase Two. In short, this is the right project for Kinross at the right time." ■

Scoping Study on Tanzanian graphite project delivers robust results

ASX-listed Black Rock Mining has completed an independent Scoping Study over its flagship Mahenge graphite project in the south of Tanzania. The study, completed by consultant BatteryLimits, returns robust conceptual economics for a 52 000 t/a graphite concentrate mining operation over a 25-year mine life with a two-year payback estimated on the US\$57,3 million capex. The NPV is estimated at US\$285,7 million and the IRR at 62 %.

Following the receipt of positive results from the Scoping Study, Black Rock Mining has now commissioned a Pre-Feasibility Study over the Mahenge graphite project. The company has also commenced more detailed metallurgical test work to continue optimising the process flowsheet and will begin a final drill programme in April to upgrade the current 131,1 Mt at 7,9 % Total Graphitic Content (TGC) mineral resource and provide additional metallurgical samples.

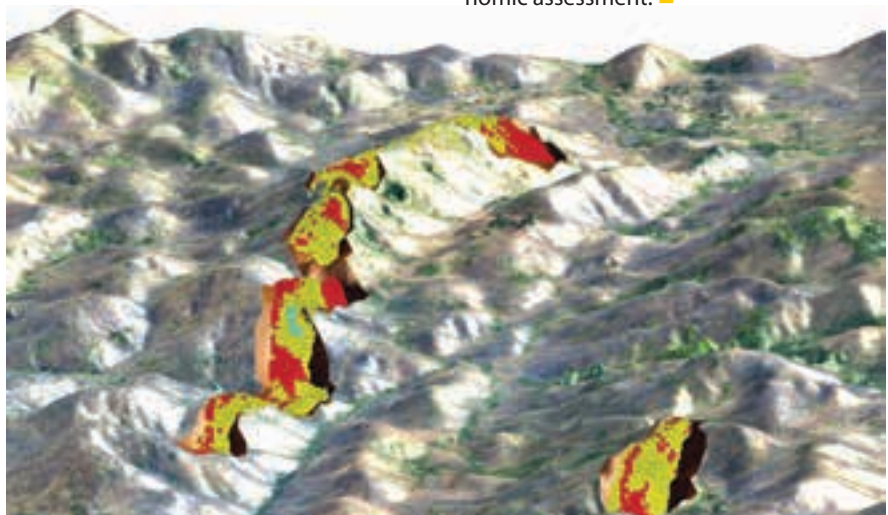
The resource is the largest – and has the highest grade – of any graphite deposit in Tanzania and is also reportedly the fourth largest globally. Some 40 % of the resource tonnes are in the indicated category.

Mining costs of US\$5,0/t have been assumed for both ore and waste at an ore to waste strip ratio of 1:1,23. There is significant scope to improve mining costs through optimising the strip ratio, re-calculating the cost of free digging material for the top 20 m of the resource, reviewing an owner's fleet, and adjusting the cut-off grade.

The flowsheet incorporates primary and secondary crushing with the ore then being wet ground by a primary rod mill for concentration by flotation. Graphite concentrate will be recovered by flotation roughing, cleaning and scavenging stages with re-grind targeting coarse graphite recovery. Concentrate will be dried, screened to various sizes and bagged for transport.

"The company is extremely excited to announce the results from the independent Scoping Study over the Mahenge graphite project," says Black Rock's Managing Director, Steve Tambanis. "The results provide further validation of the company's exploration work at the Mahenge graphite project and underpin the potential for Black Rock Mining to become a significant Tanzanian graphite producer. In particular, we are excited that the Scoping Study indicates that a relatively straightforward and small-scale plant of 52 000 t/a can offer potentially high returns due to the high-grade, near surface and coarse flake nature of the resource. A smaller, relatively simple plant will require less capital and time to develop and in turn decreases commissioning risk."

The Scoping Study reviewed three production scenarios: 31 000 t/a, 42 000 t/a and 52 000 t/a. The 52 000 t/a case predictably returned the best economics of the three alternatives due to scale economies and, as such, is the assumed production case. A larger throughput option will be reviewed as part of the next stage of economic assessment. ■



Proposed pit shells for the Ulanzi and Cascades deposits at Mahenge.

Randgold replenishes resources in record production year

Randgold Resources' annual resource and reserve declaration, published recently as part of its annual report for 2015, shows attributable measured and indicated resources steady at 21,1 Moz while inferred resources are marginally up to 6,7 Moz. Total attributable reserves of 14,6 Moz reflect a 3,5 % reduction after mining depletion, with no change in the grade, in a year that delivered record production of 1,2 Moz.

In Mali, Loulo's total mineral resources increased by 5 %, net of depletion. This

was driven by a significant increase of plus 600 000 ounces in the Gara underground inferred resources from the positive results of the Gara South drilling. Further drilling and design work are expected to convert a large portion of these resources to reserves in 2016. A drilling programme to define high grade resources is underway at Yalea as well. Total ore reserves after depletion decreased by 4 % to 4,7 Moz at 4,6 g/t. At neighbouring Goukoto, total ore reserves remained above 3 Moz with an 8 % increase in grade on the back of

an updated underground feasibility study which increased the underground reserve to 1,1 Moz at 7,2 g/t. A lower cost profile and higher grade resource model have highlighted the potential for a superpit mining option, which together with an underground mine is now the subject of a trade-off study planned for completion in 2016.

At Kibali in the DRC, total reserves decreased to 10,6 Moz at 4,1 g/t from 11,0 Moz at 4,1 g/t, with mining depletion being partly offset by gains from underground and the Pakaka and Gorumbwa satellite deposit. Resources were down after depletion by 5 % as a result of mining and the ongoing assessment of the substantial resource base acquired from Moto.

In Côte d'Ivoire, Tongon's resources and reserves decreased marginally with partial replacement from ongoing advanced grade control drilling within the pit. Drilling continues to highlight the potential for further gains within and immediately below the current Southern Zone pit design and nearby satellite deposits which will be further tested in 2016.

Group General Manager Evaluation Rod Quick said Randgold's reserve and resource management was based on the calculation of its Life of Mine reserves at a gold price of US\$1 000/oz, coupled with a strong emphasis on the optimal exploitation of the various orebodies by each of the operations.

Chief Executive Mark Bristow said the fact that the group's reserve grade remained intact demonstrated that Randgold had not been forced into high-grading by the challenging market conditions.

"We've been able to steer a steady course through some choppy waters because our long term strategy takes the cyclical nature of the gold mining industry fully into account. By ensuring that our operations are focused on real returns and breakeven cash flows, we have secured a profitable consolidated business plan for at least 10 years at an annual production in excess of one million ounces, based on our existing reserves. In the meantime, our exploration teams are hard at work replenishing those reserves as well as hunting for our next big discovery," he said. ■



Based on current reserves, the Loulo-Goukoto mining complex in Mali has a Life of Mine to 2028, and ongoing exploration to identify new brownfields opportunities is aimed at extending its life (photo: Randgold Resources).

XRT system integrated into screening operations

Diamcor Mining Inc, listed on the TSX-V, reports it has completed the initial integration of a Tomra XRT system into the in-field screening operations at its Krone-Endora at Venetia project in South Africa's Limpopo Province.

The integration of this equipment is aimed at allowing the company to test the effects of further concentrating and reducing the size fractions of material being processed at the project's main treatment plant. It is also expected to reduce overall water consumption associated with processing of all material; and reduce the operational costs of heavy equipment

through a reduction of double handling of material realised during the initial testing of this equipment as a separate standalone item.

Diamcor further reports that in addition to the previously announced 7,50 and 12,78 carat rough diamonds recovered utilising the Tomra XRT system and sold at recent tender, two additional rough diamonds in the +10,8 carat 'special' category, an 11,64 and a 12,73 carat, were recently recovered at the project. The recovery of these two gem-quality rough diamonds occurred during initial testing being performed on the integrated in-field screening operations. ■

Section of canal relocated at iron ore mine

Working next to the main haul road of a well-known iron ore mine and sequencing construction activity around its blasting programme are just two of the challenges Murray & Roberts Infrastructure has to overcome on one of its current contracts.

However, this leading South African construction company, which forms part of Murray & Roberts Construction, has ample experience working in mines' 'red zones' in the Northern Cape. Since 2005, it has earned itself an enviable reputation for being able to deliver quality infrastructure in these demanding environments. This includes at Kumba's Sishen iron ore mine, where it has been involved in a number of projects.

The latest contract at this mine is the relocation of a section of the G80 canal and its related infrastructure. It forms part of Kumba's environmental management plan for Sishen, with the canal used to collect run-off surface water to be reused elsewhere in the operation.

Tiaan Krugel, Contracts Manager of Murray & Roberts Infrastructure, says the concrete-lined canal is 4,6 km long, with the width of its base varying between 2 and 3 m. Connected to the build is a gravel road running alongside the canal over three newly-constructed cast-in-situ culverts. A steel water pipeline is also being laid along the length of the canal.

Blasting at the mine takes place twice a week. When this happens, the contractor has to evacuate the site before 12h00, denting his production scheduling. "We initially planned to achieve a production target of 150 m a week. Although we were aware of the blasting scheduling when we tendered, it took us a bit longer to achieve the desired level of production," says Krugel.

An additional 32 workers were introduced to the existing team to make up for lost time when blasting was done – a very effective strategy with production peaking at about 183 m a day.

Working next to the primary haul road means that there is a lot of interfacing with the mine on this project, calling for careful planning. While processes such as these can be managed, the Murray & Roberts Infrastructure team also had to be prepared to think on its feet to cope with unforeseen events.

Such an event occurred in January 2015 when a crack formed in the pit high wall alongside the canal and prevented further construction of the canal for approximately 950 m. The contractor only regained access to this portion in June.

Its ability to think outside of the box came to the fore again when it introduced a novel chute system to place concrete in sections of the drain that are deeper than 2 m and beyond the reach of a ready-mix truck. The polyvinyl chloride chute allows work teams to dispense concrete directly from the truck, doing away with the need for a mobile crane and

therefore boosting productivity.

Jerome Govender, Executive Chairman of Murray & Roberts Construction, says work is expected to be completed in May 2016, when the entire team will mobilise to another site to commence work on a new road construction project. He adds that given the position of the work in a mining environment, he is extremely pleased that the project's safety performance has been excellent with zero lost time injuries experienced. ■



The concrete-lined canal is 4,6 km long, with the width of its base varying between 2 and 3 m.

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Metallon's production marginally down in 2015

UK-based Metallon Corp, which owns five underground gold mines in Zimbabwe, has reported a total gold production of 96 530 ounces for FY 2015, 2,4 % lower than the figure for 2014. The group says that gold production was lower than expected due to equipment breakdowns at four of its mines (How, Shamva, Mazowe and Arcturus), increased power interruptions and a delay in commissioning its Mazowe sands retreatment project as a result of unforeseen equipment delays.

C1 and C3 costs for 2015 were US\$818 and US\$1 017 per ounce respectively. Compared to 2014, C1 costs were 5,4 % higher due to lower production and C3 costs were 9,8 % higher as a result of spending on new projects and replacement capex.

Metallon says that in 2016 its focus will be on completing the Mazowe sands retreatment plant and the Mazowe and Shamva tailings facilities in Q2 2016 and on resource exploration across the group with a budget of US\$1,6 million committed to upgrading resources from inferred to measured and indicated. The majority of the planned exploration will be underground and near surface at Mazowe mine and at surface at Shamva Hill. At Mazowe – and depending on the results of the exploration programme – the sands retreatment plant will be upgraded to process ore from both near surface and underground from 2018.

Redwing mine has successfully resumed operations and produced 814 ounces in 2015. Ramp up will continue over the next six months to bring the mine to full production. At steady state Redwing will deliver approximately 1 600 ounces per month. Dewatering will continue to open up more



Metallon's Redwing mine – one of Zimbabwe's historic mines – is located 20 km north-east of Mutare. It was reopened towards the end of last year (photo: Metallon).

reserves in the lower levels of the mine.

According to Metallon, the reopening of Redwing – which discontinued operations in 2008 – will bring many major social and economic benefits to the local region and the country. Employment is one of these benefits, with the mine having 484 employees at opening. This figure will increase to over 700 once it reaches installed capacity in H2 2016.

Construction of the Mazowe sands retreatment project is almost complete and commissioning is expected in Q2 2016. The new tailings facilities at both Mazowe and Shamva are progressing well and these should also be ready for use in Q2 2016.

Comments Ken Mekani, Metallon's CEO: "2015 was an exciting and promising year

for Metallon and the management team have been focused on making significant improvements to the business. Despite gold production for 2015 being marginally below that of 2014, we believe that advances made during the year will ensure Metallon is well positioned for future production growth. This is demonstrated by record monthly gold production in December 2015. Notably, Metallon spent over US\$15 million on capital expenditure over the last 12 months and will also have repaid US\$8 million of net debt by the end of Q1 2016. This establishes our commitment to reducing our net debt position and reinvesting in the business. The reopening of Redwing mine in Q4 2015 has been a tremendous achievement and we look forward to increased production in 2016." ■

Tango receives offer for Oena diamond mine

Tango Mining, a company listed on the TSX Venture Exchange, reports it has received a binding offer from Bothma Diamante CC, an unrelated third party company registered in South Africa, to acquire African Star Minerals (Pty) Limited, which owns 100 % of the Oena mine (in which Tango has a 51 % interest) for US\$3 million (payable in tranches).

Bothma is well known in the Northern Cape and Free State and has worked as contractor on various projects for the min-

ing of alluvial diamonds, the processing and manufacture of river sands and kimberlite projects.

The Oena project consists of an 8 800-ha mining right and corresponding infrastructure and all associated processing equipment. It is located along the Orange River in a well-established alluvial diamond mining province known to produce high quality and large sized diamonds.

In connection with the agreement with

Bothma for the purchase of African Star, Tango has entered into a binding term sheet and sale and acquisition agreement – contracting (Stage 1 Agreement) whereby Bothma will continue the alluvial diamond bulk-sampling programme at the Oena project. Following that, it will enter into a Stage 2 agreement whereby Bothma will complete the acquisition of African Star. Tango will receive a minimum of 15 % of the proceeds of all diamond sales "for a term of the longer of 12 months and/or until a Section 11 approval is obtained". ■



Overall view of the zinc expansion project at Bisha (photo: Nevsun).

Bisha zinc expansion project starts commissioning

Vancouver-based Nevsun Resources, listed on the TSX and NYSE, has provided an update on the Bisha zinc expansion project in Eritrea. Nevsun has a 60% interest in the high-grade Bisha mine with the balance held by the state-owned Eritrean National Mining Corp.

According to the company, construction remains on schedule and well under budget with nearly one million man hours worked with zero lost time incidents. Cold commissioning is now underway and pro-

gressing well. Hot (ore) commissioning has been delayed one month due to additional supergene copper processing.

The zinc expansion project enables processing of the primary copper-zinc-gold-silver ore at up to 2,4 Mt/a, producing both copper and zinc concentrates from the existing copper flotation and new zinc flotation plants. Current reserve life with the completed zinc expansion project is to 2025.

Bisha is one of the few new sources of zinc concentrate hitting the market in 2016. Bisha's zinc concentrate is expected to be high quality and is reportedly attracting significant interest from buyers. Bisha's zinc offtake remains completely uncommitted at this time as the zinc market is expected to continue to tighten.

The forecast total cost of the zinc expansion project remains approximately US\$80 million, significantly under the original budget of US\$100 million.

Bisha continues to mine, and has historically stockpiled, a variety of highly variable precious metal materials. In 2015 Bisha invested in equipment to

screen and beneficiate portions of the materials in an effort to create saleable contiguous lots of material. These efforts defined 90 000 tonnes of varying materials assaying 20 to 30 g/t gold and 800 to 900 g/t silver. Bisha will continue to market this material throughout 2016.

Cliff Davis, Nevsun's CEO, commented, "With the zinc plant nearly complete, strong demand for products and increasing gold, silver and copper prices since December 31, 2015, we expect higher than budgeted cash flows throughout 2016. The recent precious metal stockpile sales confirm the marketability of the material at more favourable commercial terms than originally expected. In addition, with the likely prioritisation of shipping the precious metal stockpile material, I am not expecting the first sale of zinc concentrate until late Q3 or early Q4 2016."

Bisha is a large, high-grade volcanogenic massive sulphide (VMS) deposit located 150 km west of Asmara in Eritrea. The US\$250 million Bisha mine was constructed on time and under budget from 2008 to 2010. Processing oxide ore, the mine produced low-cost gold-silver doré until mid-2013. Through a US\$110 million copper expansion project, also delivered on time and under budget, throughput expanded to 2,4 Mt/a supergene ore and the product switched to copper concentrate. The zinc expansion project adds zinc concentrates to the product mix. ■



The zinc regrind facility at Bisha under construction in October 2015 (photo: Nevsun).

Galane settles Galaxy's 'legacy' issues

Galane Gold, listed on the TSX-V (and owner of the Mupane gold mine in Botswana), has announced that the company and its subsidiary, Galaxy Gold Mining Limited, have entered into a full and final settlement agreement with Traxys Europe SA, Mine2Market and certain others (collectively the 'Traxys parties') with respect to various outstanding claims arising from the time period when the Traxys parties operated Galaxy's mining operations. Galaxy was acquired by Galane last year.

As a result of the settlement, the Traxys parties have unconditionally and irrevocably cancelled and waived all claims in relation to the various contract mining, off-take and tailings agreements and indebtedness entered into or owed by Galaxy and/or its subsidiary, Galaxy Gold Reefs Proprietary Limited. The Traxys parties have also released their security interests against Galaxy's assets including its plant and mining licences.

In connection with the settlement, the Traxys parties have agreed to settle their claim for US\$4,3 million of indebtedness owing by Galaxy and Galaxy Gold Reefs in exchange for the issuance by Galane Gold of unsecured convertible debentures in the aggregate principal amount of US\$3,2 million.

"We are pleased to have completed this settlement with the Traxys parties," comments Galane's Chief Executive Officer, Nick Brodie: "This settlement is a significant step in our process of cleaning up legacy issues with Galaxy and removes one of the final hurdles to recommencing production. The exchange of a sizeable amount of short-term indebtedness of Galaxy into long term indebtedness and the cancellation of the security on the assets should provide additional financial flexibility to implement our strategic vision for Galaxy."

Galaxy's mining assets, located on the Barberton Greenstone Belt (BGB) approximately 10 km to the west of the town of Barberton in Mpumalanga, include several historical mining operations on the BGB as well as tailings storage facilities comprised of previously mined and processed material. To date, the mining assets have produced over one million ounces of gold with mining operations having first started in the 1880s. Galaxy's existing processing plant is designed to treat 16 000 tonnes of ore a month but is in need of refurbishment. The facility can be expanded through refurbishment and the introduction of larger mills and flotation equipment. ■

Kimberley to host land rehabilitation conference

The Land Rehabilitation Society of Southern Africa (LaRSSA) has gone from strength to strength since its inception in 2012, with membership numbers still rising and a growing interest in its activities on the part of other organisations. After three very successful conferences, LaRSSA is ready to host its fourth annual conference in Kimberley, Northern Cape, from 13-16 September 2016. A one-day pre-conference training workshop is planned, as well as post-conference technical visits.

The theme for the 2016 conference is 'The Rehabilitation Business Case'. Conference topics will include: improving ecosystem function for long-term gain; harnessing the intrinsic value of rehabilitation for communities; improving the economic gains from rehabilitation; understanding the business indicators for successful rehabilitation; and identifying sources of funding.

Scientists and practitioners in the

rehabilitation field are invited to submit abstracts for the conference.

The Kimberley venue is appropriate for a conference which will include coverage of mining rehabilitation. The area's rich mining heritage has resulted in a long and distinguished rehabilitation history. Rehabilitation approaches have included conversion of kimberlite lay down pads to game parks; dedicated conservation of indigenous trees; focused management of alien invasive plant species across disturbed mining and agricultural lands; management of artisanal miners; as well as rehabilitation of pans historically used for storage and evaporation of dirty process water, which now provide important roosting and feeding sites for birds.

Further information is available from: Claudin Kruger, LaRSSA 2016 Conference Coordinator, Kruger & Associates, tel: 028-316-2905, e-mail: kruger@krugerassociate.com. Details of the conference are also available at www.larssa.co.za. ■

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The processing plant at Otjikoto, which has now been expanded to take its capacity to 3 Mt/a (photo: B2Gold).

Namibia's Otjikoto gold mine enjoys "exceptional year"

Reporting on its operational and financial results for the fourth quarter and year-end (to December 31, 2015), Canada's B2Gold Corp says its new Otjikoto mine in Namibia had an exceptional year in 2015, quickly ramping up to commercial production and meeting its 2015 production guidance. It was also able to beat its cost guidance and successfully completed its mill expansion project on time and budget (expanding the mill from 2,5 Mt/a to 3,0 Mt/a).

For the full-year 2015, Otjikoto produced 145 723 ounces of gold (including 18 815 ounces of pre-commercial production), in the mid-range of its 2015 production guidance (of 140 000 to 150 000 ounces), and produced 39 374 ounces of gold in the fourth quarter of 2015.

In 2015 (after commencing commercial production), Otjikoto's cash operating costs were US\$425 per ounce, well below (17 %) the company's 2015 guidance of US\$500

to US\$525 per ounce. The lower realised per ounce cash costs were due mainly to favourable exchange rates and fuel cost impacts as well as an effective commissioning of the mine during the year. In the fourth quarter of 2015, Otjikoto's cash operating costs were US\$385 per ounce, US\$21 per ounce below budget.

Net capital expenditures totalled US\$34,8 million for the year, consisting of mill expansion costs of US\$10,8 million, a

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net cash inflow of US\$7,1 million for pre-commercial sales proceeds offset by pre-commercial production costs, and mine development costs of US\$31,1 million (including cash payments of US\$14,4 million for capital costs which were incurred and accrued in 2014).

Subsequent to December 31, 2015, the company prepared a preliminary new Otjikoto Life of Mine (LOM) plan that incorporated a revised geological and grade model for the Otjikoto deposit as well as preliminary modelling and scheduling of the Wolfshag zone into the overall Otjikoto Life of Mine plan. The preliminary LOM plan indicates that over the four years 2016-2019, gold production is expected to average 170 000 ounces per year. Production for the years 2020 and beyond will vary depending on the conversion of Wolfshag underground and open-pit resources to reserves and bringing a potential underground mine into production on schedule.

Otjikoto is forecast to produce between 160 000 and 170 000 ounces of gold in 2016 at a cash operating cost of approximately US\$400 to US\$440 per ounce. ■

BlueRock busy with a review of its mining strategy

In an operational update released at the end of March, AIM-listed BlueRock Diamonds notes that in January this year it appointed VBKOM, a specialist mining consultancy, to join its existing management team and, in particular, to review BlueRock's mining strategy and produce a life of mine plan. BlueRock is mining at Kareevlei, located 100 km north-west of Kimberley in the Northern Cape. The property hosts five confirmed kimberlites.

The review process is under way and BlueRock expects that it will be finalised over the next couple of months. In addition, the company has started conducting a strategic review covering all operations as its business expands. The first action of this review is to appoint an experienced mine manager to run operations.

The combined throughput of the Kareevlei plant and the Diacar plant is now in excess of 20 000 tonnes per month – up from 14 000 tonnes as reported in December. (Diacar Mining and Plant Hire acts as a sub-contractor and has established a second processing plant at the Kareevlei site in order to process kimberlite of over 70 mm in size).

The water shortages faced during the very dry summer have been alleviated by rain, says BlueRock, and a change in processing which enables the mine to utilise water more efficiently.

"We are pleased with the ability of Kareevlei to process higher volumes of kimberlite but continue to make adjustments to our plant set up to achieve more processing efficiencies," says BlueRock. "During the first quarter our recovery ran at slightly under 2 cpht. Whilst this is below the expected average grade as set out in the CPR published at the time of our admission to AIM, limited testing of our tailings has shown that our plant is not recovering a significant quantity of diamonds and that the DMS as it is currently set up is unable to process effectively the increased throughput. The board, together with VBKOM and other industry experts, are currently deciding how best to resolve this issue."

The company adds that Diacar, whilst operating at the expected levels of throughput, is also recovering at lower than expected rates. Diacar is currently in the process of adding a DMS to its processing unit and it is anticipated that this will improve its recovery grades. ■



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Night view of the Tharisa mine, which is located on the south-western limb of the Bushveld Complex, near Marikana (photo: Tharisa).

Tharisa achieves steady-state production levels

Tharisa, South Africa's only PGM and chrome co-producer, reports it recorded a number of milestone achievements during the three months ended 31 March 2016 as its mining and processing reached steady state levels on an annualised basis.

A continued focus on safety contributed to a significant reduction in safety related stoppages in Q2 FY2016 with a lost time injury frequency rate as at 31 March 2016 of 0,3 per 200 000 hours.

Second quarter milestones included (on an annualised basis) reef mined exceeding the steady state required run rate of 4,8 Mt/a, mill throughput at nameplate design capacity and contained PGM production on a 6E basis meeting the steady state production level.

"We are very encouraged by the milestones achieved during this, our second quarter. Not only have we achieved improved production, we have exceeded

previous records," says Tharisa CEO Phoevos Pouroulis.

Tharisa's mining operations are characterised by the shallow open-pit, large scale co-production of PGMs and chrome concentrates with a consequential low cost of production.

Improvements in reef mined during the quarter resulted from a continued focus on opening up access to the full mining strike length and the benefits of maintaining

Mine construction activity at Fekola builds up

Canada's B2Gold reports that early works were completed and activities ramped up in preparation for full construction of its Fekola project in Mali in the fourth quarter of 2015. Significant activities included formal ground-breaking ceremonies for the project with local and national leaders, clearing and topsoil removal at the tailings basin, camp and workshop construction, and earthworks and steel piling installation in the mill and leach tank areas.

Numerous major mill packages have been issued for purchase including grinding mills, crushers, tanks, and motors. Detailed design for the Fekola plant and infrastructure construction is being completed by Lycopodium Engineering (Australia). This is the same engineering group that was used

to design the Otjikoto project in Namibia and many of the same Lycopodium project engineers are involved in the design phase. Additionally, many of the same vendors that have provided equipment to Otjikoto have been successful in their bids on equipment packages for the Fekola infrastructure and plant.

The 2016 construction and development budget for the Fekola project totals approximately US\$233 million. In 2016, the company will continue to develop the project with work in all major areas. Excavation and compaction of the mill area will be supported by an on-site geotechnical laboratory and concrete will be provided by an on-site batch plant. Structural steel and tank erection is expected to begin in the

second quarter of 2016. Major earthworks to be undertaken in 2016 include the tailings storage facility and the surface water dam. Based on current assumptions, the project remains on schedule to commence production in late 2017.

Fekola will be a substantial gold producer with a planned average gold production for the first seven years of approximately 350 000 ounces per year at an average cash operating cost of US\$418 per ounce and for the life of mine plan approximately 276 000 ounces per year at an average cash operating cost of US\$552 per ounce. The total pre-production capital costs are estimated to be US\$395 million plus US\$67 million of anticipated mine fleet and power generator costs which are expected to be lease financed. ■



the correct multi-reef layer profile. A focus on interburden stripping (rather than overburden stripping) contributed to improved ore exposure and feed grade flexibility during the quarter.

An increase in reef mined has allowed the mine to build ROM stockpiles ahead of the mills. This provides for improved reef layer blending and better feed grade consistency, resulting in improved plant recoveries and running times.

Contained PGMs of 36,0 kt on a 6E basis for the quarter equate on an annualised basis to steady state production of 144,0 koz/a. Recoveries at 68,5 % showed an improvement from the 65,8 % reported at the year end, and put Tharisa on track to achieve its targeted recovery rate of 70 % in the near term.

According to Tharisa, weaker PGM and chrome prices during Q2 FY2016 were partially offset by the weakening of the South African rand against the US dollar. Constrained by global macroeconomic conditions, the average PGM basket price for the quarter was US\$685 per ounce, while the rand basket price was R10 849 per ounce – an improvement of R984 per ounce on the average price achieved in Q1 FY2016.

The marked decline in the average metallurgical grade chrome concentrate price in Q2 FY2016 was primarily due to the slowdown in the Chinese economy and uncertainty around growth and consumption of raw materials. There has, however, been a marked improvement in metallurgical grade chrome prices post the quarter end as demand returns to sustainable levels. During the quarter, Tharisa modified the chrome processing circuit at its Voyager Plant to increase production of higher value specialty grade chrome concentrates.

“This flexibility has allowed chrome production to be distributed to more globally diversified markets. The circuit modification has resulted in improved chrome recoveries nearing the 65 % target without impacting PGM recoveries,” notes Pouroulis.

Pouroulis says the achievement of steady state production levels bodes well for Tharisa and reinforces the group’s place as a globally competitive low cost PGM and chrome co-producer and further entrenches its position as an operationally cash generative business throughout the commodity cycle. ■



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Avnel Gold completes DFS on Kalana Main project in Mali

Avnel Gold Mining, listed on the TSX-V, has announced the results of a Definitive Feasibility Study for its Kalana Main project in south-western Mali.

The company is reporting a maiden mineral reserve of 1,96 million ounces (Moz) of gold and an updated measured plus indicated mineral resource estimate of 3,06 Moz of gold for the project.

Highlights of the study (at a base case gold price of US\$1 200 per ounce) include an after-tax 8 % NPV of US\$196 million and an after-tax IRR of 38 % with a payback period of 1,2 years from the start of commercial production. The initial net capital expenditure is estimated at US\$163 million.

During the first five years of operation, it is envisaged that Kalana would have an average annual throughput of 1,35 Mt milled and an average annual production of 148 000 ounces at a total cash cost of US\$507/oz and an average on-site all-in-sustaining cost (AISC) of US\$595/oz. Average mill head grade would be 3,6 g/t Au with a gold recovery of 94,6 %.

Total production over an 18-year life of mine (LOM) is estimated at 1,82 Moz with gold recovery of 92,7 %. Average

LOM annual production would be 101 000 ounces at a total cash cost of US\$695/oz and an on-site AISC of US\$784/oz.

The Kalana project is owned by SOMIKA. Avnel has an 80 % equity interest in SOMIKA and the Malian government holds a beneficial interest in the remaining 20 %, which has anti-dilution and free-carry rights.

SOMIKA owns and operates the Kalana gold mine, a small, Soviet-era, underground gold mine, and holds the rights to the Kalana Exploitation Permit, a combined exploitation and exploration permit covering a surface area of 387,4 km². The permit is host to 29 exploration targets, including the Kalana Main deposit.

The DFS was led by Snowden Mining Consultants with the support of several leading consulting firms, all of whom have extensive experience in Mali, including Ivor Jones of Denny Jones (Pty) Ltd, DRA Projects and Epoch Resources.

The DFS mine plan provides for 18 years of production from the Kalana Main deposit from a single open pit with 12 stages. A total of 228 Mt will be mined with a LOM waste-to-ore ratio of 9,9:1 including the pre-strip.

The deposit contains high grade min-

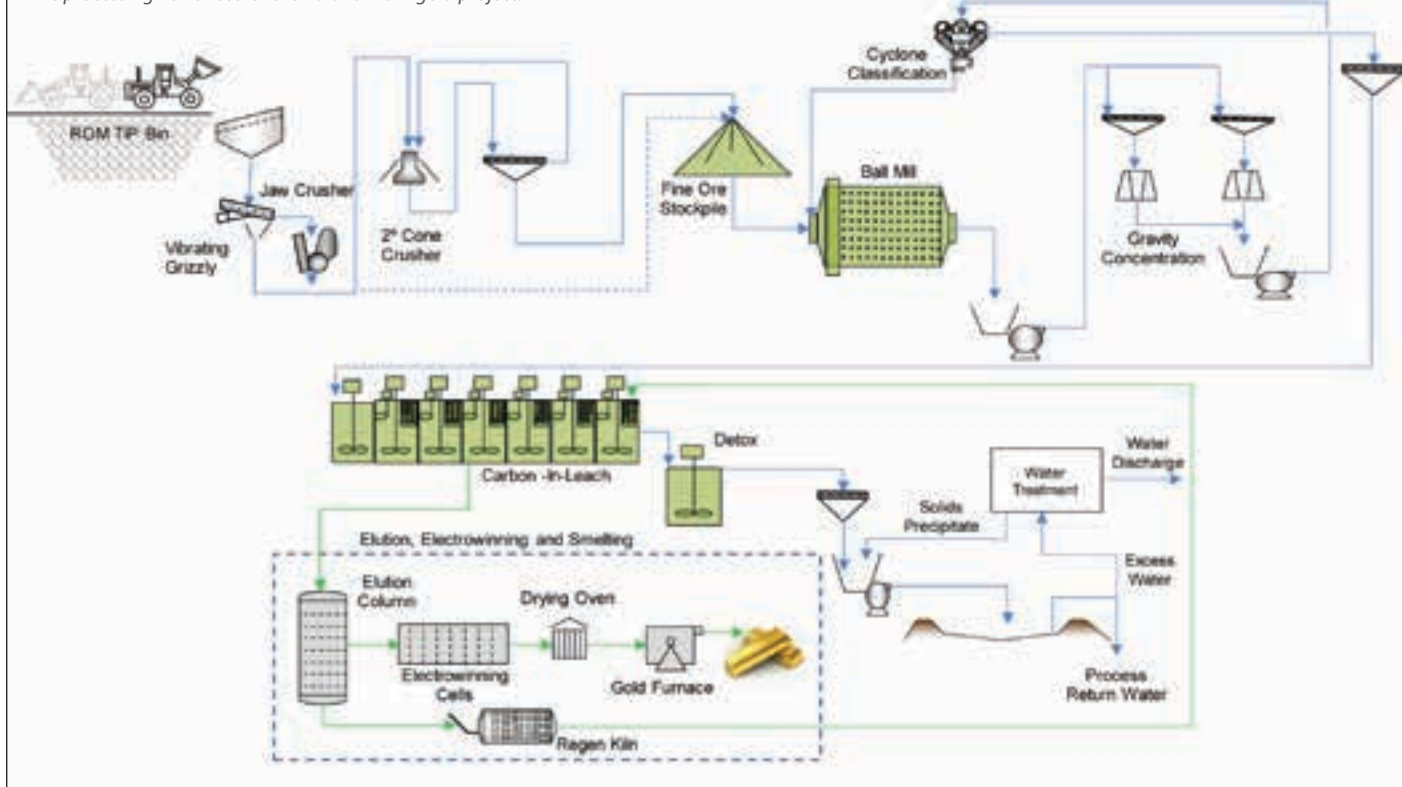
eralised zones that will be extracted by selective mining using 5 m benches. Bulk mining of the waste zones will be conducted on 10 m benches.

The mine area consists of a weathered zone to an average depth of 60 m below surface which is amenable to free digging. The mining schedule targets the areas of saprolite that will generate higher cash flow early in the mine life. The pre-strip of six months will provide ore stockpiles to enable higher grade ore to be processed in the early years of the mine life.

Mining will be conducted by the owner whilst maintenance of the open-pit mining machinery will initially be carried out by the original equipment manufacturer to ensure fleet availability. The maintenance plan provides for a five-year handover period to the owner after completion of the initial capital purchase of the full fleet component.

ROM ore will be delivered from the mine to the processing plant, which consists of a conventional two-stage crushing circuit and a single-stage milling circuit to achieve a target grind size of 80 % passing 75 microns. The processing plant design is based on annual throughput rates of

The processing flowsheet for the Kalana Main gold project.



1,5 Mt/a for saprolite and 1,2 Mt/a for saprock and fresh rock material.

Gold is to be extracted by gravity concentration and a CIL plant to produce a gold doré via elution, electrowinning and smelting. Gold is recovered from the loaded carbon in an elution and electrowinning circuit and will be poured into doré bars on site.

The plant design philosophy incorporates a requirement that the processing plant be constructed in a manner that would expedite the construction of the leaching and adsorption circuit with the intention of processing historic tailings from the underground Kalana gold mine prior to the hot commissioning of the mill.

These tailings are intended to be recovered by hydraulic mining and processed through the CIL circuit over a five-month period and then for three months during the hot commissioning of the mill. This represents an opportunity to generate pre-commercial production cash flow that will partially offset development capital requirements. ■

OreCorp starts Scoping Study on Nyanzaga

Australia's OreCorp, listed on the ASX, has begun a Scoping Study for the Nyanzaga gold project in the Lake Victoria goldfield of Tanzania. The study will examine all facets of geology, mining and processing, incorporating the encouraging results of the maiden JORC 2012 compliant Mineral Resource Estimate (MRE) of 21,3 Mt at 4,1 g/t for 2,78 Moz gold.

The Scoping Study will evaluate the technical and economic viability of open pit and/or underground development scenarios and include a combination of both mining methods. Processing options will be considered in the light of mining scenarios to optimise both throughput capacity and ore feed flexibility to enhance metallurgical outcomes.

OreCorp expects the Scoping Study will be completed in the fourth quarter of 2016 and anticipates that thereafter it will immediately progress to the pre-feasibility study stage.

Lycopodium of Perth, Western Australia has been appointed to manage the

Scoping Study. During the past 18 months, Lycopodium has completed ten major feasibility studies for gold projects in Africa and is currently involved in the construction of five gold and base metals mines in Africa. Over the last 20 years, Lycopodium has built the Golden Pride, Geita and Buzwagi gold mines in the Lake Victoria goldfield.

OreCorp also says it welcomes Ernst Griebel to the OreCorp team as Study Manager. He holds a Bachelor of Science in Engineering (Chemical) from the University of Cape Town. He has 30 years of mining industry experience, and has worked with companies that include Rio Tinto, De Beers and, more recently, AngloGold Ashanti. He has extensive African mining experience.

The Nyanzaga project is situated approximately 60 km south-west of Mwanza and 35 km north-east of Acacia's Bulyanhulu gold mine. It is the subject of a joint venture agreement between Acacia Mining and OreCorp in terms of which OreCorp may earn up to a 51 % interest. ■

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The Platreef project – Ivanhoe's

Construction of what could ultimately become the world's biggest platinum-group metals mine – the Platreef project of TSX-listed Ivanhoe Mines – is now well underway, with the sinking of the first shaft already in progress and poised to enter the main sinking phase. The new mine will exploit a remarkable underground orebody known as the Flatreef which has an average thickness of 24 m – making it roughly equivalent to 24 narrow Merensky reefs stacked one on top of another. The man responsible for the day-to-day management of the project, Gerick Mouton, Vice President & Executive Head: Capital Projects of Ivanhoe subsidiary, Ivanplats, believes that it represents the future of the platinum mining industry, not only in South Africa but globally.

Ivanplats' Mokopane team pictured at the company's premises in the town.

Elaborating, Mouton says that the incredible width of the Flatreef means that it will be a platinum mine like no other. "If you look at all the other underground platinum mines in South Africa, they're mining either the Merensky or the UG2 reefs, which are generally only a metre or so thick," he says. "Mechanising the mining of orebodies of this type is difficult although there has been some success with semi-mechanised methods on the UG2, which typically offers more mining width than the Me-

sky or the UG2 reefs, which are generally only a metre or so thick," he says. "Mechanising the mining of orebodies of this type is difficult although there has been some success with semi-mechanised methods on the UG2, which typically offers more mining width than the Me-



rensky. Now compare this with the situation we have with the Flatreef, where the typical mining stopes will be 60 m long, 15 m wide and 20 m high and yield 18 000 m³ – or 55 000 tonnes – of ore. Clearly, we can use highly mechanised, bulk mining methods on a scale never before seen in underground platinum mining – and this is precisely what we intend doing.”

The project is located on the Northern Limb of the Bushveld Complex near Mokopane in Limpopo Province, with its nearest neighbor (adjacent to the north) being the Mogalakwena open-pit operation of Anglo American Platinum, currently ranked as the world’s biggest and most profitable platinum mine. Commissioned in the early 1990s, Mogalakwena was the first – and is still the only – mine exploiting the Platreef. Ivanhoe’s Platreef mine will be the second and – once it moves into its second phase of development – will very likely overtake Mogalakwena in terms

Left: Platreef project employees on site with the headgear of Shaft 1 in the background.

Below: Looking down the barrel of Shaft 1 during the pre-sink stage (photo taken during night shift).

platinum mining game-changer





Aerial view of the Platreef site. It has been entirely fenced with an inner concrete wall surrounding the shaft area.

Photo taken during the erection of the headgear. A 600-ton capacity Demag crawler crane from Sarens was used to lift the heavy components.



of production of platinum equivalent ounces. Remarkably (given that it is an underground mine), it is expected to have costs of production that are not significantly different to those of Mogalakwena.

Ivanplats, which is 64 % owned by Ivanhoe and 10 % owned by a Japanese consortium of Itochu Corp, ITC Platinum (an Itochu affiliate) and Japan Oil, Gas and Metals National Corporation (JOGMEC) with the balance of the shareholding being in the hands of Ivanhoe's B-BBEE partners, is responsible for executing the project. It is planning to do this in three phases, with the initial phase being a 4 Mt/a

operation to establish an operating platform to support phases two and three, which will see production increasing to 8 Mt/a and 12 Mt/a respectively. The concentrator plant for phase 1 will consist of two modules, each of 2 Mt/a capacity. The final product of the project will be concentrate although smelting and refining options are not ruled out for the later phases of development.

“The timeline on phases two and three is still uncertain but we should be producing ore from phase one in 2019,” says Mouton. “This will be stockpiled as the first 2 Mt/a concentrator plant module will only be commissioned in late 2019. We would anticipate ramping up to full first phase steady-state production by 2022. A development decision on phase two, which doubles the size of the project, will probably be made in 2020 with the full 8 Mt/a capacity being achieved by 2024/25. A decision on phase three – taking the mine to 12 Mt/a – is much further out and is unlikely to be made before 2028.”

Mouton emphasises that all dates are tentative at this stage, given that Ivanhoe still has money to raise and given the vagaries of the PGM market. “We believe strongly in the future of PGMs but clearly we will need to develop the project at a pace that is consistent with market demand,” he says.

Ivanplats released the results of a Pre-Feasibility Study (PFS) – an incredibly detailed



plus 500-page document – on the project in January last year, which outlined the staged approach to development. According to the PFS, phase 1 will have an average annual production rate of 433 000 ounces of platinum, palladium, rhodium and gold (3PE+Au), plus 19 million pounds (8 618 tonnes) of nickel and 12 million pounds (5 433 tonnes) of copper. The PFS estimates the pre-production capital requirement of phase one at US\$1,2 billion (at a Rand/US dollar exchange rate of 11 to 1). It said the new mine would have a cash cost of US\$322 per ounce of 3PE+Au, net of by-products, placing it near the bottom of the cash curve. It estimates the after-tax NPV (at an 8 % discount rate) at US\$972 million and the after-tax IRR at 13 %.

Following on from the PFS, Ivanplats is now busy with a full Feasibility Study (FS), which is expected to be completed in Q1 next year, using the same team of professionals responsible for the PFS (and for the earlier Preliminary Economic Assessment or PEA). They are DRA Global (process and infrastructure), Stantec Consulting International (mineral reserve estimation and mine plan), SRK Consulting (geotechnical), AMEC Foster Wheeler (mineral resource estimation), Golder Associates (hydrology, backfill and tailings) and Digby Wells (environmental). DRA is managing the study while OreWin of Australia is responsible for overall NI43-101 report preparation and economic analysis.



The four-drum stage winder required for the sinking phase.

“Our strategy has been to retain the same team throughout all the study phases as this makes for continuity,” comments Mouton. “We have also, of course, gone for consultants with excellent track records. DRA, for example, has real in-depth mining and processing expertise and is particularly experienced in the PGM sector, where it has been responsible for designing and building close on 50 processing plants. Similarly, Stantec – we’re working with its Phoenix, Arizona office – has an international reputation in mining consulting – and indeed in other areas of engineering – and has worked very successfully with Ivanhoe on previous projects such as Oyu Tolgoi in Mongolia.”

The phase one project as delineated in the PFS is now well into construction. In fact, preliminary works on site started as early as late 2013 although work was halted for several

Reducing the impact of the Platreef mine

One of the challenges of the Platreef project is that it occupies a relatively compact site in close proximity to a number of villages and informal settlements. Ivanplats’ engineers are therefore making every effort to ameliorate the dust, noise and visual impacts of the project and to ensure the safety of community members.

All construction activities are taking place within a 345 ha fenced construction compound and a 10 m high berm will be built which will help reduce noise levels and also reduce the visual impact. Non-mineralised rock from the shaft and underground development workings will be used to create the berms, which will eventually be clad with top soil and hydro-seeded.

The shaft headframes, of course, will be visible over a long distance, particularly the 100 m-high structure of Shaft 2. To lessen the profile of the taller headframe, Murray & Roberts Cementation has incorporated unobtrusive lighting and also implemented design initiatives to reduce noise and dust levels. The overall aesthetics have also been considered, with the headframe having pleasing fluted features using concrete throughout.

The tailings storage facility will be located 8 km away from the mine site – and across the N11 road linking Mokopane with the Martin’s Drift border post on the Botswana border – in an area where there are no communities. According to the design, 60 % of the total tailings will be used for underground backfill which will reduce the overall environmental impact on surface. ■



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months in 2014 while Ivanplats awaited the formal execution of its 30-year mining right. Since then it has been all systems go with the main focus of activity being the 7,25 m internal diameter, 975 m deep, concrete-lined No 1 shaft, one of the cornerstones of phase one. When *Modern Mining* was on site recently, the pre-sink had been completed to 54 m and the shaft-sinking contractor, Aveng Mining Shafts & Underground, was preparing for the slow sink stage (the preliminary to the main sink) with the 40 m high steel sinking headgear erected, the five-deck stage in position in the shaft and the final installation of the double-drum kibble winder and four-drum stage winder underway.

According to Mouton, the shaft-sinking will employ tried and tested traditional methods using conventional jumbo drill rigs and cactus grabs. “We would expect Aveng to achieve an advance rate of 2,5 m a day once in full sink mode and at this stage we are anticipating intersecting the Flatreef at a depth of 777 m in late 2017 with shaft bottom being reached in 2018,” he says. “Although Shaft 1 is designated as the primary ventilation intake shaft, we will be hoisting through it as it will be used for early underground development and this hoisting role might become permanent as we move into phase two.” He adds that development work will include three stations at depths of 450 m, 750 m and 850 m below surface.

Shaft 1 is the smaller of the two main shafts required for the full implementation of the phase one Platreef project. The main production shaft will be Shaft 2, which – once completed – will rank as one of the biggest shafts in the platinum mining field in South Africa. Located just 100 m from Shaft 1, it will have an internal diameter of 10 m and be sunk to a depth of 1 250 m below surface. Capable of hoisting 6 Mt/a, it will be equipped with two high-speed 40-tonne skips running at 18 m/s and will also be capable of conveying 225 persons in a single deck using a cage and counter-weight arrangement. At this stage, Ivanplats is expecting to start early works for Shaft 2 in 2017, including civils work for the boxcut and hitch foundation.

The headgear of Shaft 2 will be an imposing concrete structure, 100,5 m high, making it similar in size to the concrete headframe of Impala’s No 16 shaft near Rustenburg. It will accommodate two Koepe winding systems which will be positioned 82 m above ground and – at a lower elevation – a single drum auxiliary winder. The contract for the design of the headframe – now complete – was awarded to Murray & Roberts Cementation in



The stage and bank steel being lowered into Shaft 1.

2014. Interestingly, the company has produced a 1:260 scale model of the headgear using 3D printing technology (see our photo), representing its first use of this technology. The model was printed using ceramics as opposed to plastics for aesthetic purposes, with the printing process taking just 17 hours.

One of the reasons for the generous dimensions of Shaft 2 is the fact that it will be used to transport large trackless equipment underground. Explains Mouton: “Based on the recommendations of the PFS, we’ll be using highly mechanised mining methods requiring the use of some very large mining equipment – for example, 40 and 50-tonne capacity mining trucks and 14 and 17-tonne LHDs. These machines will ‘live’ underground where we will have workshops initially but, of course, we have to get them down there in the first place and also occasionally bring them to surface for complete rebuilds. The dimensions of Shaft 2 will allow us to do this, although the bigger machines will still have to be broken down to allow them to fit within the cage.”

Transverse longhole stoping on a retreat basis will be the mining method applied to ore zones with vertical thicknesses greater than or equal to 18 m while thinner ore zones will be mined using mechanised drift-and-fill or drift-and-bench methods. Paste backfill will be used for post-mining support although in the first two years of production (prior to the startup of the mill and the paste backfill plant) cemented rock fill will be used as the fill system. Most of the cemented paste fill (CPF) preparation system will be located on surface with the only underground components being the pipeline distribution to the stopes.

Commenting on the use of longhole stoping, Mouton says that the method – which is

“Although Shaft 1 is designated as the primary ventilation intake shaft, we will be hoisting through it as it will be used for early underground development and this hoisting role might become permanent as we move into phase two.”

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particularly suitable for thick orebodies – is well-established globally although relatively uncommon in South Africa where narrow reefs predominate (although it has been used in some gold mines). “We’re absolutely confident that it is the right method for the Flatreef and that it will deliver the required tonnages, at low cost and in safe conditions,” he says.

Mouton adds that the high degree of mechanisation will mean that the Platreef mine will be an ultra-safe mine. “Mechanised methods are inherently safer than manual methods, particularly if the operators are well trained, as ours will be,” he maintains. “In fact, our vision is that our operators – who will be predominantly drawn from local communities – will be multi-skilled, well-paid professionals, who will work in air conditioned cabs in well ventilated spaces. To enhance safety even further, the mine design is such that it will minimise all man-machine interfaces. Ivanhoe’s management has stressed that the goal is to make the new mine one of the safest in the world and this objective has been prioritised in all our planning, design and engineering.”

Despite the level of mechanisation and the elimination of labour-intensive procedures, the Platreef mine will be a substantial employer even in phase one, with the projected workforce within four years of the start of operations expected to be in the vicinity of 2 200 people. Says Mouton: “We are committed to employing at least 70 % of our workers locally. This will require that we invest very heavily in training and this process has already started as part of our Social and Labour Plan commitments. In conjunction with the Department of Labour, we have created a database which will be used to select candidates for training and already we have 23 000 names on it. We’ve also committed to building a community skills and development and training facility in the Mokopane area within five years – a project which will cost around R26 million.”

Of course, building a mine the size of the Platreef operation in an area where water supplies are limited and in a country where electricity supply is constrained brings with it its own set of challenges on top of those presented by the task of creating a cutting-edge underground mine. The mine will need up to 100 MVA of power (for the 4 Mt/a production level) and also consume up to 10 million litres of water per day.

“As regards to power, we have enough genset capacity on site for the shaft sinking and we will be receiving a permanent 5 MVA supply from Eskom for the construction phase,” says

Mouton. “Work on the internal electricity substation for this has been completed and construction of the powerline is in progress. Longer-term we are confident of getting the electricity we need as our startup will occur just as the new Medupi Power Station is reaching its full capacity. We have already agreed a 70 MVA bulk supply with Eskom and are in discussions regarding the further 30 MVA that may be required.

“With respect to water, we will be drawing from the Olifants River Water Resources Development Project, which includes the raised Flag Boshielo Dam and the Phase 2B pipeline. We are also investigating other bulk water resources so that we have a back-up plan in the event that delivery of water from the Olifants project is delayed.”

He adds that the mine – as one would expect – will incorporate modern technologies to save on energy and that it will also be an economic consumer of water, with extensive use of recycling.

Summing up the project, Mouton says that the construction underway at presents represents the culmination of nearly two decades of work by Ivanhoe, which started exploration work at the Platreef site in the late 1990s. “We are pleased with the current progress on site and are on course to produce our first concentrates in 2019. We also believe we have the overwhelming support of the local communities who are excited by the employment and business opportunities the new mine presents. We are very aware of the need to have a social licence to mine and the MD of Ivanplats, Dr Patricia Makhesha, and rest of the Ivanplats team are working ceaselessly to ensure that the mine meets – and exceeds – the requirements of the Mining Charter. Overall, this is a transformative project with the capacity, on one level, to revolutionise platinum mining and, on another, to benefit a huge range of stakeholders within the Mokopane area.” ■

Report by Arthur Tassell, photos courtesy of Ivanplats



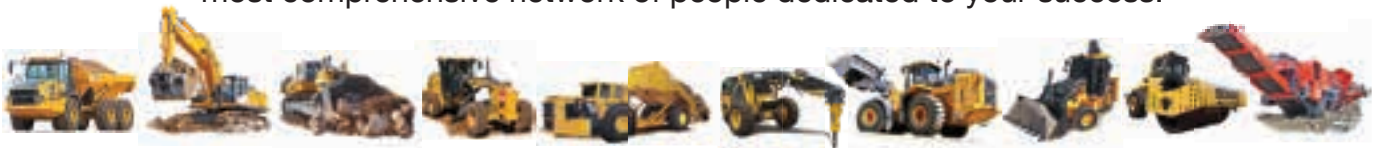
Model of Shaft 2 created by Murray & Roberts Cementation using 3D printing technology.

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The Platreef – the Merensky in all but name

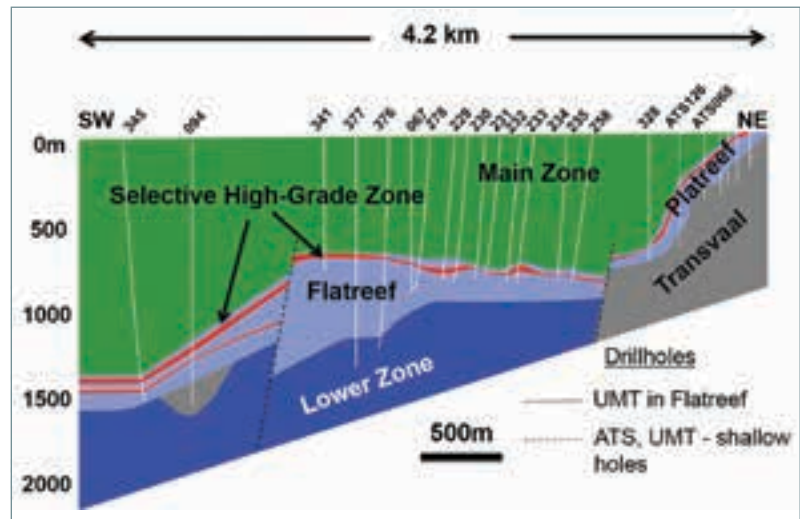
The Platreef project has been the subject of one of the most intense exploration programmes ever undertaken for a mining project in Africa. The initial focus was on near surface mineralisation but in 2007 a deep exploration programme was launched which led – three years later – to the identification of the Flatreef deposit, which lies within a flat to gently dipping portion of the Platreef mineralised belt at a relatively shallow depth of 700 m to 1 100 m below surface (over a strike length of 6 km).

Dr Danie Grobler, Head of Geology for Ivanplats, recalls that the deep drilling of the Flatreef involved as many as 30 drill rigs on site simultaneously with over 700 km of core from more than 1 200 holes being generated in the period from the late 1990s to 2015 – all of it now stored at Ivanplats’ offices and core shed in Mokopane. Some of the drill intercepts during this campaign were phenomenal and in October 2013, for example, Ivanhoe’s Executive Chairman, Robert Friedland, and its CEO, Lars-Eric Johannson, reported what they described as an “unprecedented 90 m intersection” of 4,51 g/t of platinum, palladium, rhodium and gold plus 0,37 % nickel and 0,20 % copper. This included a 40,79 m section grading 6,88 g/t 4PGE.

The Flatreef’s indicated mineral resources total 214 Mt grading 4,1 g/t (3PE+Au), 0,34 % nickel and 0,17 % copper at a 2,0 g/t (3PE + Au) cut-off grade containing an estimated 28,5 million ounces of platinum, palladium, gold and rhodium, 1,61 billion pounds (725 747 tonnes) of nickel and 794 million pounds (360 152 tonnes) of copper. The current resource was published in 2013 and a new mineral resource estimate is expected later this year.

The geological interpretation of the Platreef (and, by extension, the Flatreef) and the degree to which it correlates with the Merensky Reef is a highly technical subject – and a matter of some controversy in the geological community – but Grobler is in no doubt that the Platreef is, to all intents and purposes, identical to the Merensky.

This view was more formally expressed in a paper he co-authored with Dr David Broughton, Ivanhoe’s Executive VP,



Exploration, and Tim Dunnett, a senior geologist with Ivanplats, presented at PDAC in 2014 in which it is stated that the Flatreef can be viewed “as a hybrid deposit type with internal features and stratigraphic correlation consistent with the Merensky Reef, and economically attractive thicknesses (the Flatreef indicated resource averages 24 m thickness at a 2 g/t 4E cut-off) typical of Contact-type deposits.” ■

Cross section through the Flatreef. The highest grades occur at the top of the Flatreef.

Personnel from drilling contractor Major Drilling studying drill core during the exploration phase.



Mali's Kobada open-pit gold

Mali has a host of gold projects currently at various stages of development, including B2Gold's Fekola project, already under construction and destined to be a plus 300 000 ounce a year producer, Hummingbird's Yanfolila and Avnel Gold's Kalana. Perhaps less well publicised than these is African Gold Group, Inc's Kobada gold project. Compared to Fekola, it will be a relatively small mine but the recently completed Feasibility Study (FS) demonstrates that it has attractive economics, with the payback period on the estimated pre-production capex of US\$45,4 million being 31 months.

According to African Gold Group, Inc, which is listed on the TSX-V, the FS demonstrates the robust nature of the project, with the highlights including an 'All In Sustaining Cost' (AISC) of US\$788 per ounce and free cash flow of US\$122 million net of all capital expenditure, operating costs, royalties and taxation in Mali, at a gold price of US\$1 200 per ounce. Mining and processing supports gold production exceeding 50 000 ounces per annum over an eight-year mine life.

The low capital and operating costs of the project reflect the fact that the deposit is easily mined and that the process plant will be a relatively simple modular facility with only modest milling requirements. The total power requirements for the project are estimated at just 1,9 MW, to be supplied by diesel gensets.

Located 125 km south-west of Mali's capital, Bamako, Kobada – acquired by African Gold in 2005 from French company Cominor – has its permitting in place, with the environmental permit having been granted in June last year and the mining licence shortly thereafter in July. A community development plan (essential in Mali's permitting process) has also been completed.

The total measured and indicated mineral resource at Kobada contains 1,21 Moz of gold, with a further 1,02 Moz in the inferred category. The FS only considers the processing of oxide ore types. The proved and probable mineral reserve is estimated to be 12,7 Mt at 1,25 g/t containing 511 000 ounces of gold. The reserve was reported within the optimised pit design and above a cutoff grade of 0,53 g/t Au.

While the mineral reserve comprised only material from the M&I resource, there remains



African Gold's pilot plant at the Kobada site. It has a throughput capacity of up to 2 t/h and is specifically designed for metallurgical research.

an important opportunity to improve the resource category of the large inferred mineral resource immediately to the north and south of the reserve pits. African Gold plans to fund the development of this resource upgrade from the internal cash flow of a producing mine.

Contract mining is planned to be undertaken using 40-t dump trucks and 70-t excavators. This type of equipment is relatively common in Mali, which allows significant flexibility in scheduling the mining programme. The mining schedule aims to deliver 1,6 Mt/a of ore for processing. The saprolite to be mined is free digging although it is anticipated that minor use of blasting might be required for some parts of the overlying laterite cap.

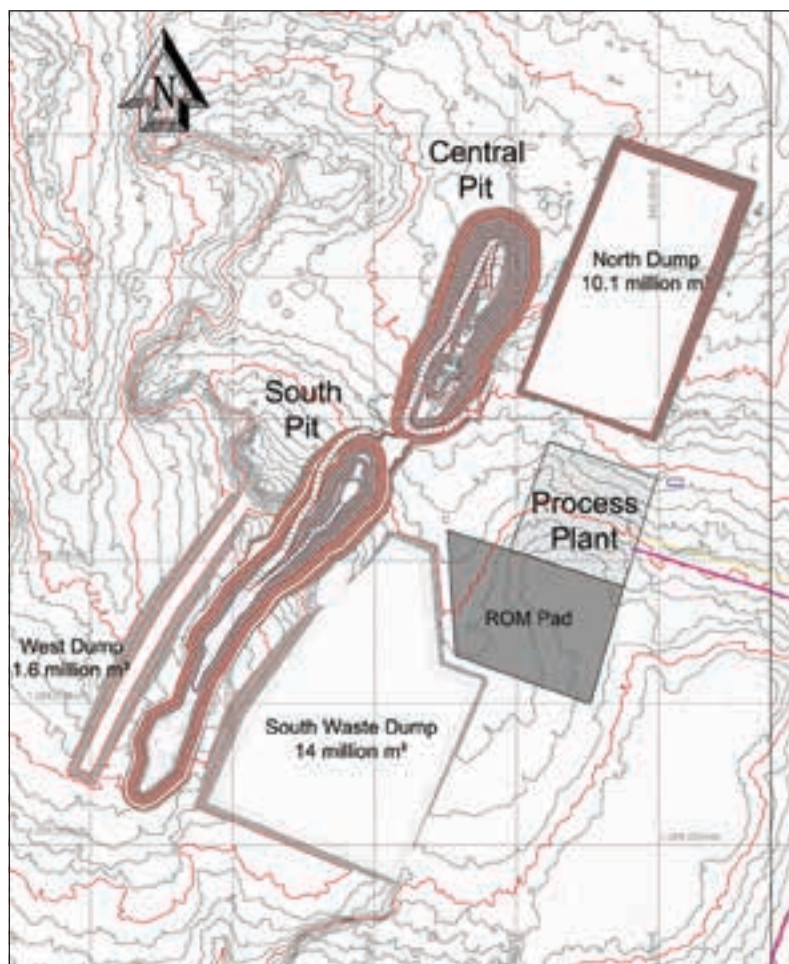
The life of mine strip ratio is estimated to be 3,28 to 1 (waste tonnes to ore tonnes). The strip ratio during the first two years is maintained at less than 2 to 1 with the mining of starter pits. The final cut back is then initiated, with the mining rate increasing to 11 Mt/a.

Further metallurgical test work was completed as part of the FS. A 305 kg sample of saprolite ore was obtained from 64 m below surface to examine the metallurgical response

project offers fast payback



of ore near the base of oxidation. The calculated recovery of gold for this sample was 80,1 %. While this is lower than the 2014 testwork programme, which recovered 89 % of contained gold, the 2014 sample was sourced from the top 20 m of the saprolite orebody. African Gold believes the difference between the two is likely



General layout of the proposed mine at Kobada.



A drill rig in action during a recent drill programme at Kobada for metallurgical and geotechnical testwork.



New accommodation modules serving the project.

Below right: *A trench through the orebody. Large laterite plateaus cover most of the area. The underlying saprolite is exposed below the plateau boundaries.*

Below: *Concrete block making on site has provided employment for members of local communities.*

indicative of the recovery response throughout the total depth of the saprolite orebody.

Independent test work completed since 2009 now totals 1,2 tonnes of saprolite ore over three separate samples by two different independent consultants. Each provides confirmation of the amenability of the orebody to physical separation and leaching techniques.

The process plant flow sheet includes a large scrubber (7,9 m long x 3 m diameter) to create ore slurry and remove larger rocks (+40 mm). Screening of the -40 mm from the scrubber separates the fine material (-1,18 mm) and directs the coarse ore to further crushing.

The -1,18 mm slurry is then passed to a bank of hydro-cyclones for the pre-concentration stage. This pre-concentration process rejects up to 70,5 % of the feed mass while recovering 94 % of the gold.

Pre-concentration is followed by gravity concentration consisting of InLine Pressure Jigs and Knelson centrifugal concentrators. The gravity circuit is planned to produce a concentrate representing 5 % of the feed to the jigs. The tailings from the pre-concentration and gravity concentration are pumped directly to the inert Tailings Storage Facility (TSF). This tailings material will have no chemical



addition and can be disposed of in an unlined impoundment.

The concentrates are then to be passed to the grinding circuit. This comprises a ball mill in closed circuit with cyclones to produce an 80 % passing 125 micron grind size. Cyanide is also added to the ball mill to increase leaching residence time. Grinding is followed by intense leach reactors with leaching occurring in a high oxygen environment for around 10 hours.

After leaching, the slurry density is increased in a thickener before the remaining leach solution is recovered from a belt filter. Pregnant solution will be fed directly to an AuRiX resin adsorption column to extract the gold from the solution and return the barren solution to the process. The solid residue from the belt filter will then be treated in an SO₂ and O₂ cyanide destruction circuit (detox) to reduce the tailings cyanide concentration to below the International Cyanide Management Code (ICMC) requirements. This residue will be stored as a dry tailing in a purpose-built lined facility that will be encapsulated within the waste rock dumps.

A resin stripping, electro-winning and gold smelting system are located in a secure gold room. The process plant has been designed to treat 1,6 Mt/a, with gold produced as doré bars ready for shipment to a refinery outside Mali. The process is expected to recover an average of 82 % of the gold contained in ore, and the test work indicated that a constant tailings

grade of 0,22 g/t Au can be expected. This means that a higher recovery may be achieved at higher process feed grade.

Process plant commissioning is planned to start in September 2017. Detailed design of the plant and ordering of longer lead time items is planned to commence in July 2016 in order to meet this commissioning target.

The payback period from commencement of capital expenditure in July 2016 is estimated to be 2,6 years, with the cumulative cash flow being positive from January 2019.

Mining costs are estimated to be US\$1,97 per tonne of material mined, but excluding capitalised waste stripping expenses of US\$21 million. Average mining costs over the life of mine are estimated at US\$2,35 per tonne mined, including these capitalised expenditures. The projected processing cost of US\$6,55 per tonne includes all materials handling associated with stockpile management and tailings storage.

The construction of an all-weather road and a permanent bridge over the Fié River will provide year round access to the local villages and provide reliable access to markets for local produce. Planning permission for the road upgrade has been granted.

The total directly employed workforce is estimated to be in excess of 180 employees and contractors, with camp facilities to house up to 100 staff and employees.

Photos courtesy of African Gold Group, Inc





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Construction kicks off at

Endeavour Mining, listed on the TSX, has announced that its 90 %-owned Houndé gold project in Burkina Faso has entered the construction phase of its development.

Houndé is expected to deliver an average production of 190 000 ounces per year over a 10-year mine life at an AISC of US\$709/oz, based on current reserves. The project is an open-pit mine with a 3,0 Mt/a gravity circuit/CIL plant. The initial capital cost is estimated at US\$328 million, inclusive of US\$47 million for the owner-mining fleet.

Houndé is located approximately 250 km or a three hour drive south-west of Ouagadougou, the capital city of Burkina Faso, and 25 km from a rail line which runs to Abidjan in Côte d'Ivoire. The property is within the Houndé greenstone belt and just south of Semafo's Mana mine.

During the past year, a thorough review and optimisation of the project was completed and an implementation plan established. The mining and ore processing schedules have remained unchanged since February 2015

while the operating and capital costs were fully scoped and optimised by Endeavour, with assistance from Lycopodium Minerals.

Following cost and business risk comparisons, the 'Owner Operator' option was selected over the 'Contractor Mining' approach. The fully scoped mining costs were revised upward mainly due to increased cost assumptions for ore re-handling, blasting and fixed cost re-allocation. All deposits are amenable to conventional open-pit mining methods and the pits are expected to reach depths of up to 175 m. The proposed mining fleet will have the capacity to move in excess of 35 Mt/a.

During the optimisation process both the Run of Mine (ROM) pad and the Tailings Storage Facility (TSF) were relocated to more favourable locations. Furthermore, the TSF was changed from basin to paddock style to optimise the usage of waste material and generate nearly US\$25 million in reclamation and closure cost savings.

The processing costs estimate decreased due to the positive impacts of (i) reagents use optimisation; (ii) power demand optimisations; and (iii) relocation of the TSF, which more than



Houndé

offset the power costs increasing from US\$0,15 to US\$0,18 per kWh.

Site General and Administrative (G&A) costs have decreased due to favorable exchange rate variations and re-allocation of fixed labour costs into mining costs.

The optimised and fully scoped upfront capital cost has been estimated at US\$328 million, inclusive of US\$47 million for the owner-mining fleet and US\$28 million for contingencies, which is in line with the 2015 estimate of US\$32 million.

The current upfront capital cost estimate is based on power supply from Sonabel, the national electricity utility, consisting of a 38 km, 91 kV overhead power line.

Project capital commitment in 2016 is expected to be approximately US\$180 million, with the remainder in 2017. Within the coming weeks, Endeavour expects to lock-in approximately 25 % of the total capital cost by placing firm orders for the SAG and ball mills, purchasing the mining fleet and paying land compensation and related taxes.

Replicating its successful construction partnership at other mines it has developed,



Endeavour has awarded the EPCM contract to Lycopodium Minerals, and detailed engineering is now commencing. Lycopodium has already had detailed involvement in the Houndé project, through the completion of the Detailed Feasibility Study and the recently completed optimisation reviews.

The overall duration of the project construction is estimated to be 18 months – with the first gold pour expected in the fourth quarter of

Above: Layout of the Houndé mine.

Left: Drilling at the Houndé site in Burkina Faso.

Houndé Project Highlights

Ownership	90 % Endeavour, 10 % Burkina Faso
Reserve and Resources	
P+P Reserves	31 Mt at 2,1 g/t Au for 2,1 Moz
M+I Resources (inclusive of reserves)	38 Mt at 2,1 g/t Au for 2,5 Moz
Inferred Resources	3 Mt at 2,6 g/t Au for 0,3 Moz
Mine type	Open pit
Mill type	Gravity/CIL plant
Production	
Mine life	10 years
Strip ratio, W:O	8,4
Processing rate	3,0 Mt/a
Average LOM Recovery rate	93 %
Total LOM gold production	1 906 koz
Average annual production	190 koz
Average LOM AISC	US\$709/oz

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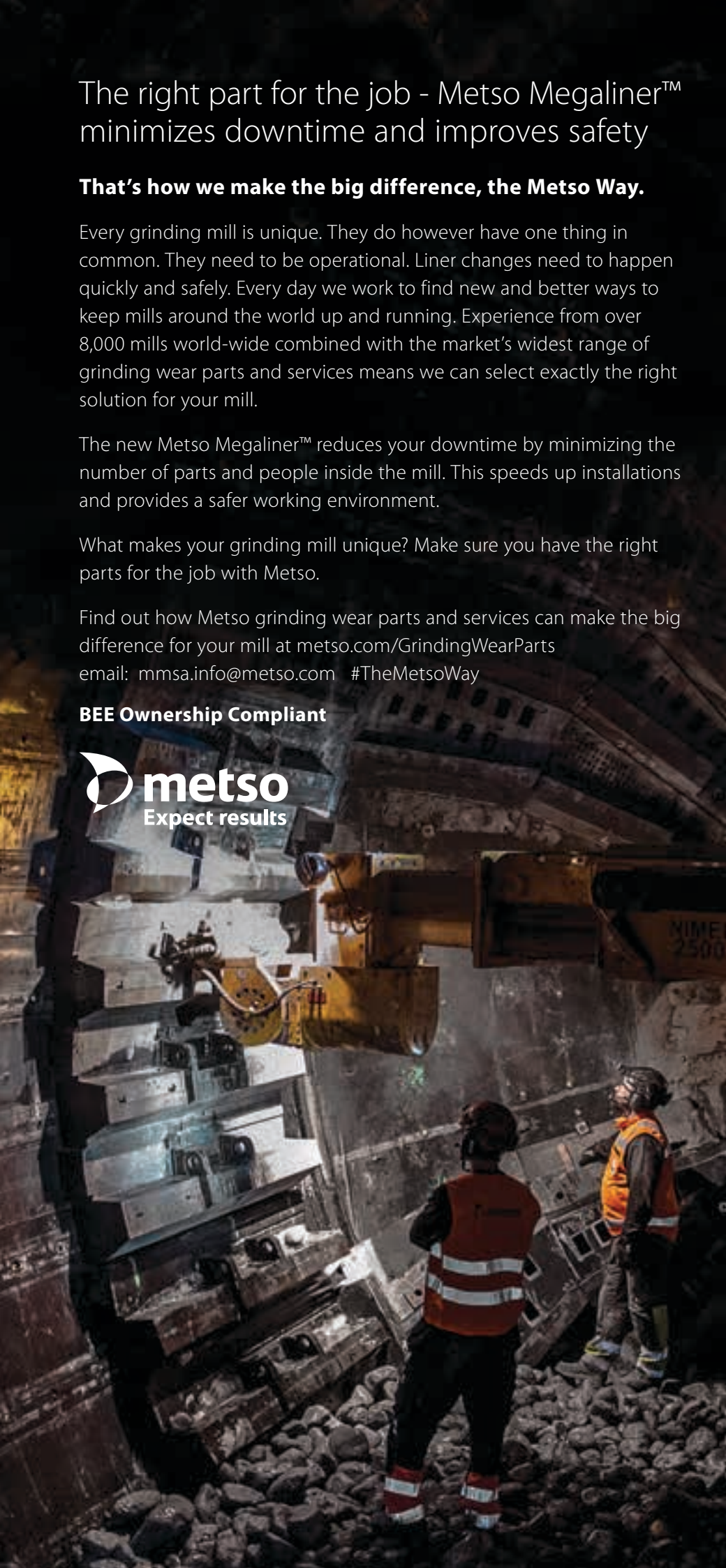
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2017. Endeavour plans to self-perform 72 % of the project build, while Lycopodium will focus primarily on the processing facility which is the remaining 28 % of the total capital commitment for the project. Endeavour's project management team will include approximately 90 personnel to perform all remaining construction tasks. Endeavour's team will also be responsible for all concrete work.

The Houndé project is expected to be funded from internal and existing sources of capital, as well as the planned mining equipment financing. In addition, the free cash flow generated during 2016 and 2017 from Endeavour's operating mines will – it is anticipated – increase total financing sources to above 1,5 times the total capital cost, representing in excess of 50 % financing headroom.

Endeavour's objective is to fund Houndé utilising its free cash flow generated over the construction period rather than accessing its Revolving Credit Facility (RCF). To support this funding approach it has put in place a short-term Gold Revenue Protection Strategy consisting of gold option contracts evenly spread over a 15-month period, to increase the certainty of its upcoming free cash flow. The gold option contracts have been structured to limit Endeavour's debt requirements even if the gold price drops to US\$1 000/oz.

Endeavour believes there is considerable potential to increase resources at Houndé. The Houndé exploration tenement covers over 1 075 km² within Burkina Faso's highly prospective Birimian belt. However, in light of the project's already robust economics, limited exploration has been done over the past years, aside from a short drilling campaign in 2014 which outlined the Bouéré and Dohoun deposits and resulted in a 34 % increase in mineral reserves to 2,1 million ounces.

Historically, exploration focused mainly on the Vindaloo trends; however, at least 15 significant targets located within 20 km of the planned mill have been identified by previous limited drilling campaigns. Most of these targets are untested and Endeavour expects to explore high grade targets of greater than 5 g/t as its priority.

The Houndé long-term exploration strategy is currently being integrated into Endeavour's ongoing exploration strategic review.

Endeavour already has four producing mines in the West African region – Tabakoto in Mali, Ity and Agbaou in Côte d'Ivoire and Nzema in Ghana. Houndé will be its first mine in Burkina Faso. The company is, however, in the process of acquiring True Gold Corp which

has just announced the first gold pour at its Karma mine, also located in Burkina Faso (see sidebar below).

Comments Neil Woodyer, CEO of Endeavour: "With the ramp-up of Karma soon underway, and our operations delivering a strong performance, we are now well positioned to build the Houndé project, which will further lift the overall quality of our portfolio. Once in production, it will become our flagship low-cost mine and will rank amongst West Africa's top tier cash generating mines. Furthermore, Houndé will benefit both from our construction track-record, demonstrated most recently at Agbaou, and our team's operating experience in Burkina Faso." ■

Karma project produces its first gold

Canada's True Gold Mining Inc, which is listed on the TSX-V, reports that it achieved first production at the Karma gold mine in Burkina Faso on April 11, 2016, a few weeks following the start of leaching of ore.

"This achievement is a direct result of the hard work and dedication of the management team and employees, Board of Directors, our suppliers and financing partners, as well as the strong support of the Government of Burkina Faso and local communities," commented Christian Milau, President & CEO of True Gold.

Karma has been designed as a shallow, low-cost, open-pit, 4 Mt/a heap-leach operation which will produce between 110 000 and 120 000 ounces of gold a year in years 1 to 5 at an all-in sustaining cost of approximately US\$700/oz. The material being mined is free digging with no blasting required.

On present reserves of 33,2 Mt at 0,89 g/t, Karma will have an eight-year mine life although this will likely be extended by about 2,5 years by mining of the North Kao deposit (which currently has an inferred resource). The mine is situated in the regionally east-west trending Goren greenstone belt, one of the larger Birimian greenstone belts in central north Burkina Faso. ■



True Gold executives at the first gold pour. They (from left): David Laing (COO), John Sampson, Cyriaque Ki, Scott Heffernan, and Christian Milau (CEO).

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“Fantastic achievement” at Asanko

Asanko Gold Inc, listed on the TSX and NYSE, has announced that commercial production has been declared at Phase 1 of the Asanko Gold Mine (AGM) in Ghana, effective April 1, 2016, a quarter ahead of schedule. Gold production will continue to ramp-up during Q2 2016 as the mining operations access the main orebody in the Nkran pit.

During March 2016, the plant processed 276 146 tonnes or 8 908 tonnes per day which is 111 % of design capacity. The Phase 1 project construction is now essentially complete, ahead of schedule and within budget, with all ancillary infrastructure, such as workshops and warehouses, installed and operational.

As at March 31, 2016, a total of 15 337 ounces of gold and 2 860 ounces of silver had been produced and shipped.

Commenting on the performance to date, Peter Breese, President and CEO, said: “The ramp-up to steady-state production levels is progressing well and reaching commercial production a full quarter ahead of our original

schedule is a fantastic achievement by our team. The milling circuit achieved design feed rates and target grind size within weeks of being commissioned. Since then, the milling rates have continued to improve as has gold recovery, both of which are exceeding design parameters by some margin.

“The stripping of waste at the Nkran pit continues to advance as the pit is being opened up to expose the main zones of mineralisation. 2016 will therefore be a year of two halves. The first half is focused on preparing the pit for continuous long life operations and steady-state production levels whilst the second half of 2016 will reflect the Definitive Project Plan (DPP) run rates and grade profile.” ■



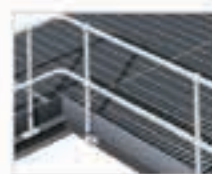
The Asanko processing plant showing the pre-leach thickener. Steady-state operations at Asanko are expected by the end of Q2 2016 (photo: Asanko Gold).

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Tenova TAKRAF Africa puts



Tenova TAKRAF Africa, which offers one of the widest ranges of technologies and engineering services for materials handling and air environmental control aimed at the mining sector, has consolidated its operations at its premises in Spartan, Johannesburg and believes that it is now in better shape than it has ever been to meet the demands of its customer base and cope with the challenges presented by the current depressed mining market. "Tenova TAKRAF Africa has been transformed into a highly focused company that has launched a number of initiatives to

aggressively target areas of the market where there is scope for growth," says Richard Späth, the company's GM, Engineered Technologies.

Richard Späth, Tenova TAKRAF's GM, Engineered Technologies.

Tenova TAKRAF Africa was responsible for the materials handling portion of Sasol Mining's Tweedraai expansion near Secunda.

The broad offering of Tenova TAKRAF Africa stems from the fact that it is an amalgam of the Bateman Engineered Technologies (BET) and TAKRAF brands, which were brought together under 'one roof' four years ago when Italian engineering group

Tenova, which had already absorbed Germany's TAKRAF in 2007, purchased Bateman Engineering, a South African company with roots going back to the 1920s. BET became part of the global Tenova TAKRAF business and was rebranded as Tenova TAKRAF Africa.

Says Späth: "We are no longer using the



Below: Tenova TAKRAF has developed a modular overland conveyor consisting of concrete modules that can be precast on site.



in place growth initiatives

‘Bateman’ name but we are the inheritor of all the technologies, expertise and track record that BET acquired or developed over the years, including those under the Delkor brand name. Add to this the fact that we also market the world-class materials handling technology of TAKRAF and you can see why our product and services offering is so strong – to the point where we have a complete ‘pit to port’ capability.”

The entire line-up of equipment is now organised into three broad product lines. These are bulk materials handling (which includes the TAKRAF technology); specialised equipment (which includes pipe and chain conveyors, Bradford breakers, coal granulators and the Delkor range of liquid/solid separation technologies); and an air environmental product range. The product lines are supported by Tenova TAKRAF Africa’s comprehensive client support services, which provide spares, after-market support and life extension services for equipment supplied by the company as well as by other OEMs.

The company’s new base in Spartan has been within the group for some years, accommodating its laboratory, its stores facility and its aftermarket business unit. “What’s changed now is that we’ve brought our management and capital sales business unit, which were

previously in a separate location, to Spartan and the move was made in February this year. The premises are modern and well equipped and can cope with any expansion we’re likely to see over the next several years.” Späth adds that having all the business units and management in a single location is making for a much more focused and efficient operation.

The stores facility is equipped with a computerised inventory system and it also boasts a 10-ton capacity overhead crane with a 29 m span. As for the laboratory, it is a sophisticated facility which can handle sample preparation and test work on behalf of clients. Through a partnership with Greentechnical, it can also undertake

The popular Bradford breaker is now available in a skid-mounted, semi-mobile version.





Tenova TAKRAF Africa has consolidated operations in these modern premises in Spartan.

material flow test work to determine the flow of solid material through chutes and into storage vessels.

Commenting on the current business environment, Späth says conditions are extremely tight but notes that Tenova TAKRAF Africa still has considerable forward momentum from ongoing projects, one of them being Eskom's Kusile Power Station. "Our work at Kusile comprises three separate materials handling work packages covering the terrace handling system, the stockyard handling system and the limestone handling facility," he states. "The scope of the three packages is considerable and includes 79 conveyors adding up to distance of more than 16 km, as well as the supply and installation of stackers, reclaimers and feeders."

Other current contracts include a boiler emissions abatement plant at Impala Platinum's Springs refinery – reportedly the first of its type in Africa – and also a load out station for a coal mine in Mozambique presently undergoing commissioning. This is the second installation of this type for the client and the order was secured on the basis of the excellent performance of the system supplied for the first phase of the project. Tenova TAKRAF Africa's rapid rail loading systems feature a flask-loading design and can load particulate material into moving trains at rates of up to 8 000 t/h.

A recently completed project of which Tenova TAKRAF Africa is particularly proud is the materials handling portion of Sasol Mining's Tweedraai expansion near Secunda.

This involved the design and installation (on an LSTK basis) of three conveyors totalling 3 km to convey coal at a rate of up to 4 800 t/h. The system comprises a 1 000 m long incline conveyor with a lift of 83 m, a 1 518 m overland conveyor with a lift of minus 9,3 m and a 434 m tripper conveyor with a lift of 30,3 m. The scope included the bulk earthworks and civils foundations for the conveyors, as well as the transfer towers and the E&I system.

Späth says that with the current dearth of large-scale mining projects, the demand for Tenova TAKRAF Africa's ultra-heavy materials handling equipment – bucket wheel excavators, for example, or ship loading and unloading systems – is limited. "This market will return but in the meantime we are putting additional focus on the junior mining market, where there is still a reasonable level of activity," he observes. "We have developed a number of solutions for the juniors and are also offering some attractive financing packages."

One development Späth points to is an ingenious modular overland conveyor consisting of concrete modules precast at the project site and fitted with idler frames and brackets. The system – which reduces on-site work by as much as 80 % and is also relocatable – is easily and quickly installed after the conveyor line has been surveyed, with only a prepared terrace required and no concrete footings. "The beauty of the system is not only its cost effectiveness but also the fact that it can maximise local community involvement – which is

always important in Africa,” says Späth. “The concrete segments can be produced on site in a small precast plant, thus opening up employment opportunities and, in addition, delivering savings on transport costs.”

Also ideal for the junior market is one of Tenova TAKRAF Africa’s ‘signature’ products, the well-established Bradford breaker which has been enduringly popular since first being introduced to the South African mining industry in the 1980s and which falls under its specialised handling and comminution equipment product line.

“We manufacture the Bradford breaker under licence to Terrasource Global in the US but in truth it is almost an entirely South African-designed machine as we have adapted it over the years to suit the particular characteristics of South African coal – which differ quite substantially from those of typical American coals,” says Späth. “The most recent development is a semi-mobile, skid-mounted version which is particularly aimed at those miners who are exploiting small coal resources and who need a machine that is economically priced and which can be moved from one block or resource to another.”

Turning to the air environmental product line, Späth says demand for this equipment remains buoyant, reflecting in part the more stringent air quality regulations which have recently come into force in South Africa. “The demand is coming not just from the mining sector but also general industry,” he notes. “We are well placed to meet this demand as we are able to offer the broadest range of air environmental products in the country – and can point to more than 2 700 air pollution control solutions supplied over the past 40 years by Tenova TAKRAF Africa and its predecessor, BET, across the Southern African region.”

Examples of Tenova TAKRAF Africa’s capability in this field are recent orders from Petra Diamonds for its Finsch and Koffiefontein mines, both in the Northern Cape. Placed in July last year, the orders comprise the replacement of a Tenova dynamic scrubber at Koffiefontein and the installation of a new, upgraded system at Finsch. The original dynamic scrubber systems at these mines were installed decades ago by BET, with the system at Koffiefontein dating back to the late 1970s. The systems, with capacities of 15 to 20 m³/s, are installed at the transfer points of the kimberlite materials handling systems at the two mines.

Tenova TAKRAF Africa’s dynamic scrubbers are simple to operate and enable low dust emissions to be achieved with relatively low



capital and operational costs. They are used for general dust collection of medium to heavy dust loads with an efficiency of 99 % for particles in the 1 to 2 micron range. The smallest dynamic scrubber can handle 0,2 m³/s while twin arrangements of the largest scrubber handle up to 65 m³/s.

The company has recently extended its air environmental range by acquiring the local distributorship for US company Dust Solutions Inc (DSI), which manufactures dust suppression systems. These include dry fog agglomerative dust suppression systems, which use ultrasonic, air atomising nozzles, compressed air and plain water to produce a dry fog that agglomerates to airborne dust particles.

“This is a relatively new distributorship for us but we see huge scope for the DSI technology in mining and quarrying,” says Späth. “The systems are ideal for transfer points, crushing and screening plants, truck tips and indeed anywhere where dust is being generated. The technology offers the driest form of dust suppression available, which is big plus in a relatively water scarce country such as South Africa, and – as further benefit – does not involve the use of chemicals.”

Looking ahead at the outlook for Tenova TAKRAF Africa, Späth says the company is well placed to take advantage of the upturn when it comes. “All the branding and organisational issues which inevitably stem from mergers such as the one between BET and TAKRAF are now behind us. We are already performing strongly relative to market conditions and see exciting growth ahead as we continue building on the nearly 100-year history we have in South Africa of meeting the needs of industry in general and the mining sector in particular.” ■

The laboratory is a sophisticated facility which can handle sample preparation and testwork on behalf of clients.

Tenova TAKRAF Africa’s dynamic scrubbers are simple to operate and enable low dust emissions to be achieved with relatively low capital and operational costs

Stemming trucks from Scania can cut open-pit mining costs



Becky Smith, Scania South Africa's GM Mining.

A completed Scania stemming truck ready for delivery.



A crucial part of the open-pit mining cycle is the blasting process and any equipment that can make this activity more efficient is highly prized by the mining industry. Stemming trucks are one class of product that can contribute to making blasting procedures faster and more efficient and Scania South Africa can now offer customers what it believes is one of the most efficient trucks of this type on the market. The stemming truck forms part of Scania's extensive range of mining trucks.

Stemming is a key element in the 'drill and blast' mining technique. In stemming, material such as fine gravel or aggregate is placed on top of explosives in drill holes. When the explosives are detonated, the stemming locks in the expanding gases and keeps the forces in the borehole until rock begins to break.

The stemming truck's duties are to fill blast holes on a mine site into which the liquid mixture of ammonium nitrate and fuel oil explosive charges has already been inserted. The holes are typically located at 5 m intervals in the area to be broken up.

The stemming trucks available from Scania South Africa are the result of a partnership it has with Cobra Petro Projects. An initial truck

was manufactured and introduced to the South African market two years ago. One of South Africa's most well established mining groups saw it and arranged a demonstration review. The truck impressed the company to the extent that it purchased the demo model. Within a few months two other units were purchased. The units are manufactured under licence to Ausroad, an Australian company which originally developed them for a mining client in Western Australia.

According to Becky Smith, Scania South Africa's GM Mining, it is not uncommon in the South African mining industry to see the stemming function being performed by front-end loaders, which she says is not only inefficient but also tends to give inconsistent blasting results. In addition, backfill material either consists of aggregate that needs to be transported to the blast site or of the rock displaced through the drilling of the blast hole. This means that the material is not graded and specific to the requirements of the blast – which affects efficiency.

"This new stemming truck technology makes it easy to ensure that the correct amount of precisely sized aggregate is delivered into the blast holes in an efficient manner," Smith says.

Benefits of using the stemming truck include operational safety (one truck and operator) versus several smaller vehicles; being able to access hard-to-reach blast areas with an 8 m boom conveyor (170 degrees); and significantly decreasing the



A 3 400 litre water tanker feeds the dust suppression system comprising water jets around the aggregate spouts, plus a pair of powerful jets located at the rear.

time between charge and blast to an almost negligible period. The stemming unit, in combination with Scania's extra heavy vehicle chassis, is built for the toughest mining conditions.

Aggregate flow control and rear boom manoeuvring can be carried out through a joystick mounted in the cab or via a wireless remote control from outside the vehicle. A neatly integrated control screen fitted into the dash allows the operator to keep a close eye on the amount of aggregate delivered or that remaining in the hopper, and another notes the vehicle's gross vehicle mass.

The trucks are available in two configurations – with either a 13 m³ hopper or a 16 m³ hopper. Elements of the unit as well as the interior of the cab can be customised to meet client requirements. As the trucks are assembled locally, clients benefit from local support teams and spare parts availability.

Scania and Cobra Petro Projects are proving that the incorporation of such game-changing stemming truck technology guarantees increased blasting efficiencies across the open-cast mining sector in Southern Africa which can in turn increase production – ultimately resulting in higher profit margins in an increasingly challenging mining environment.

Scania South Africa was established in 1995 as a wholly owned subsidiary of Scania CV AB in Sweden. It initially assembled vehicles in Elandsfontein but – following increased demand – opened a new purpose-built plant in 2003 alongside the head office complex in Aeroton. The South African assembly plant is Scania's largest knocked-down kit assembly operation outside Brazil and is seen as a model for all future facilities of this type within the worldwide Scania organisation. ■



The trucks are manufactured to stringent standards.



All trucks are fitted with an 8 m boom conveyor.

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Open-pit mining starts at Lerala

ASX-listed Kimberley Diamonds Ltd (KDL) reports that open-pit mining operations have begun at its Lerala diamond mine in Botswana. Assuming that recommissioning of the process plant proceeds as planned, the first production and recovery of diamonds is expected this month (April) and the first diamond sales in June 2016.

As announced by KDL in February this year, the mining contract for Lerala was awarded to Basil Read Mining Botswana following a competitive tender process.

Basil Read mobilised staff and equipment to site during the months of February and March. Mining then commenced early in April from the K3 kimberlite pipe and operations will continue to develop a buffer stockpile of fresh kimberlite ore. Mining will then ramp up in line with the current production schedule to provide a consistent feed to the processing plant once processing commences.

The Basil Read fleet of equipment includes a Komatsu PC850 hydraulic excavator, a Komatsu D155 tracked bulldozer, Komatsu HD465-7 haul trucks, a Komatsu WA430 front end loader and an Atlas Copco T45 drill rig, as well as a fleet of service/support vehicles and equipment.

KDL says that plant construction activities at Lerala continue to progress well despite recent delays experienced due to higher than usual rainfall being experienced at site.

The primary scrubber, secondary crusher, 400-tonne DMS storage bin and the new recovery module are all

structurally complete, with electrical and instrumentation work well advanced. Construction of the tailings dam extension commenced in March 2016 and is progressing on schedule to accept tailings this month (April). In addition, construction of the new dry tailings conveyor system was started in March 2016.

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

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

KDL acquired the project in early 2014 and has since been busy upgrading Lerala at a total cost of A\$14 million, with the plant modifications accounting for A\$9,4 million of this figure. ■



Basil Read Mining machines in action at Lerala (photo: Kimberley Diamonds).



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World's biggest electronic detonator blast at coal mine



Block with 5 665 detonators in 2 683 blastholes ready for blasting using the AXXIS™ digital detonation system.

Daunia open-cut coal mine in the north-eastern state of Queensland, Australia, has broken the world record for the largest electronic detonator blast ever – firing 5 665 detonators in 2 683 blastholes using the AXXIS™ digital detonation system from BME.

The mine had last year set a previous record for the largest AXXIS™-controlled blast to date when it successfully initiated 4 303 detonators in a single blast to break 2,8 million cubic metres of overburden.

Situated in Australia's largest coalfield – the Bowen Basin – Daunia has taken advantage of the benefits of electronic detonation to conduct larger blasts; this generates greater operational efficiencies by reducing the number of mine stoppages that must take place every time blasting is conducted.

The mine also chose this technology in response to its faulted ground conditions. If not well controlled, faults tend to slide

over each other during a blast; when using non-electric detonators, there is a possibility of the product being snapped by this movement of ground before it can be detonated, resulting in a misfire.

"These misfires are eliminated with electronics, as the detonator operates as a stand-alone entity the instant you push the 'fire' button," said Trevor Grant, MD of the Australia-based blasting optimisation company Advanced Initiating Systems (AIS).

The latest record blast was prepared and carried out by Daunia staff using a single initiation point and one master control box. The blasting team was initially trained and certified by AIS, who are supplied by leading explosives firm BME; both companies are subsidiaries of diversified agricultural, mining and chemicals group Omnia Holdings, which is listed on the JSE.

"The use of the AXXIS system and electronic detonators allowed the mine

to better control and manage the shock waves and rock movement arising from the faulty ground conditions," said Grant. "The size and success of the blast demonstrates both the ease of use and the confidence that the client has in the system. Very few, if any, other electronic detonator suppliers empower clients to conduct blasts of this magnitude and complexity on their own."

The AXXIS™ electronic delay detonators feature very high accuracy, as well as timing flexibility between detonations. The average depth of each hole in the blast was 19 m, and the explosive was initiated from both top and bottom.

"The improved control of the blast helps keep vibration levels down," said BME Technical Director Tony Rorke. "This in turn improves safety in the opencast mining environment, as high vibration levels can undermine the integrity of the pit wall."

BME, tel (+27 11) 709-8765

Latest version of Micromine will have "something for everyone"

MICROMINE is set to release the latest version of its leading exploration and 3D mine design solution, Micromine 2016, to clients and industry at a launch event in May at the QV1 Function Centre in Perth, Western Australia.

Micromine 2016 is the 16th version of the application, which enables users to capture, manage and interpret critical data, and is relevant to all stages of the mineral extraction process.

Micromine provides explorers with an in-depth understanding of their project so they can target prospective regions more effectively, increasing the chance of a project's success. It gives miners easy-to-use modelling, estimation, planning and design tools to simplify day-to-day production tasks.

Commenting on the upcoming release,

MICROMINE's Technical Product Manager, Frank Bilki, said, "After nearly two years of continuous development and many hundreds of individual changes, we're close to finalising Micromine 2016.

"This year's release has something for everyone. Many of the updates are Core features that benefit every user, not just those with extra modules. They include simple timesavers like being able to drop any supported file into Micromine from an outside location, and a Project Explorer pane that provides direct access to all of the files in a project."

Other Core enhancements include:

- ❑ 3D PDF output, which produces PDFs where users can interactively show and hide layers, and rotate, pan and zoom the display.

- ❑ Dynamic field expressions that let users write 'equations' wherever they would select an input field, together with an expression-based calculator that takes full advantage of this enhancement.
- ❑ Quick-find options for locating drillholes and wireframes (triangulations) within a mass of data.
- ❑ Maximum Intensity Projection for the Vizex Point layer for visualising trends in huge point clouds.

Explorers benefit from a suite of flexible new drillhole planning tools that include options for designing straight or curved holes from the bottom up or the top down. As an added timesaver, customers working in a mature area can easily use an existing hole as a template for a planned hole.

MICROMINE, website: www.micromine.com

Pipe launders make their way to chrome

Multotec's pipe launders are well known in the mineral sands and iron-ore mining industries. According to the company, the polyvinyl chloride pipe launders have proved their worth in these arduous applications for many years, significantly outperforming their steel rubber-lined counterparts. Now, chrome producers are taking note of their benefits.

This includes Northam Chrome Producers, the first chrome miner to put Multotec's pipe launders to the test, and Multotec's Graeme Smith reports that the company will be supplying an additional 400 running metres to another undisclosed chrome producer shortly.

The pipe launders were supplied as part of a spiral retrofit project at Northam Chrome Producers' recovery plant. A total of 72 of Multotec's HX5 and HX3 spirals were designed, manufactured and installed, boosting the plant's recoveries by as much as 6%.

The plant was using conventional steel

rubber-lined pipe launders that had been designed initially for the previous installed spirals and were also due for replacement.

Smith says that Multotec's Technology Division discussed the many advantages offered by its pipe launders with the plant's management team. "We detailed the proposed layout of the launder solutions, and the team really liked our idea of ensuring a more durable and tidier installation that would also be safer and easier to maintain over time," says Smith.

One of the biggest benefits offered by the company's pipe launders is their durability. Smith says some of the company's installations in the mineral sands production environment have lasted for up to nine years in highly corrosive coastal environments. What is more, they are easy to maintain. Their design incorporates a replaceable polyurethane boot inside the pipe that endures wear, as opposed to the inside of the pipe.

Manufactured from a much lighter



The cleaner concentrate and tail pipe launder arrangement, together with Multotec distributors.

material than steel and having a smaller outside diameter, the Multotec pipe launders are easier to handle and can be installed by two men without the need for any lifting or hanging equipment. The launder pipes supplied to Northam Chrome Producers have outside diameters of 200 mm, 255 mm and 400 mm.

Every pipe launder, which is installed from the collection point leading down to the sump, had to be specially designed and manufactured to fit into the existing footprint of the plant.

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

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Cat 6015B has most powerful engine in its class



The newly launched Cat 6015B in action.

The worldwide introduction of the Cat 6015B sets a new research and development (R&D) milestone for Caterpillar as it targets strong gains in the highly competitive 100-tonne plus hydraulic mining shovel (HMS) class.

Significantly, the Cat 6015B marks the transition point between Caterpillar's largest 'construction' class hydraulic excavator, the Cat 390F L (with its approximately 86 275 kg operating weight), and the 140 000-tonne 6015B backhoe, which is the new entry level unit for the current Cat HMS range. A comparison of their respective payload capabilities provides a clear distinction in terms of their downstream roles: 9,6 tonnes for the Cat 390F L and 14,6 tonnes for the Cat 6015B.

"The 6015B backhoe is the next benchmark in terms of ergonomics and performance, with the most power-

ful engine in its class (606 kW) plus one of the largest standard Heavy Duty bucket offerings (8,1 m³)," explains Wouter Kraan, Senior Product Manager: Mining Shovels at Cat dealer Barloworld Equipment, pointing out key features.

This class winning combination results in a one-pass-better match per cycle advantage with Cat 773, 775, and 777 sized rigid off-highway mining trucks over leading competitors with equivalent sized

load and haul combinations. When consistently achieved, the result is more material moved and greater profit. All 6015B structures have been fully tested and validated at Caterpillar's proving ground in Tucson, Arizona.

The 6015B comes to market with two engine options for 'lesser regulated emissions' standard countries, namely a Cat C27 ACERT Tier I or Tier II power plant. (The Cat 6015B is also the only EPA Tier 4 Final compliant machine in its class, meeting legislative requirements in Canada and the US.)

The previous generation Cat 6015FS (Face Shovel) model will continue to be sold in diesel configuration for a limited period. However, the backhoe derivative remains by far the most popular customer choice for the Southern African region.

On the Cat 6015B, lower ownership

costs are driven through proprietary integrated Cat engine control technologies (for efficient fuel burn and power distribution), closed-loop swing and boom float valves and a new hydraulic filtration system. A separate kidney loop ensures continuous filtration and optimum oil cleanliness at all times, minimising the risk of progressive hydraulic power losses due to contamination.

Commonality of components forms a key part of Caterpillar's R&D strategy from life cycle costing and maintenance perspectives. On the Cat 6015B, for example, these components include Cat D11 track links (with Positive Pin Retention).

Further efficiencies are achieved with Cat C70 hammerless GET designed specifically for the Cat 6015B. "In designing this GET system, Caterpillar took a production rather than a component focus to optimise performance across the entire machine," Kraan says.

This is also a safe machine. The Cat 6015B provides updated egress and walkways for safe movement, improved wire and hose guarding for safe maintenance, numerous and optimally positioned lights, mirrors, and E(emergency)-stop buttons, and an optional 45 degree powered access stairway for easy boarding and egress.

The unit comes standard with connectivity to on-board Cat Connect technologies like MineStar™, VIMS™ (Vital Information Management System), and Product Link™.

First shipment orders of the new Cat 6015B will start leaving Caterpillar's manufacturing facilities for worldwide delivery from March 2016.

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Shaw Controls customises E-House for Zibulo

Custom built E-Houses are said to offer a rapid and far more cost effective alternative to the building of brick and mortar substations, and this is especially true in an underground application. This is one of the reasons why Zibulo Colliery contracted Shaw Controls, a division of Zest WEG Manufacturing, to design and manufacture an E-House for its operation in the Mpumalanga coalfields.

Containerised electrical control installations in underground applications are not new. Bevan Richards, COO of Shaw Controls, says the concept was first used during the sinking of many of South Africa's gold mining vertical shafts when ISO marine containers were equipped with mimic panels and other ancillary equipment.

"However, the evolution and development of pre-manufactured electrical substations or E-Houses has opened up numerous possibilities including the ability to completely customise the unit according to process and plant requirements," Richards explains.

Specifically designed for this underground application in a coal mine, the E-House was designed with several specific parameters taking precedence. Underground height restrictions meant that the structure itself had to be lower than usual but would still need to accommodate all necessary electrical infrastructure and allow for sufficient headroom for cooling.

Richards says it is testimony to Shaw Controls' mechanical design capability that its engineers were able to design such a low profile steel structure that could house all the equipment and still maintain the requisite internal clearances. He says that extensive use was made of Solid Works CAD software during the design process and this ensured the integrity of the design. The final E-House dimensions are a height of 2,3 m, a length of 8,5 m and a width of 3,5 m.

Another important criterion that had to be met was the voltage being used on the mine. The majority of mines use 525 V but at Zibulo Colliery the voltage being used is 1 000 V. This required special design work on both the Motor Control Centre (MCC) and the Variable Speed Drive (VSD) to ensure safe operation at this voltage.

Operation in a coal mining application brings with it additional specifications and these were met by equipping the E-House with a fire detection and suppression system.

The E-House is the prime power centre

for an underground trunk belt conveyor which is driven by three 400 kW WEG 1 000 V motors. The conveyor belt has been designed to transport 4 800 t/h.

The complete E-House including the base, cladding (side walls and roof) and all internal electrical equipment was designed and manufactured by Shaw Controls at its modern comprehensively equipped facility in Johannesburg.

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



Designed by Shaw Controls for underground application in a coal mine, the E-House was designed with several specific parameters taking precedence.

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Inertial spin filters combat dust build-up

The mining environment faces constant challenges from heavy dust loads generated by the mining process. An effective and practical solution to these challenges can be found in inertial spin filters – technology which is attracting increasing interest in the mining industry, according to Ian Fraser, MD of RTS Africa Engineering.

“More and more, RTS inertial spin filters are being accepted as an effective solution to dust build-up in underground

mining operations, particularly in control panel and VSD back channel cooling applications. Dust can be a major problem in mining, notably in working spaces and control rooms – spin filters offer a number of advantages, the most compelling being that they require virtually no maintenance,” says Fraser.

While the concept of spin filters is not new, RTS Africa Engineering says it has been at the forefront of introducing this technology to South African industry,



RTS Africa Engineering supplies inertial spin filters for the variable speed drive (VSD) panels typically used in large-scale mining projects such as the one pictured.

with a focus on the mining sector.

“Spin filter technology is enjoying increasing acceptance as users in the mining sector start to reap the benefits which include simple installation, free (or extremely low) maintenance, high efficiency and a long service life of between 10 and 20 years,” Fraser comments.

The problem with conventional filtration systems, according to Fraser, is that they tend to require costly maintenance.

“Spin filter units are a high-efficiency application of cyclone technology,” Fraser explains. “Through the process of ventilation, air is drawn into the spin wall by a fan. This air, which is dust laden, passes through the spin wall, where the dust is removed by inertial forces, and then vented back into the space where it came from.”

This process is especially effective where workers are confined to closed spaces, such as workshops or control rooms. “Clean, dust-free air can be fed into the space by using spin filters, which will remove 98 % of all dust particles 15 µm and larger, and 80 % of dust from 5 µm upwards in size,” says Fraser.

When it comes to removing very fine breathable dust – 1 to 2 µm in size – spin filters offer an effective solution through the use of a primary filter, as well as a secondary filter, Fraser explains.

“The main problem faced by ventilation engineers is to contrive a filtration system which will remove the very fine dust while at the same time not becoming blinded by larger particles, which represent by far the greatest mass. This would mean a continuous replacement of the filter media. The solution is to use RTS Africa’s inertial spin filters as primary filters to continuously remove the heavy dust particles, thus preventing the fine filters from becoming rapidly overloaded. The fine secondary filters will, as a result, require vastly less attention and replacement.”

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Johnson completes two heavy lifts at Kolomela

Working with two customers on the same project site and on the same massive piece of machinery enabled both companies to achieve significant savings in both time and cost. This is according to Johnson Crane Hire, which was contracted to undertake heavy lifts for both Tenova and EMC Engineering at Kolomela mine in the Northern Cape.

These heavy lifts involved a counterweight boom exchange and a bucket wheel exchange on a stacker reclaimer at the mine. The lifts for the boom exchange were undertaken for Tenova while EMC Engineering handled the bucket wheel exchange.

Brandon Grange, Heavy Lift Technical Manager at Johnson Crane Hire, says that careful planning ensured that the project timeline flowed as intended. "This attention to detail during the planning phase allowed us the flexibility to select a solution which would meet both customers' needs and still meet the stringent safety requirements in the mining sector."

Interestingly the lift of the counterweight boom was a repeat process as this lift had previously been done by Johnson Crane Hire for EMC Engineering. Grange says the only difference was that the newly engineered counterweight boom was stronger, and therefore heavier, leading to the use of a larger crane for this particular lift.

The scope of the heavy lift for Tenova

comprised the removal of the counterweight itself and, following this, the removal of the previous counterweight boom. The new counterweight boom was then lifted into position and the counterweight placed back into its original position on the stacker reclaimer.

A Liebherr LR 1600 crawler crane was used to remove the counterweight from the stacker reclaimer. The counterweight is made up of eighteen 10-ton concrete weights. This lift was accomplished by removing two 10-ton weights at a time and was done in nine separate lifts.

The new counterweight boom was positioned at the most appropriate and ideal lifting radius for the task at hand, and once the old boom had been lifted off it was laid down alongside the new boom. The new boom, weighing in at 108 tons, was lifted into position using the same LR 1600 crane and then secured by the EMC Engineering team.

The final lift was to reposition the counterweight and this was achieved by lifting one 10-ton block of the counterweight on each lift. This was done using Johnson Crane Hire's LTM 1300-1.

At the same time, Johnson Crane Hire undertook the second lift which was the bucket wheel exchange for




Placement of the old counterweight boom structure.



EMC Engineering. The old bucket wheel, weighing 30 tons, was removed using a LTM 1300-1 crane and a LTM 1095-5.1 crane. Once it had been lifted off the boom, a second crane – an LTM 1095-5.1 – was used to tail the large component until it was laid down safely.

Both heavy lift projects were successfully completed over an 11-day period.

Peter Yaman, Johnson Crane Hire, tel (+27 11) 455-9242




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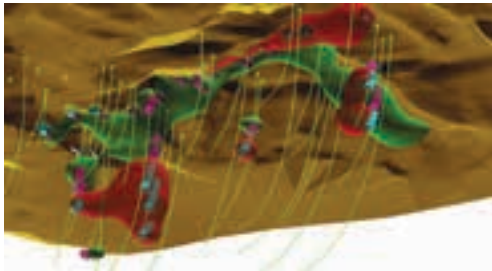


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Vulcan 10 incorporates new Workbench platform

New and enhanced tools in Vulcan 10 will value-add to technical data across critical modelling, design and planning processes. Highlights of the software release include a new automated pit designer, variogram analysis, implicit modelling and grade control.

Vulcan 10 is said to herald a new era in



Vulcan 10 implicit modelling includes a new radial basis function for defining domains with shared or independent structural trends while accurately honouring drillhole data.

user experience with the introduction of the Maptek Workbench as an integrated platform for development and delivery of products and services.

“The Workbench defines our future as a global mining technology leader,” said Maptek CEO Peter Johnson at the software launch.

“Designing a new platform presents a host of challenges that need to be considered,” he added. “One of the issues Maptek faced was resolving how mature products interact with new products and ensure an auditable data flow across mine processes.

“When it comes down to it, the important thing about software design is how it relates to the user. This is especially true in critical value markets like mining. It’s not enough to just develop a new application – it must improve the workflow and

respond to practical concerns of the user base and business conditions.”

The new approach to variogram analysis is a good example. Fourteen menu items have been streamlined into a sophisticated tool that provides new methods for handling structural and grade based anisotropy. Resource geologists have access to alternative methods to evaluate data, displaying multiple models concurrently for real-time, side-by-side comparisons.

A new splitting solids tool applies current Vulcan multi-boolean capability to generate valid mining blocks for scheduling. Created solids can be clipped to a new topography as new data becomes available, delivering noticeable improvement in workflows for mid-term scheduling. This is complemented by another option that interactively cuts bench polygons, with target tonnage reserved against a block model as cutting proceeds.

Sophisticated modelling techniques are supported by advanced visualisation regimes for communicating alternative scenarios. Users can work with regular block models containing billions of blocks in Vulcan 10.

The new automated pit designer for creating mineable pit shells improves efficiency for engineering tasks.

Vulcan 10 implicit modelling includes a new radial basis function for defining domains with shared or independent structural trends while accurately honouring drillhole data. Uncertainty modelling allows multiple orebodies to be automatically generated from drillhole datasets. Incorporating financial information enables quick assessment of mining viability for different scenarios.

Maptek, website www.maptek.com

Poly-Met grates perform at El Teniente copper mine

Metso has recognised Codelco El Teniente as the first mining company in the world to use its innovative grinding technology – the next level of Poly-Met discharge grates for SAG mills.

In 2010 Codelco El Teniente’s problems with grate piece breakage in their SAG mill resulted in low mill availability and operational instability. Codelco El Teniente worked in close cooperation with Metso to solve the problem. As a result, the next level of Poly-Met discharge grates was taken into use in a SAG mill for the first time. According to Metso, this innovative technology improves the copper production process by increasing the throughput and pebble production while also decreasing wear rate.

The results have been impressive. In 2015 Codelco El Teniente achieved record

commercial production of over 71 000 tons of fine copper at one of the industry’s lowest cost levels. An increase in slot size and operational stability has increased throughput by 7 %. Pebble production increased by 24 % during the first 50 days of operation, while the wear rate decreased from 0,26 mm/day to 0,11 mm/day. Mill availability has increased thanks to the elimination of pinning and breakage

The Poly-Met discharge grates are made of metal and rubber, which means less weight and greater elasticity. The composite material was identified as the best solution for this type of application after a series of trials with El Teniente between 2012 and 2014.

Metso is planning a global launch of Poly-Met grates in the later part of 2016.

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Pilot Crushtec seals agreement with Metso

Pilot Crushtec International has been appointed as the sole Southern Africa distributor for Metso's aggregates products and services.

The joint agreement, which came into effect on 2 April 2016, is recognised by both parties as the basis for an operational business model that will drive the marketing of Metso's comprehensive range of rock processing equipment by a distributor with an industry reputation for service excellence and technical support.

Adrian Wood, Head of Global Distribution, Aggregates at Metso described the announcement as "a really exciting development. Service is a vitally important aspect of our business and Pilot Crushtec International's recognised strength in this discipline will be of significant benefit to our customers."

Pilot Crushtec International CEO Sandro Scherf explains that the association with Metso offers a wealth of opportunities to both partners as well as improving its product offering to customers operating Modular plants.

"We will be marketing all aggregate producing products within the Metso range including static, tracked and wheeled, crushers, scalpers and screens. An added benefit, which will certainly appeal to our Pilot Modular customers, is that Metso static crushers and screens will in future be specified as original equipment for this semi-mobile range of products," he says.

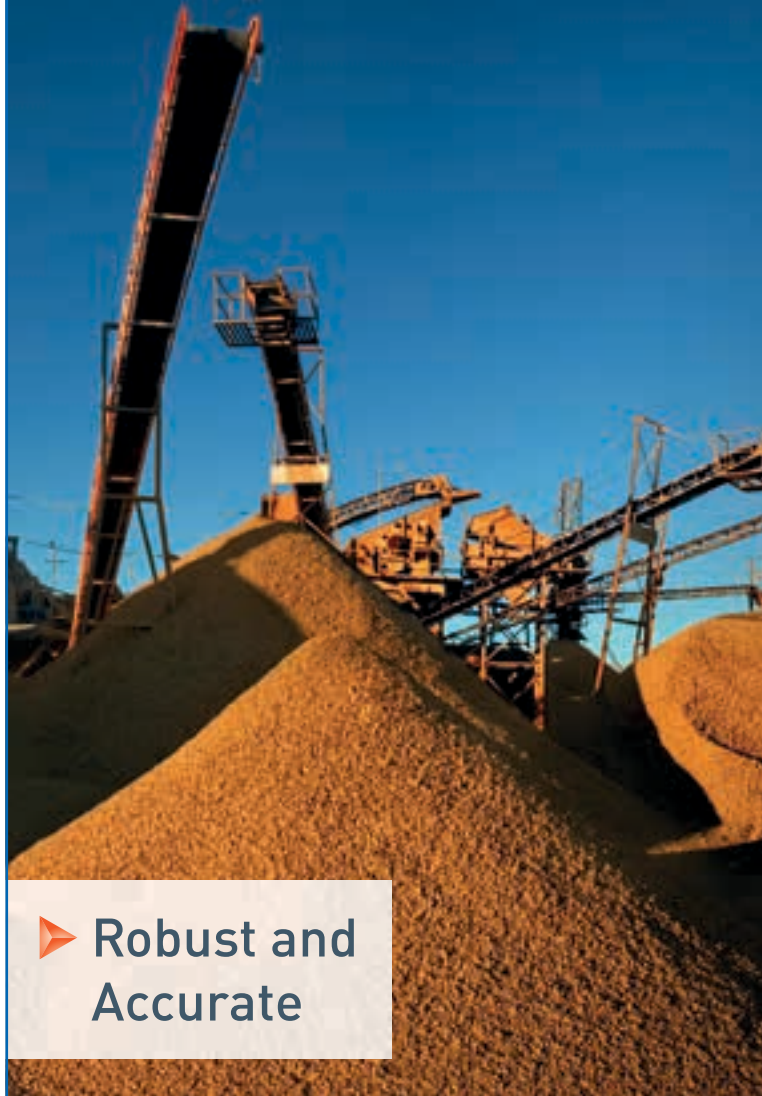
"We have direct factory support from Metso in Finland which includes one of their senior technical specialists being in residence here for a significant part of the year. In addition, we have the immediate benefit derived from Metso South Africa's service hub which is also based in Jet Park."

Scherf adds that Pilot Crushtec International has already committed itself to a sizeable inventory investment in terms of finished products and spare parts and has already addressed matters related to after sales service. The company has already taken on board no fewer than 11 of Barloworld's sales and support team, which means that from an after sales care perspective the operation will be up and running from day one.

Pilot Crushtec International, tel (+27 11) 842-5600



Seen here at the signing of the joint agreement are (left to right): Eric Maricot, VP Southern Africa Sales, Metso; Adrian Wood, Head of Distribution, AGG Business Line, Metso; Jarkko Leppänen, Distribution Business Manager (Southern Africa), Metso; Sandro Scherf, CEO, Pilot Crushtec; and Eric Bonin, General Manager, AMET Distribution – Africa, Middle East & Turkey, Metso.



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Expanded metal continues to be an economical and cost effective material.

Elaine van Rooyen, Marketing Manager at Andrew Mentis, based in Elandsfontein, explains that the material is made by slitting and expanding a solid sheet of metal into a web of diamonds.

“The metal sheet can, in fact, be expanded up to ten times its original size, losing no material in the process and resulting in a remarkably light mesh,” she says. “And expanded metal offers flexibility because it is available in a variety of sizes and materials.”

One of the most important features of expanded metal is its inherent structural integrity and strength. Van Rooyen says this is facilitated by the network of rigid strands which also permit light and air to pass freely through it. The material is also lighter than the original equivalent mass.

High quality local mild steel is used in the manufacturing process, but any other ductile metal is also suitable. The finished product can be painted, stove-enamelled, plated and galvanised. The company produces expanded metal with a raised mesh, known as Mentex, and with a flattened surface, known as Flatex. Van Rooyen says the most appropriate type of expanded metal is selected depending on the application for which the material will be used.

The range of mesh sizes and thicknesses of both Mentex and Flatex is extensive and the expanded metal can be bent, shaped to radii, angled or notched. Customers can select a broad spectrum of mesh sizes, from the smallest mini-meshes with openings of 2 mm by 4 mm and a thickness of 0,3 mm to the larger versions with openings of 75 mm by 200 mm and a thickness of 6 mm.

Elaine van Rooyen, Andrew Mentis, tel (+27 11) 255-3200

Booyco Electronics leads the way on PDS technology

Lack of knowledge when it comes to legal compliance of Pedestrian Detection Systems is not a good enough excuse. Access to information is fairly simple and for those that need a more in-depth understanding Booyco Electronics is well positioned – it says – to assist with the application of this technology in both underground and surface mining operations.

The company has led the drive towards producing Pedestrian Detection Systems (PDS) technology that will meet and, where possible, exceed the legislated requirements within the South African mining industry. This is according to Anton Lourens, MD of Booyco Electronics, who confirms that the company is one of those selected to participate in The Earth Moving Equipment Safety Round Table (EMESRT) forum.

“This level of collaboration is important in the industry, especially with technology that is cutting edge,” he says. Participation

at EMESRT has allowed the company to gain insight into the global requirements for PDS equipment and also to share with the leading international mining houses the strides Booyco Electronics has made with its technology.

Staying close to the market and understanding the operational challenges faced by customers has enabled the company to accelerate its research and development programme, and strategic re-engineering of its products will see these not only meeting South African legislation but also the requirements of EMESRT.

Significantly, Lourens says the company has already developed a high processing power controller. “Essentially, the Booyco Controller Interface is a processing gateway and all sensing technologies and informational data is channelled through this,” he explains. “This enables the user to create the requisite artificial intelligence which is

fed to the control systems of the trackless mobile machinery on a site.”

Lourens says that what is most important about this technology is that it facilitates the enormous inflow of information, the processing thereof and then the presentation of it in a simple, easy to understand manner. “Equipment operators cannot be overloaded with information as informed decisions need to be made in a short time frame, and our processing interface will allow this.”

Each Booyco PDS is deployed as a fit-for-purpose technology solution based on application specific risk assessments, and can be integrated across systems for use both underground and on surface, as well as a combination of both.

The same PDS technology deployment could vary from vehicle to vehicle on a single site. Each is manufactured with full self-diagnostics, and the visual and voice display is activated in the case of a warning or a system failure.

Booyco Electronics, tel 0861 B00YCO (266926)

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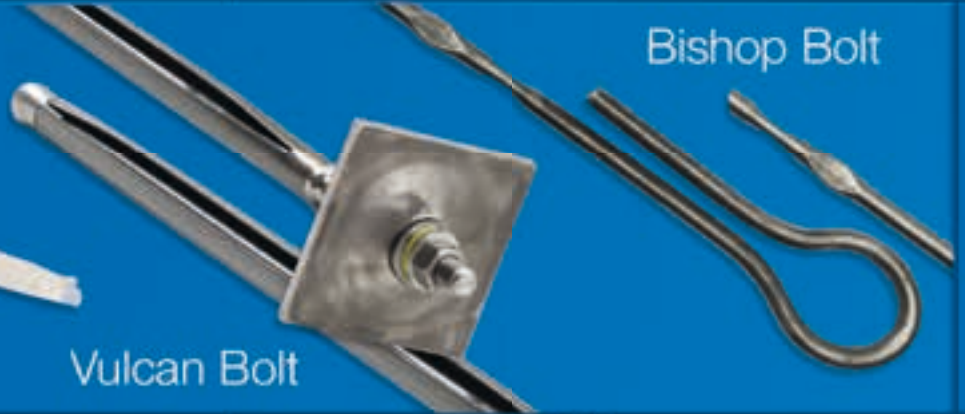
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