



Media Release

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Master Drilling rolls out cutting-edge mining technology

Horizontal raise boring technology to double mining productivity in kimberlite

Master Drilling today announced its Horizontal Raise Boring (HRB) technology is ready for international roll-out after the successful pilot test at the Cullinan Mine. HRB can replace conventional drill-and-blast mining and promise to increase mining productivity thanks to its continuous process of rock boring, and in addition offers significant safety benefits. This will enable more mining construction projects to meet the required hurdle and feasibility rates towards becoming producing mines. Projects with less safe access, such as deeper mining operations and higher stress zones, is also more likely to pass feasibility tests thanks to the safety improvements that HRB brings.

The latest version of the Master Drilling HRB was officially unveiled at the Investing in Africa Mining Indaba 2017, held in Cape Town.

Master Drilling is a South African based JSE-listed drilling solutions provider with over 160 drills across 17 countries. HRB is an entirely new rock boring solution and can be offered to Master Drillings' existing client base of multinational mining concerns, as well open the door to approaching new clients in mining and civil construction. The technology is expected to offer support to Master Drilling revenue growth over the medium to long term, and thereby provide further income diversification.

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

HRB will provide the mining industry with an excavation and construction tunnelling tool for the mechanical excavation of a tunnel between two existing access points, very similar to the standard form of raise boring. The steady progress of the reamer is able to excavate an average 6 meters per day, compared to 2 meters in conventional drill-and-blast cycles.

The technology offers the much-needed mechanisation to reduce the number of workers who are exposed to dangerous underground conditions.

The benefits extend across the project-chain and include amongst others:

- No need to use explosives
- No blast effected damage inflicted to the tunnel sidewalls

- The structure of the tunnel is stronger due to the circular profile of the tunnel
- Reduced rock support costs
- Improved tunnel construction accuracy
- Lower excavation costs
- Continuous operations not effected by blast re-entry
- Greater remote operated possibilities
- In certain locations it is impossible to assemble a tunnel boring machine (TBM) due to its length and size. In these locations the plant for raise boring is smaller and easier to transport

The pilot project at the Cullinan Mine of Petra Diamond Mines involved boring and excavating a 180 meter horizontal tunnel with 4.5 meter diameter through the kimberlite ore, i.e. diamond deposits. The construction method entails first drilling a smaller pilot hole through the kimberlite, which was challenging as no water can be used for flushing. The pilot hole also needed to be near perfectly straight. For these reasons Master Drilling pioneered using vacuum air suction and laser assisted directional steering in collaboration with a US-based company, which is typically used in civil construction.

“Tunnel Cutting Technology seems to be the next logical step in underground mine development,” said Ben Swarts, Group Manager, Mining Projects of Petra Diamonds Limited. “This technology brings with it additional benefits such as improved excavation integrity and safety, better advance rates and possible downstream financial benefits. The HRB is one of the very few options currently in operation. We are optimistic about the technology and in progress to finalise a commercial agreement to continue the use of the HRB within Petra Diamonds.”

Master Drilling was established in 1986 and listed on the JSE in 2012 and operates in the mining, underground and open pit business. The business model is that of a contractor who designs and manufactures its own drilling equipment to provide complete drilling service solutions, and does not sell any of its machines. Master Drilling recorded revenue of USD 58.3 million in the six months ended June 2016, and net profit of USD 9.6million for the period and market capitalisation of R2.5 billion, with a \$209 million order book excluding HRB.

“Master Drilling is about selling a solution and not a product. Our technologies is the result of identifying and responding to needs in the market - ahead of the curve,” said Danie Pretorius.

Over the years Master Drilling has developed new technologies including the Remotely Operated Shaft Inspection Unit (ROSI), amongst others. Currently Master Drilling is developing the Blind Shaft Boring System (BSBS), a mechanised system for boring a vertical shaft to a depth of 2 000 meter with finished diameters ranging from 10 meter to 13 meter. No underground access is required for the BSBS to start boring operations as a shaft sinking method.

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NOTES TO EDITORS

About Master Drilling

“We challenge the status quo to provide our clients with specialised, adaptive one-stop-shop drilling solutions”

Master Drilling has over 30 years of experience in servicing the mining industry with innovative mining technologies, and has built relationships with some of the biggest mining concerns in the world. The Master Drilling approach of tailor-made design for each project coupled with on the ground operations from start to finish, and a flexible support chain has established as a trusted partner.

Master Drilling acquired a 40% stake in the Swedish raise boring company Bergteamat in Sweden, which will not only establish the European footprint, but will also allow Master Drilling to tap into existing technology and operating methods whereby the ratio of man to machine can be reduced from the current accepted norm of 20 to 6.

Projects (selection)

- Master Drilling deployed the RD8 machine, which uses a combination of electrical and hydraulic power to drive the equipment and can be operated and monitored remotely.
- In conjunction with Swedish companies, Atlas Copco and IMA Engineering, we developed the OREalyser which will primarily be used in the exploration side of the business.
- Master Drilling is currently experimenting on excavating thin reefs at great depths as a method of production. Further research and development will be done as work progresses to deal with remote operation and efficiencies. The company is in the testing and set-up phase of using reef boring technology in the stoping environment, which will target reserves of legacy ore bodies.

Services

Rock boring

- Remotely Operated Shotcrete System (ROSS)
- Remotely Operated Shaft Inspection Unit (ROSI)
- On reef drilling
- Horizontal Raise Bore (HRB)
- Gripper tunnelling
- Grade control
- Reverse Circulation Shaft Drilling
- Blind Shaft Boring System (BSBS)
- Raise boring
- Box hole boring
- Slot boring
- Slim drilling
- Core drilling
- Percussion drilling
- Reverse circulation drilling
- Air Rotary drilling
- Mud rotary drilling

Focus on: Blind Shaft Boring System (BSBS)

BSBS is similar to HRB in terms of the benefits it can deliver to the mining and construction sectors. BSBS is another recently developed and tested in-house technology that promise to change mining and construction in a big way.

The boring can be done in rock hardness of most mineral ore deposits such as platinum and gold. The BSBS enables an advance rate of 7 meter per day compared to 3 meter per day in the case of conventional shaft sinking using drill and blast techniques. This system and technology will create access for man-, material- and ventilation shafts of up to 13 meter in diameter and up to 2 000 meter deep in hard-rock applications.

The system will be suitable for greenfield and brownfield underground mining applications. While current shaft drilling or raiseboring services require bottom, or underground, access, this new system could be applied in areas where there is no such access or in greenfield projects, where shaft boring is required from the surface. There is significant value in this system, as it provides faster access to underground orebodies. The potential impact of such a shaft boring system is significant as feasibility projects could now pass capital hurdle rates due to cost and time savings.

As with HRB, there is no need for explosives when using BSBS, which in turn means that no blasting fumes released into the atmosphere and minimal noise levels throughout the boring process, making the system environmentally friendly and can be deployed in areas in the vicinity of other existing infrastructure.

Applications include

- Mining sector: Shaft boring or enlargement is used for the construction of access or ventilation shafts for the mining industry. The BSBS is suitable for any Greenfield or Brownfield underground mining application at copper, zinc, gold, iron-ore and platinum mines, among others.
- Civil sector: In the urban infrastructure industry it can be used to bore access and ventilation shafts to metro tunnels and underground storage areas such as parking garages, with the added advantage that normal operations can continue around the bore site as no explosives are used.
- Energy sector: In the energy sector it is used for surge, ventilation, access and pressure shafts.

Management team

Danie Pretorius, Chief Executive Officer

Danie founded Master Drilling in 1986 and was appointed as CEO in July 2012. Danie holds a Government Engineers Certificate of Competency.

André van Deventer, Financial Director

Andre joined Master Drilling in 2001 and was appointed as FD in April 2011, and supported the listing in 2012. Andre holds the CA(SA) professional designation.

Koos Jordaan, Technical Director

Koos joined Master Drilling in 2001 and was appointed as Technical Director in 2012. Koos holds a BEng degree, MBA, and BS in International Technology Management.

Gary Sheppard, Chief Operating Officer – Americas

Gary joined Master Drilling in 2001 and was appointed as COO in 2012. Gary holds a BSc Eng degree and an MBA.