



Enhancing exploration

GeoDrilling International talks to industry experts about the latest innovations and solutions for mineral-exploration applications

Above: an early model of the Dando Multitec 4000 wireline-coring for diamonds in Sierra Leone

Overall market pressures and the fact that a vast majority of the economically viable mineral deposits have already been discovered have pushed technological innovation to the forefront of mineral-exploration activities.

There is a growing need for better technologies that can help reduce the costs of drilling operations and decrease the time it takes to find, sample, validate and mine mineral-resource deposits.

Up until 2012 the mineral-exploration equipment market was more straightforward, but when mineral prices, especially coal, took a dive, many major miners and contractors sought to freeze capital expenditure.

Dando Drilling International sales director Quentin Dulake explains that sales of Dando's

larger rigs began to slow. Exploration continued to be necessary but the focus changed to obtaining good results, while reducing initial outlay and running costs. This was also when, Dulake reports, the company's small footprint, track-mounted Multitec 4000 caught the attention of the market.

"The Multitec 4000 is the most significant new rig in our mineral-exploration range at the moment," he says. "Up until 2012 the majority of our sales to this sector were for our powerful and versatile larger rigs like the Mintec 12.8. With a top-spec rotary head and a 900cfm/350psi compressor on board, these rigs are capable of wireline coring, reverse-circulation, rotary air-flush and open-hole mud-rotary operations from a single large crawler-mounted platform.

"Our customers saw the Multitec 4000 as an opportunity to continue drilling while maintaining profit margins that had suffered due to mineral market conditions," he states. Capable of the full range of mineral-exploration drilling techniques with penetration rates for wireline coring and open-hole boring that matched much larger, more expensive equipment, the rig was a cost-effective solution to demanding mineral-exploration programmes, but at a much lower price point, Dando claims.

CHEAP DRILLS

According to the Australian Deep Exploration Technologies Cooperative Research Centre (DET CRC), improving the productivity of mining and ensuring its long-term future, in the low sovereign risk countries of the developed mining world, requires that new Tier 1 discoveries be made beneath barren cover with greater success and at lower cost than has been achieved to-date.

Drilling is the only method by which discoveries can be made beneath cover, but is expensive, often permitting only single-hole tests of geophysical targets. Cheaper, safer and more environmentally friendly drilling techniques are the key to improving exploration success beneath barren cover.

Cheaper drilling and associated real-time sensing technologies can enable explorers to drill multiple holes that progressively vector towards deposits in a single campaign using their geophysical and/or geochemical haloes, i.e. 'prospecting drilling'.

Vectors include the mineralogical haloes around iron oxide copper-gold deposits (IOCGs) and the elemental haloes around gold deposits described by DET CRC or the elemental vectors for porphyries in greenrocks described by the Australian Research Council Centre of Excellence in Ore Deposits (CODES). ▶



The Multitec 4000 Mk3 is a 200-tonne rig with a 27m drilling mast, an overall height of 30m. It is designed to increase the success of mineral exploration through better access.

27m drilling mast means a continuous run of 20m drilling depth is possible from a single site. Drilling and reaming tools with the rig can be drilled from the hole, as opposed to drill rods that must be lowered and recovered multiple times during the drilling process. This can lead to improvements in:

- cost efficiency: no rod changes, therefore no drilling or hoisting time of the rods over again, leading to cost savings of 10% to 15% per rig.
- safety: reduced handling of drill rods is equivalent to 10% of the time it would take to handle 100 rods.
- environmental friendliness: drill rods have a smaller footprint and are made of fully recyclable steel systems.
- hole stability: no pressure variations during rod changes.

Customer testing of the new Multitec rig has been undertaken at 100% scale in the Orange Drilling Research Facility in Australia. Geoff Dulake, Operations Field Engineer, says:

"Having used the Multitec Systems Drilling Program (MSDP) since its 2012 February launch..."

"There will be approximately 20 months of testing ahead before the rig is offered for commercial sale in 2017-2018. The current representative says that it is difficult to say how long it will take to commercialise as further testing is in the work of being completed. But it is expected that commercialisation will be 12-18 months from now."

EXPLORATION VERSION

Dando explains that after its launch in 2015, interest and sales for the Multitec 4000 took off in the mineral-exploration sector with international sales across Africa and South America for a range of mineral targets.

So while it is a multipurpose machine, the Multitec 4000 was filling a niche in the market for mineral exploration. A number of sales to customers drilling in equatorial jungle regions with difficult terrain and limited access along narrow tracks and between trees spurred the design team to focus on producing a fully-fledged exploration version of the rig.

"The level of adoption from the mineral sector was probably greater than we had anticipated," explains Dulake. "With enthusiastic reports from existing and new customers, and plenty of feedback, our design team had a very strong picture of an ideal version."

Rupert Coler, design engineer at Dando, illustrates the criteria for the new model: "The Multitec 4000 was frequently being used in uneven, sometimes steep, forested terrain with muddy, sticky or slippery surface conditions. Our first target was to ensure the rig could navigate this kind of terrain quickly and with maximum safety to the operator." As a result, the Dando engineers focused on designing the chassis and component layout of the Multitec 4000 Mk3 to achieve a low and central centre of gravity.

Wider 400mm tracks were

selected than the standard 300mm versions, with options including steel single-bar grousers to provide good clearance of mud in wet environments, or rubber tracks for gentler surfaces.

The track-base was also widened slightly to 1.55m, which increased the tilt angle of the rig markedly with a view to increasing safety while traversing slopes or other uneven terrain. A high-power hydraulic climbing winch was designed-in as an option to provide additional security when navigating steep and slippery terrain.

In standard form, the rig is supplied with a 74hp Tier 4 Final engine to meet regulations in European and North American markets, and a 111hp Tier 3 has been chosen for the rest of the world, although other options are available. With the majority of customers exploring to depths in the 50-250m range and in core sizes between N and P, the compact RH6 rotary head usually used on the larger Multitec 9000 rig was selected as a high-performance option. To ensure sufficient oil was supplied to the 6,000Nm/750rpm head and uprated crawler motors, a high-efficiency hydraulic system was designed by UK-based Hydraulic Alliance around Bosch-Rexroth pumps and motors.

Two mast options are available for 2.6m and 3.6m working strokes and both have deployable mast extensions to allow two rods to be pulled at a time. The folding mast extension ensures that when tracking the mass is kept firmly at the middle of the rig, providing a stable base. Double-acting hydraulic break-out clamps at the foot of the mast make and break joints while an integrated soft coupling ensures the longevity of wireline rods and sub adapter threads.

A new console has been designed on a swing arm so that the driller can choose a position that affords them the clearest and safest view of the borehole. The rig conforms to all new UK and

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► EU regulations and standards such as EN16228. Opening the guards leads to an immediate decrease in rotation speed, while the power units meet emissions standards and have noise-attenuated canopies. A robust radio remote-control option supplied by Scanreco enables this machine to crawl up steep inclines in muddy and slippery conditions.

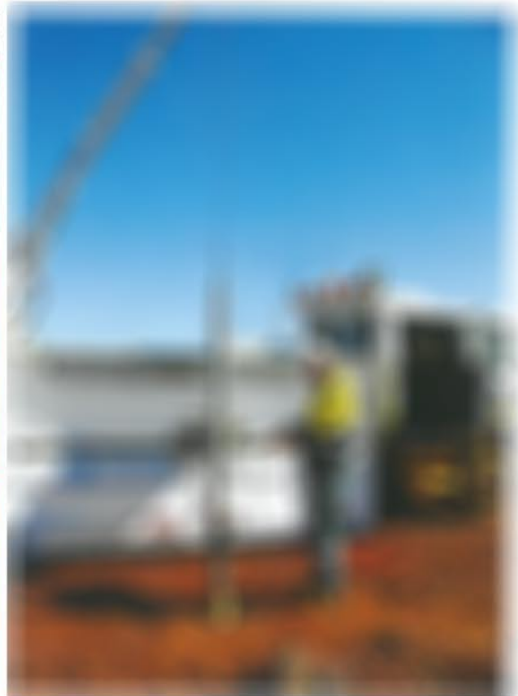
Sales account manager Callum Mee says: "The mineral market is beginning to show signs of revival and we are receiving a stream of enquiries for the rig. We currently have three in build, two for coring and one for reverse-circulation drilling with an accompanying track-mounted compressor, and our sales figures show it is our best-selling rig over the last six months, with a number of sales already confirmed for the coming year."

SECURED LOGGING

Since its first 2005 launch, the RH6 offers a full complement of scientific and technical logging capabilities. It is designed to meet current operating procedures, both onshore and offshore. The machine is based on a proven platform technology called TrackStar by TrackStar Mining Services (TSM).

The RH6 machine offers a wide range of logging capabilities, including the ability to log a wide range of diameters. The core samples are generally classified according to their diameter, into three categories: 60-75mm, 75-90mm and 90-110mm. The RH6 can log to full diameter and can perform 60-75mm, 75-90mm and 90-110mm.

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Centre column: N-wireline core samples. The RH6 rotary head on the new Multitec 4000 allows the small rig to take H size cores to over 250m as well as N and P size cores where required

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