Exploring new options

Ailbhe Goodbody examines how innovations in mineral exploration are even more important during a downturn, and what's new in exploration drilling and software

The exploration and mining industry is currently experiencing what some are saying is the biggest downturn, percentage-wise, for 40 years. This has had a significant impact on the mineral-exploration industry in key mining regions globally.

As a result, there has been low activity and weak demand in the exploration business for quite some time. The availability of capital is limited, and what is available is usually spent on projects that can realise results in the short term.

The decline in commodity prices has made it more difficult for exploration companies to raise funds for drilling campaigns. When profits dropped for many miners and spare cash became scarce, exploration budgets were often the first to be cut. For example, the mines still required dependable, fast, strong exploration drilling rigs, but they started looking for lower-cost solutions.

The prospecting market has also changed. In the past, it tended to be a contractor's market – now, the initial investment required to contract drilling services for a fully fledged drilling operation has become prohibitive. As a result, prospectors are starting to invest in smaller rotary rigs to obtain early evidence of mineral resources.

Contractors have been forced to lower their costs to win business. Martin Fitch-Roy, CEO of Dando Drilling, explains: "As a result, they too are looking for cheaper equipment so that they can bid low on a project to get their foot in the door. Basically, everyone is looking for more bang for their buck."

In addition, mining projects are becoming more complex and more expensive to develop. Access to mineable resources has become a big challenge; deposits are deeper and in less accessible locations. The costs to prove these resources, let alone develop economically viable operations, have increased drastically.

Tough times force mining companies to home in on costs; mines must re-evaluate efficiency and productivity in all areas of a project. Software has an important role to play in such re-evaluation, as a tool for driving greater efficiencies in businesses.

Glenn Wylde, chief innovation officer – planning at Hexagon Mining, says: "It's this combination of factors that has actually elevated the role of software in mineral exploration. It's now more important than ever to reap the benefits software can provide, while also understanding the science behind this technology so that results can be audited."

Dando Drilling's Terrier drill rig offers rotary drilling to 50m for a very low capital outlay

With a higher level of scrutiny by investors and less funding available, there is an increasing need for explorers to demonstrate that they have efficient data collection and management systems, along with good governance practices, transparency and auditability. This is where exploration software has a key role to play.

Workflows can help users to manage large amounts of data and decrease the effort in maintaining it. Peter Johnson, general manager, Australasia at Maptek, recommends: "Accurate data representing the geology, geochemistry, structure, shape, location and size of the resource makes a successful mine."

Integrating the systems that collect, model and report data contributes to improvements above and beyond the individual performance gains of each process. Integrated systems deliver more than the sum of their parts.

Tim Dobush, president and CEO of Geosoft, says: "Mineral explorers are looking for ways to take more risk out of discovery. With tighter budgets and risk-averse shareholders, they want to make full use of available resources and data to improve the potential of their projects. And they are merging proven science with technological innovation to do this."

If there is anything positive about the current exploration downturn, it is the opportunity for explorers to take a breath, comb through the data they've collected, purge what is redundant or corrupt, and organise what remains to make it more useable. Software technology and services exist to help automate this process, and make valued data and information more readily available to exploration teams.

While this effort will take time upfront, ultimately it will deliver increased exploration efficiency and provide more insight to improve target selection and hit rates.

Shaun Maloney, CEO of ARANZ Geo, adds that while the downturn has been painful, there is still an upside: "You can't fix anything unless it's broken, and adversity drives innovation. Now exploration and mining practices are shown to be badly broken, there are significant and game-changing fixes on the horizon." ►

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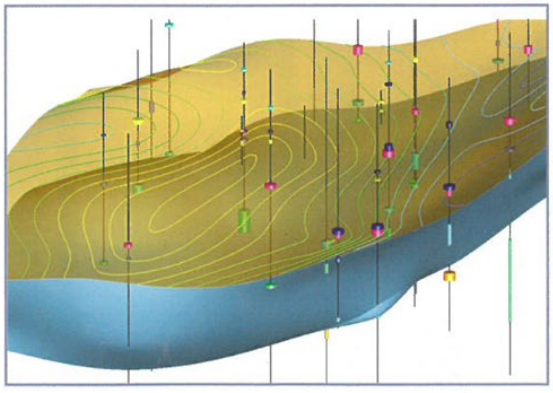

Combining Hexagon's MineSight Implicit Modeler and MineSight Torque: drill holes through a coal-seam model

Exploration drilling

The Sandvik DE151 diamond core drill rig

Most recent innovations in exploration drilling have focused on engineering rigs down to a lower price – adding value into the rig so that exploration drillers can retrieve an accurate sample for less cost.

Another constant globally nowadays is that drilling must have a low environmental impact. Sonic drilling is an ideal solution in these circumstances. Dando Drilling has recently been focusing on sonic technology in collaboration with Sonic Drill Corp.

Quentin Dulake, sales manager at Dando Drilling, notes: "Sonic drilling is very fast up to depths of around 100m, it retrieves unparalleled samples, is exceptional in difficult geologies such as mixed sand, gravel and till, and requires little or no drilling mud, so it isn't messy and helps preserve the environment."

Dando has also been developing new rigs based on the changing mineral-exploration market. The company is focused on compact but fully featured rigs that are modular in design.

"Most recent innovations in exploration drilling have focused on engineering rigs down to a lower price"

The first of these models was the Multitec 9000. Sitting on a small crawler unit that is only 142cm wide, this rig features 10,000kg of pullback and can take H wireline cores to more than 500m with pullback to spare if difficult drilling conditions are encountered.

Rupert Coler, rig designer at Dando Drilling, says: "The Multitec 9000 features a modular design that allows the customer unprecedented control over the specification.

"The customer can, for example, choose between Caterpillar, Kubota or John Deere engines, a number of mud and coring pumps, a hydraulically deployed mast extension that allows tripping of 6m sections of rod, an on-board rod rack and a rod loader. There is also the option for crawler, truck- or trailer-mounted versions."

Master Drilling's R&D has developed a driller application for a smartphone device to create a paperless system on the drill site

The modular nature of the rig means that very quick changes can be made based on the customer's preferences. The result is a unit that can meet the needs of the drilling project on a very short lead-time and at a price that suits the budget.

Coler comments: "Probably our most exciting new rig, however, is the Multitec 4000. This is a smaller crawler-mounted rig that can take H wireline cores or drill open hole to 200m."

Like the larger Multitec 9000, it is modular by design and has a versatile rotary head capable of the full complement of drilling methods. At a fraction of the price of the bigger models, it is aimed at contractors with smaller operating budgets.

Coler says: "With 4t of pullback, and two mast sizes allowing the loading of 2m or 3m rods, an on-board rod rack, and a number of engine options including a Hatz silent-pack engine, this rig is already receiving a steady stream of orders."

Dando has one of the most powerful sonic rigs on the market using the biggest Sonicorp 50K head, and is developing a micro-sonic rig with a 50Hz sonic head on the Dando Multitec 4000 base. Dulake explains: "This is a rig on a crawler that is only 1.36m wide and a little over 2m long. It's a very exciting prospect for low-impact, low-cost sonic drilling."

Master Drilling, meanwhile, has been focusing on automation, improving safety, working conditions and productivity. All of its diamond drills are now fitted with operator cabs, and drilling operations are monitored by cameras that can be accessed remotely. Development of automated rod handlers is well advanced and will be implemented during 2015.

Sandvik Mining also has on-going developments in its product and exploration-drilling technology. The company launched the Sandvik DE130i and DE140i at PDAC 2014, and new product launches in equipment and tooling are planned for the near future.

R&D

Dando is continuing to develop new rigs that are smaller, lighter and even more capable than traditional models but at a lower price. This includes lightweight, or modular, rigs that can be knocked down into easily transportable sections but still have the full complement of features and power provided by the Dando range.

The company is working towards rigs that are light enough to be heli-lifted into locations; many of its customers need to be as low-impact as possible, and cutting new roads to drill sites is often impossible.

In many areas this means looking at new technology in terms of materials and components. Coler states: "For example, we are working with alloys such as aircraft-grade aluminium to reduce component weight and incorporating components such as compact high-performance, turbo-charged aluminium engines to further reduce rig sizes."

Dando is also starting to incorporate flexible, expanding hydraulic tanks into its designs, which vastly reduce the weight and space usually occupied.

Master Drilling's R&D has developed a driller application for a smartphone device to create a paperless system on the drill site. This allows for immediate accurate access to drilling information, and a direct link to the quality and safety system. This aims to enhance the efficient management of safety and quality on a remote drill site.

Sandvik's main areas of research and development are currently in mechanisation and automation.

Geosoft's data-services team has worked with Cameco on the design and deployment of strategic exploration information management solutions

RECENT DELIVERIES

Despite the tough times, rig manufacturers are still racking up sales.

Sandvik has just delivered a DE880 drill rig to a customer in China – this is the company's biggest exploration drill rig, which is capable of drilling both reverse circulation and core mineral samples.

The company also recently delivered a DE840 to a customer in Australia, which will drill core samples.

One of Dando's customers is using the Dando Terrier drill rig for gold exploration in West Africa. Dulake says: "Our latest Terrier model for the mineral-exploration sector has been fitted with a hydraulic mast dump to allow angle drilling up to 45°. The Terrier sits on a tiny crawler system that is only 800mm wide so no clearing of the jungle is required."

Dando also supplied a separate crawler-mounted compressor to accompany the rig, so no water is needed. With this setup, the customer is able to drill two 50m holes a day using rotary air blast. The customer can collect chip samples, which provides the information required to start the next stage of its wider exploration programme.

"The overall low initial outlay of the Terrier setup and low running costs compared to the high returns from a successful prospecting project are, I think, a good representation of the current exploration market," explains Dulake. "For us at Dando, business is looking very promising because we took the initiative early on and have exactly the equipment required by the current market: high-performing, reliable, low-cost rigs that provide a substantial return on investment."

Exploration software

One of the big issues facing the mineral-exploration industry right now is how to make sense of the 'big data' produced through the adoption of technology to drive meaningful decisions on operational efficiencies.

Almost US$75 billion was spent on exploration in just five years from 2009 to 2013, according to research by SNL Metals & Mining. However, the industry has only a handful of discoveries to show for it.

Part of the problem is that most of the 'easy' deposits have been found. Those remaining lie either deep under cover or in remote or dangerous areas that are difficult and expensive to access. Yet there is another, more controllable factor: although the amount of exploration data is growing exponentially, much of that data has not been dealt with in an efficient, integrated way.

From the moment the exploration process starts to the operation of a mine, a vast amount of multidisciplinary data is gathered to use, share and interpret. Dr John McGaughey, president of Mira Geoscience, says: "The notion of 'data integration' has become broadly accepted as essential to effective interpretation. In recent years, it has become a common theme of exploration technical conferences. However, for practical reasons, coherently managing disparate and complex data streams remains a daunting challenge."

The big emerging technologies are cloud computing, software-as-a-service and big data analytics. Wylde notes: "One major innovation that has only really appeared in the last year or so is the ability to render massive point clouds on your standard desktop or laptop. Operations have been collecting these massive datasets for years, but have had to make compromises on how much data they can display/use."

Exploration companies are adopting collaborative and multidisciplinary, real-time approaches to improve exploration effectiveness. They are maximising the value of data and technology to deepen insight, prioritise opportunities and select the best drill targets.

As a result, organisations globally are looking for far greater interoperability between different specialist software suites rather than placing their reliance solely on more generalist packages.

It is possible that in the future, explorers will be able to choose a location anywhere in the world, access all of the exploration data ever collected there, and immediately begin to build an integrated 3-D model to guide further exploration with the intent of improving the odds of discovery.

Innovations that are helping to make this possible include: the emergence of high-performance geocomputing in the cloud; more sophisticated and faster methods for integrating and modelling large multidisciplinary data; and web-based solutions for managing and delivering exploration information.

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NEW PRODUCTS, CAPABILITIES

ARANZ Geo recently released several updates across its range of Leapfrog 3-D geological modelling software, starting with Leapfrog Geo 2.0 in July 2014. Its vein-system modelling tools utilise the dynamic implicit modelling of Leapfrog to rapidly model complex multi-vein systems. ►