

Nordic directional drilling co-operation

A deep hole exploration project is taking place in Finnish Lapland to increase Agnico-Eagle Finland's Probable reserves at depth in the Kittilä gold mine. Diamond drill rigs have since the summer of 2008 been drilling NQ-size boreholes to recover core for analysis. Arctic Drilling Co's LM75 drill rig has been drilling boreholes deeper than 1,300 meter and that in a quite impressive six weeks. The results will hopefully show that it will be profitable to develop further from open pit to underground mining.

In the beginning of March 2009 Devico was hired to help make branch holes from the boreholes that had been drilled in previous months. Norwegian company Devico specialises in directional core drilling and borehole surveying. It was hired to improve the accuracy of the boreholes and reduce drilling time and costs on the project compared to drilling from the surface.

Agnico-Eagle Finland had already in an early stage of the project considered using directional drilling to hit targets at depth. Kati Oy and Arctic Drilling, two Finnish drilling contractors, were contacted to drill NQ-size boreholes in the mafic vulcanite rocks. Several boreholes were drilled during the autumn and winter. By spring 2009 sufficient boreholes had been drilled to involve Devico more actively in the project.

Once Devico arrived at Kittilä, the process of branching from the earlier boreholes started. At that time initial planning had taken place at the office, discussing how to hit the targets in the best way. Several factors had been considered, like which order to drill the targets, at what depth to start the different branches and which borehole to give priority.



Cutting a curve at 523 m depth for Agnico-Eagle Finland

To start a branch from the mother hole, the drilling companies installed an orientated steel wedge to force the drill bit to create a new borehole. When the new branch hole was started, Devico could run its DeviDrill down the hole. The DeviDrill is a directional core barrel that fits directly on a normal NQ-wireline operated drill string. The DeviDrill can be adjusted to give any curvature, but a dogleg of approximately 9 is normal (that means 9o deviation per 30 m drilled). Higher doglegs risk possible wear and damage to the drill rods, as well as increased torque.

The directional core drilling operation is a co-operation between the Kati and Arctic Drilling drillers and field engineers from Devico. The field engineers do the orientation and borehole surveying, while the drillers drill with supervision from the field engineers. A normal directional core drilling section varies from 15 to 80 m, depending on how far from the mother hole the targets are located.

When the directional drilling section is finished and the required azimuth and inclination has been obtained, the directional core barrel is replaced with a standard core barrel. Borehole surveying is regularly performed to make sure that the borehole is not deviating more than the expected natural deviation while drilling continues towards the desired target. If necessary, a correction has to be made closer to the target. In the mean time, the field engineers from Devico have started a new correction on the next drill rig.

When it is time to hit a second target, a different technique is used to create the branch hole. It is possible to take advantage of the directional section in the borehole and drill straight out of the curve. This approach is less time consuming, since it involves less tripping of the drill string, than putting down a wedge. Slow and careful drilling in the curved section, repeated a few times, creates an edge which is the beginning of a new branch. Besides being quicker, this approach also gives a smoother borehole trajectory, and avoids all the disadvantages of using wedges. After the hole has been created, the DeviDrill is yet again run down the borehole, to create the new curve leading to the second target.

The feedback from the project so far is very good. The co-operation between the drilling companies and Devico is working fine, and Agnico-Eagle Finland is happy to hit targets in less time and with higher accuracy.

www.devico.com

HEROIC FEAT FOR FORDIA

Fordia has launched a new matrix diamond bit; the HERO™. Its Matrix rated 7 core bits are manufactured using high grade diamonds, which are coated with titanium in order to preserve their cutting abilities throughout the bit baking process. The bits are manufactured using a new unitary baking process, which regularises the consistency of

the tools. According to the manufacturer, the HERO core bit offers the best penetration/lifespan ratio in the industry in medium hardness ground.

The bit has already been in Fordia's top-ten sellers since it was tried out in the field with the official launch highly anticipated by the contractors who took part in the try-outs. It

cuts through quartz and all types of granite or equivalent hardness rocks without any problem, and is well adapted to softer and abrasive ground. It is available in standard, pie-shaped and turbo pied-shaped configurations and is offered with a diamond impregnation height of 13 mm. For deep-hole applications, it can also be ordered in Vulcan, with a diamond impregnation height of 16 mm.

www.fordia.com

Hyundai introduces front shovel

Hyundai has introduced the R800-7A FS, a 78 t front shovel crawler excavator. Based on its R800LC-7A backhoe, this front shovel version relies on a wide range of extensively tested structures, systems and components. Hyundai's expertise in excavator manufacturing has been put to use when developing the front attachment of the R800-7A FS. Also, Hyundai engineers succeeded in limiting noise and emission levels notwithstanding a powerful tier III Cummins QSX15 engine, delivering 370 kW.

The R800-7A FS provides the operator with a comfortable working environment. The smooth and sensitive hydraulic system delivers precision, while performance and comfort levels can be set to the operator's preference in the Hyundai -7A series cabin, which, mounted on a riser, provides the operator with a better working area view. www.hyundai.eu

The first R800LC-7A sold in Europe was delivered to Steenkorrel recently



MORE HYBRID DRIVE

Dana has introduced new hybrid drivetrain technology specifically engineered for off-highway vehicles. A concept transmission in the evaluation phase, the Spicer® TE-15HX is an electric parallel hybrid featuring a dual power path transmission control system. This system continuously monitors operating conditions and selects the proper combination of diesel and electric power to optimise productivity while reducing fuel consumption, emissions, noise, and engine idling.

“Off-highway vehicles are the next frontier for hybrid technology, especially with the looming deadline for meeting Tier 4 emissions standards,” said Pietro Franzosi, VP of Sales and Marketing for the Dana Off-Highway Products Group. “Purchasers of off-highway equipment will not sacrifice power and productivity for hybrid technology, which is why Dana has engineered the TE-15HX transmission to provide hybrid advantages at vehicle start-up, acceleration, and idling while maintaining the output customers have always expected from a Spicer transmission.”

Whenever possible, the TE-15HX control system disengages the diesel engine and supplies power generated by super capacitors for inching and other vehicle operations that require low energy consumption. It also provides power for lights, climate control systems, and other electrical accessories.

For light loads, the diesel engine works alone to power the vehicle while

the electric device serves as a generator to efficiently charge the super capacitors for later use. Vehicle braking is also an important source of regenerative energy for recharging the capacitors. When additional tractive effort is required, the controller directs the electric device to function as a motor and provide a second source of power for added torque boost and faster take-off.

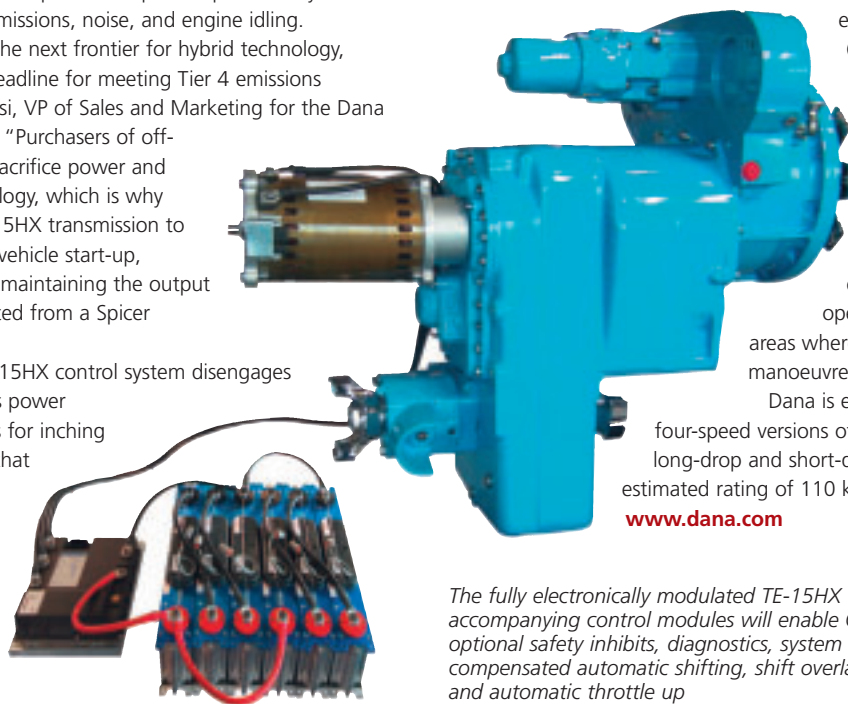
The TE-15HX transmission incorporates high-contact-ratio spur gears in conjunction with helical gearing to reduce noise, while an electronic

control system provides electronic clutch modulation (ECM), electronically controlled inching (ECI), safety inhibit protection, diagnostics, and compatibility with CAN 2.0B protocols.

These features will improve ease of use and enable safer and faster vehicle operation, especially in confined areas where large loads need to be manoeuvred carefully.

Dana is evaluating three-speed and four-speed versions of the TE-15HX transmission in long-drop and short-drop configurations with an estimated rating of 110 kW to 175 kW.

www.dana.com



The fully electronically modulated TE-15HX transmission and accompanying control modules will enable OEMs to equip vehicles with optional safety inhibits, diagnostics, system monitoring, load- and speed-compensated automatic shifting, shift overlap control, single pedal drive, and automatic throttle up

Analysing geochemical data within the ArcGIS environment

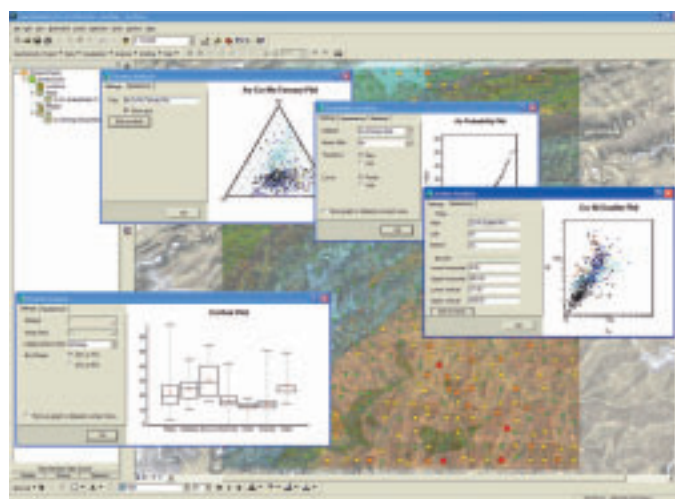
Geosoft now offers its Geochemistry for ArcGIS extension for ESRI's ArcGIS software. The Geochemistry for ArcGIS extension adds a powerful geochemical workflow to ArcGIS, enabling geoscientists to efficiently conduct their geochemical QA and analysis inside ESRI.

“Geosoft’s Geochemistry extension further extends the explorer’s toolkit, by providing the ability to analyse geochemical data within the ArcGIS environment,” said Louis Racic, Director of Product Management. “It builds on the success of our subsurface geology extension, Target for ArcGIS, and provides a powerful exploration workflow solution not currently available in the market.”

Geochemical investigations require the ability to process and analyse all components of geochemical sampling in context with the geology and geophysics. Using the tools available within Geochemistry for ArcGIS, geoscientists can effectively extract knowledge from their data by examining multivariate relationships, uncovering underlying structures, identifying outliers and anomalies and present results by easily creating informative, visually impactful maps.

Using Geochemistry for ArcGIS, geoscientists are able to:

- Simplify their geochemistry quality control process and maintain data in an ESRI file geodatabase using a data model optimised for geochemical data
 - Select and subset data interactively from maps based on lithology and regions to enhance data display
 - Create advanced geochemical maps within the ESRI ArcGIS Desktop environment
 - Analyse multi-element geochemistry using interactive multiple histogram plots, Pearson’s correlation reports, scatter plots, probability plots, ternary plots and box plots, to identify outliers and define populations.
- Geoff Wade, Natural Resource Industries Leader for ESRI, commented, “We’re excited that Geosoft has released another advanced workflow



The Geosoft Geochemistry for ArcGIS extension is compatible with the latest software release from ESRI, ArcGIS Desktop 9.3

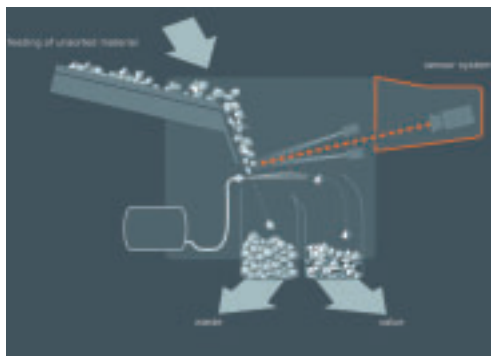
oriented solution that leverages ESRI’s GIS technology. Geoscientists will benefit from the integration of geochemical analysis, conducted in spatial context, to support their critical decision making. The development of specialist workflows has been critical to the uptake and effective utilisation of GIS within mining exploration and the geosciences,” said Wade. “We look forward to an increasingly tight global partnership with Geosoft going forward, to build integrated workflow support for the explorer of tomorrow.” www.geosoft.com

Sorters Reduce Mining Costs and Increase Profits

Mathias Moritz, Managing Director of Commodas Mining in Germany, believes that "sensor-based sorting machines have impacted the mining industry to the extent that they are fast replacing the traditional, high cost methods of milling and expensive metallurgical processes. Tough economic times have led to a steady decrease in raw material prices, particularly in the mining industry. Mines using electronic sorters have reported a significant reduction in mining costs and an increase in profits. Once on stream, the benefits are almost immediately reflected in the bottom line."

"The advantages of eliminating waste and sub-economical ore from plant feed are convincing," commented Professor Wotrube of Aachen University in Germany. He went on to say that traditional pre-concentration methods for plant feed have limited applications, whereas sensor-based sorting can separate material which is impossible to treat by traditional methods. "Sorters can work, where these methods fail," he said.

Using high speed, high tonnage sorting machines results in markedly reduced



According to Commodas, "sensor-based sorters represent an investment for the future, with long term advantages over traditional processes that are slow and inefficient, resulting in poor recovery rates."

beneficiation costs. Commodas sensor-based sorting machines detect and separate the valuable ore fraction from barren residue at high speed and at low cost, with accuracy. According to Rosemary Falcon, Director of the Fossil Fuel Foundation and Professor in the School of Chemical and Metallurgical Engineering at the University of the Witwatersrand, Johannesburg, the application

of X-ray sorting on dry coal has solved a long-standing problem in the coal industry. "These sorters identify and separate torbanite from coal," she said. "The typical method is to separate coal from the host rock using heavy media concentration with the torbanite fraction included. Since this is a mineral rich clay with a high proportion of fossil algae, and is a valuable source of high quality coal, bitumen and oil, the x-ray sorter has made an enormous difference in separating torbanite from the lower grade coal."

The sorters use a number of intelligent detection criteria to identify ore and mineral characteristics, such as colour, atomic density, transparency and conductivity. These include optical and colour recognition, x-ray transmissions, radiometry, near-infrared, fluorescence, conductivity and magnetic systems. These methods not only increases profit by improving yield and recovery, but also reduce emissions and energy consumption. This technology is applied to a wide variety of minerals, metals and gemstones.

www.commodas.com

BREAKING OUT OF THE BOX

Breaker Technology's BXR160 21,693 Nm breaker is designed for rugged, continuous duty in demanding breaking applications. It offers an extra long stroke design which improves the power-to-weight ratio of the breaker, providing the widest carrier range (54,840 to 99,880 kg) and power available. Precise tolerances between the piston and cylinder provide high efficiency, blow rate and power. Large cross section upper and lower shock absorbing isolators reduce vibration feedback to the carrier.

Breaker Technology's exclusive front head restraint system tightly guides the front head within the housing, reducing loading to the tie rods and the upper portion of the breaker. The narrow box housing design of the machine is well suited to tight trenching conditions. It has a working weight of 5,448 kg (may vary depending on bracket) and a tool diameter of 203 mm in



addition to a flow range of 321 to 454 litres/minute and operating pressures from 140 to 190 bar.

www.rockbreaker.com

Breaker Technology's BXR160 has a frequency range of 260 to 425 blows/minute in long stroke mode (high impact) and 340 to 530 in short stroke mode (high frequency) which is manually controlled via hydraulic piloted stroke control