



CaveTracker

Real-time measurement
of fragmented rock and
its flow in underground
block caving

MONITORING REDEFINED



Elexon Mining is a world leader in wireless in-ground geotechnical monitoring systems for open pit, tailings dams and underground mines; providing real-time insight into ground movement, cave monitoring and ore flow.

At Elexon Mining, our success is your success. We are committed to providing tailored solutions and building lasting relationships around high precision movement and positioning activities.

Having access to this information and real-time insights enables operators to anticipate needs, manage workforce, diminish risks, and prevent disasters.

Elexon Mining's wireless configuration also eliminates the need for manual monitoring and expensive cabling.

Since forming in 2006, Elexon has worked collaboratively with some of the industry's

leading research organisations and mining companies with systems now deployed across the globe on every continent, except Antarctica.

Our customers choose Elexon Mining, because our professional teams have the specialist service expertise to ensure quick project commencement and maximum uptime. Every challenge is an opportunity to work together to deliver systems that exceed expectations.

Elexon Mining's systems provide invaluable data that empowers mining companies to make well founded decisions to improve safety, efficiency, and resource conversion.

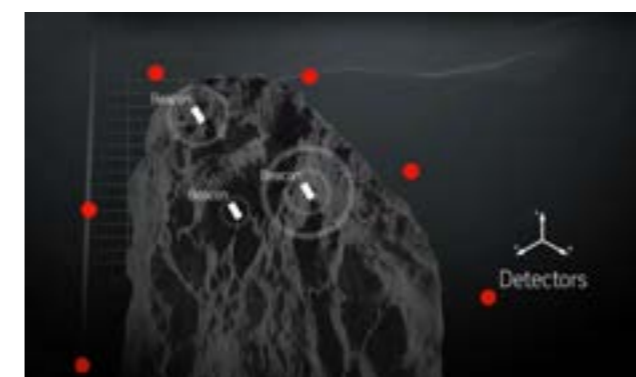


CHALLENGE

Block caving relies on fragmentation and the force of gravity to 'cave' the fragmented ore to draw points built deep underground, where it is collected and taken away for processing.

Mine operators cannot see what is happening in the fragmented body of ore, which means that the behaviour of the ore when it flows cannot be accurately predicted. Without accurate knowledge of ore behaviour, risks to safety and output are high and difficult to manage. The risks include unpredicted events that impact personnel safety, loss of resources and inefficient operations.

A number of monitoring methods have been developed which attempt to provide greater insight into the cave's extent. These include time domain reflectometer, extensometers and seismic systems. Each of these methods has limitations and, in isolation, are unable to provide the broad ranging data required to have a comprehensive 3D view of the extent of the cave.



SOLUTION

The Cave Tracker system, developed by Elexon Mining in partnership with Rio Tinto, Mining3 and Newcrest Mining, uses robust, wireless, magnetic beacons which are embedded into the cave and are monitored by detectors placed in and around the orebody. The detectors feature highly sensitive magnetometers, which measure minute changes in the electromagnetic field and those changes are converted into distance.

The ability to track beacon movement allows mine engineers to determine which parts of the cave are moving and which parts are not. The rate and direction of movement can also be established. Through the data gathered with the Cave Tracker system, mine managers are able to make better decisions to protect the mine asset and maintain efficiency.

The technology not only delivers significant productivity improvements but has the potential to improve the safety of cave mining by detecting the formation of air gaps. This allows the hazard to be managed before it poses a threat.

The system can transmit signals through 180-metres of rock and will continue working remotely for years, withstanding the rigours of a harsh underground environment.

Robust technology that improves productivity and also has the potential to improve safety in cave mining.



WHAT IS THE CAVE TRACKER SYSTEM?

Cave Tracker is a highly sensitive but robust system that consists of the following components:

Beacon

Cylindrical fibreglass enclosure containing a strong magnet, batteries, and electronic circuitry.

Cave Tracker Detector

Cylindrical fibreglass enclosure containing a sensitive magnetometer and various electronic circuitry including a small computer. Detectors are strategically placed throughout the mine so that the system may detect 3D positions of beacons installed in the mine. Detectors send the measured Beacon ranging information via the Communication Adaptor Module's (ITCAM) serial link to the Cave Tracker Management System server for data storage and analysis.

Communication Adapter Module (ITCAM)

Provides a DC power and serial data communication link for detectors. Messages between Cave Tracker Management System, and detectors are relayed through the ITCAM.

Cave Tracker Management System (CTMS)

The CTMS is responsible for data storage of detector range readings, converting received detector ranges into 3D beacon positions and managing installed Cave Tracker System Devices.

Wireless User Interface

A small ruggedised laptop plus USB activation wand is used for system commissioning and wireless activation of beacons prior to installation.



Beacon & Wireless User Interface Activator



Cave Tracker Detector



ITCAM

CAVE TRACKER FEATURES & BENEFITS



World first wireless capability

Elexon Mining's world first patented wireless in-ground monitoring system is unrivalled to anything else on the market today. We look forward to continuing to work with pioneers of the industry to redefine monitoring.



Monitoring where others can't

Our wireless capability allows flexibility to be applied in various challenging environments where the use of cabled monitoring is costly or impossible. The Cave Tracker system and its installation methods are far less intrusive and more cost-effective than other options.



Getting the answers

Be confident in the data and understand what it means for your site. Elexon Mining's dedicated team of interpretation experts are on hand to assist or provide data analysis. We provide you with the data you need to keep your stakeholders fully informed.



Reduced risks and uncertainties

Unlike above-ground monitoring, our in-ground Cave Tracker system provides near real time data and early detection of change well before it is seen at the surface. Being wireless means you'll never lose connection due to a severed cable. Early detection of a change allows site and geotechnical engineers to improve process control and mine planning.



Real-time data

The Cave Tracker system can be used to report at set intervals, as required by the client. This reporting is supplied by Elexon Mining's Technical Services team.



Maximised Recovery

The Cave Tracker system allows for improved ore recovery, resulting in less waste and dilution.



ELEXON MINING SUPPORT

Real time operations

Elexon Mining provides full support services, which monitor data distribution to our clients. This function helps maximise productivity of our services through improved operational efficiency and minimised downtime.

Research and development

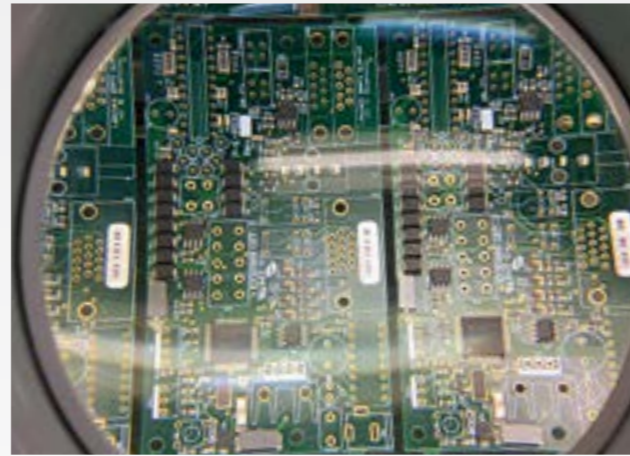
A continual focus on research and development keeps Elexon Mining at the forefront of geotechnical in-ground monitoring and the provision of the highest quality data. Our deployment and measurement technologies are constantly being improved to increase value for our clients.

Project coordination

We see your success as our success. We stand behind all of our products and work with you to ensure you receive a tailored solution for your project site and a seamless transition from feasibility right through to delivery and commissioning.

Installation support

Installation is key to ensuring great results. Our focus at Elexon Mining is to make this process as simple and easy as possible. We have an expert team on hand to help explain and to assist with the installation – providing you with confidence and maximising results. All Elexon Mining products can be installed alongside existing mine infrastructure.



CAVE TRACKER DATA

The system operates through a series of beacons that are embedded in the mine, which can be tracked in 3D as they move with the fragmented rock of the orebody. The ability to track beacon movement allows mine engineers to determine which parts of the cave are moving and which parts are not. The rate and direction of movement can also be established.

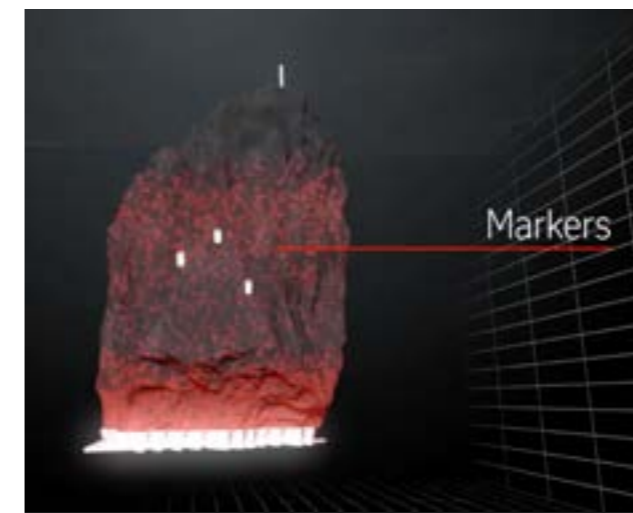
3D Positioning

The detectors multi-laterate the position of the beacons in 3D.

CAVE TRACKER SOFTWARE

To communicate, extract and crunch the data from the Cave Tracker system, Elexon Mining has its own software package - GeoHive.

The GeoHive software allows the data, once processed, to be visualised or exported using a CSV format, enabling operators to import the data into their preferred visualisation and monitoring software such as Voxler, Canary, Maptek and Vulcan.



SPECIFICATIONS

Cave Tracker Detector

Specifications	
Length	885mm
Diameter	58mm
Weight	1.95kg
Power	External
Communication	Cabled up to 1200m
Operating Limits	
Operating Temperature Range	- 0°C to +40°C

Cave Tracker Beacon

Specifications	
Length	450mm
Diameter	76mm
Weight	4.3kg
Power	Internal
Communication	15-35Hz
Operating Limits	
Operating Temperature Range	- 0°C to +40°C
Maximum Sensor Distance	180m
Nominal Life Span	500 spins (dependent on duration and frequency)

Cave Tracker ITCAM

Specifications	
Height:	190mm
Width:	660mm
Depth:	390mm
Power	External (with backup battery)
Communication	Ethernet RJ45. External Options: fibre optic link, and long-range wireless connection



Your **eyes** into the mine

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