

Microseismic monitoring for slope stability

Challenge

Unexpected rock movement in open pit and underground mining is a serious risk. As pits get ever deeper, rock mass strength at these large scales and depths is difficult to evaluate. Current monitoring methods for open pit stability assessment are predominately based on remote mapping techniques, such as interferometric radars, lasers, lidars, photogrammetry; all of which are looking for signs of surface movement.

Solution

Microseismic monitoring techniques are used to assist in characterising the rock/structure disturbance behind the slope before movements on the surface can be visualised or detected. This information is crucial for slope assessment and potentially warning of impending collapse. By integrating microseismic information with other surface monitoring and modelling results, the mining industry has a reliable assessment tool for slope management and ground control.



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How it works

Geophones configured in small arrays are installed in shallow drill holes around slopes of concern. Seismic signals from the geophones are continuously recorded, time-synchronised and transferred via cables and USB's for collection and processing.

Both strong and weak microseismic events are measured and assessed to determine their source location, energy and potential impact on slope movement.

Service offering

The Mining3 research team has extensive experience in the application of microseismic monitoring techniques in mining with R&D at over 40 mines globally. These microseismic interpretations may be integrated with other geotechnical data sets and geotechnical models.

The services include:

- Designing, configuring and installing geophone arrays
- Collecting and processing data for interpretation
- Training can be offered for mine staff in the maintenance of the instruments, collection, pre-processing and analysis of the data, for the on-going, on-site monitoring

Benefits

- Identification and assessment of potential failure locations
- Estimation of potential damage scales and unstable volume
- Improved understanding of how induced mining stress affects pit slope stability

Status

The microseismic continuous monitoring approach is a bespoke service offered to mines with slope stability issues. Mining3 will design and implement the system and offer training to mine geotechnical staff to use and interpret the data.

While microseismic monitoring is currently available, Mining3 continues to advance the technology. We are working towards a system with automatic collection and incorporation of high-speed telemetry (e.g. 5G telecommunications) combined with distributed cloud computing and AI technology for rapid monitoring, processing and interpretation of results in near real time.

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Mining3 is the world's leading research organisation, directed by its global mining industry members to develop and deliver transformational technology to improve productivity, sustainability and safety.

About Mining3

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