New intelligent rock bolts for rock mass condition monitoring

M. Nöger[1], T. Ladinig[2], P. Hartlieb[3] and D. Dendl[4]

1. Montanuniversitaet Leoben, Austria, email: michael.noeger@unileoben.ac.at
2. Montanuniversitaet Leoben, Austria, email: tobias.ladinig@unileoben.ac.at
3. Montanuniversitaet Leoben, Austria, email: philipp.hartlieb@unileoben.ac.at
4. DSI Underground, Austria, email: dominik.dendl@dsiunderground.at

ABSTRACT

Currently rock mass monitoring programs are strongly based on observations conducted by engineering personnel on the mine as well as specific monitoring devices installed on selected locations. Shortcomings are that visual inspections of all mine openings are practically impossible on a weekly or daily basis and that documented monitoring data is mostly rather sparse and dependent on local rock mass and stress conditions. As a result, data collection, processing and analysis are rather slow and heavily dependent on experience. Judgement and interpretation are necessary in order to get an overview of ongoing rock mechanics processes, such as stress redistributions, rock fracturing, instabilities etc. Moreover, the evaluation of data needs some time. Accordingly, information and knowledge lag behind ongoing mining activities. The availability of mine wide, real time rock mass monitoring data could overcome at least some of the latter issues.

Digital rock bolts providing information about the state of the bolt and deformation of the rock mass could provide this data. If such data were available, it could be used as an integral part of rock mechanical mine design and mine operation. Examples are derivation of (objective) rock mass characterization and classification, support on demand or adoption of mining layout and mining sequence on demand. Challenges are especially related to the issue that underlying rock mass deformation and failure characteristics must be understood in order to gain benefits from mine wide, real time data. The latter aspect requires further research.

The prevailing presentation highlights possible improvements of real time rock mass monitoring data related to rock mechanics planning activities. The necessity of an in depth understanding of rock mass behaviour is discussed as well.