

Underground Mine Construction

Contact: Peter K. Kaiser
pkaiser@miningexcellence.ca

Purpose - Objectives

This program will support projects for underground construction by both conventional drill and blast as well as mechanical excavation and will focus on four key aspects:

- Speed and quality of underground infrastructure construction including shaft sinking and tunnelling logistics;
- Development and design of innovative support methods for different excavation systems including prototype development and testing;
- Reliable prediction of rock behaviour to properly select and implement construction technologies including effective, advanced ground characterization procedures;
- Use of smart (observational) approaches when working with the rockmass to minimize risks and uncertainties including feedback processes to facilitate flexibility in matching construction to different conditions that will be encountered in large, complex ore bodies (at km-scale).

In this manner, CEMI will establish excellence in underground mine development for new, large mines, focus on ground control issues to facilitate the implementation of new and mechanized technologies, and develop innovative means for ground characterization for mining at depth (reduction of risk and conservatism in design).

Context – Value Proposition

Transition from open pit mines to underground operations for Rio Tinto alone requires on average 5 shafts per year and more than 80km of tunnels. While technological advances facilitate higher drilling speeds, overall advance rates are dropping.

Time is money! Thus, increasing development speed can add hundreds of millions to NPV.

For pre-operational development - for new mines - mechanized excavation technologies are under development for both shaft and tunnel advance with target speeds of >10m/day. Ground control plays a key role in ensuring successful application of step-function technologies.

Project Listing / Description

1. Ground control in mechanized excavations: Shafts and Tunnels
2. Strength and depth determination based on borehole information (laboratory, borehole breakouts, etc.)
3. Development of innovative support systems for rapid instalment (mesh replacement)

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Sub-Project Listing

1. April'09: Preliminary reports on strainburst potential in mechanized excavations at depth and support requirement for rapid shaft advance rates
2. June'09: Guidelines for shaft support, support in mechanized excavations
3. Dec'09: Innovative support systems for rapid development techniques
4. Dec'09: Methods for rock mass strength determination for mining at depth

Industry Sponsorship

Additional industry participation in this project is welcomed through sponsorship and collaboration.

a) Current program sponsors and solution team members:

- The current program sponsoring mining companies are Rio Tinto (lead sponsor), Xstrata Nickel and Vale Inco with Ontario Government leveraged funding.
- Collaborating organizations: MIRARCO, Itasca U.S.; Herrenknecht; Wirth; Atlas Copco; Redpath/Cementation; ROWA Logistics, Laurentian University, and others (TBD).

b) New program sponsors can join as:

- A single strategic research program (SRP) sponsor and contribute \$50,000 per year for 4 years. If the program is extended, new sponsors will be expected to contribute at a higher rate to buy into previous achievements (\$75,000/years). Program sponsors are also expected to make in-kind contributions by providing access to data and information and by designating an active program participant.
- Multiple strategic research program sponsor and CEMI membership (as per bylaws) at \$100,000 per year for 4 years. CEMI Membership allows the member to participate in up to two SRPs and to assume technical advisory functions within CEMI's program management structure.

Benefits to Strategic Research Program (SRP) Sponsorship

- Access to the all products of the research (e.g., data, software tools, manual, etc) for the duration of the project and for use at all of its operations (some confidentiality, IP or copyright rules may apply)
- Receive final reports in electronic form for use within all their operations.
- Members have the ability to focus the research on sponsor specific sites, data and case studies.