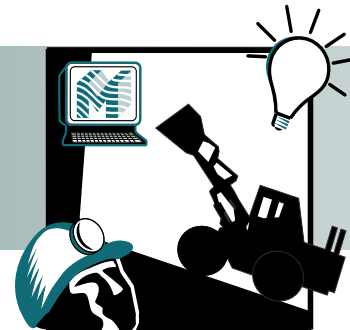# MINING

Project Fact Sheet

COMPUTERIZED ROOF BOLT DESIGN SYSTEM

BENEFITS

- Increases safety in an underground mine
- Decreases energy requirements of clean up efforts of a roof fall
- Decreases cost of clean up of a roof fall
- Reduces waste disposal generated from roof falls
- Improves productivity

APPLICATION

Computerized roof bolt system will reduce the occurrence of roof falls in any underground mine. This will increase mine worker safety and reduce the cost and energy associated with a roof fall clean-up.

ROOF BOLT SYSTEM WILL ENABLE REAL TIME EVALUATION OF ROOF GEOLOGY AND IMPROVE MINE SAFETY

In this project a computerized method to evaluate the roof geology and stability in real-time during roof bolting operations will be developed. In addition, roof bolt system design requirements will be developed. U.S. underground coal mine entries are required by law to be roof bolted. Roof bolting is also the most popular roof supporting method for underground openings in the mining industry, especially in bedded deposits. Hardrock mines commonly implement roof bolting using split set, swellex or cable bolts. However, roof falls still occur frequently in roof bolted entries. Two possible reasons are the lack of knowledge and technology to accurately assess the roof's geological conditions and insufficient roof bolting design to accommodate change in local geology. The development of real time evaluation of roof geology and stability conditions as well as design requirements for roof bolting systems will reduce roof falls.

For the evaluation of roof geology and stability condition in real time, drilling parameters such as feed force, feed rate, rotation torque, rotation speed, drill position, and vacuum condition will be studied. Also, rock cores will be obtained for determining rock strata, mechanical properties and structure within the bolting horizon. For the development of roof bolting requirements, parameters such as bolt size/strength, bolt length, bolt spacing, grout annulus and length, and roof geology will be studied in laboratory and field tests.

The results will be used to develop a computer program that will work with the roof bolter for real-time production of the mechanical properties and structures of roof strata, and design requirements for the roof bolting systems.

ROOF BOLTER

The system will help improve roof bolting operations such as this one shown above.

Project Description

Objective: To improve roof-bolting techniques, the most popular method for supporting roofs in underground mines. A computerized roof-bolting control system that can evaluate the geologic conditions of a roof in real-time will be developed to determine suitable roof bolt system design requirements. Improvements in roof-bolting systems will lead to increased worker protection and mining production.

Progress and Milestones

This project includes the following activities:

- Development of operator control technology for monitoring roof bolter drill operation parameters.

- Laboratory and underground testing of operator control technology.

- Drilling parameter data analyses and correlation with roof stability conditions.

- Software development for mapping of roof geological conditions.

- Computer modeling to investigate the mechanisms of roof bolting.

- Development of computerized roof bolting design system for use in the primary roof bolting cycle.

Commercialization Plan

The results of this project will be aggressively transferred to the mining and scientific communities. The results will be published in various media including peer-reviewed journals and conference proceedings. The research will be presented before professional gatherings including the Society of Mining Engineers, the American Rock Mechanics Association and the International Ground Control Conference. A series of technical workshops will be held throughout the United States where the technology will be demonstrated. The technology transfer program will be focused on obtaining a significant industry penetration within five years.