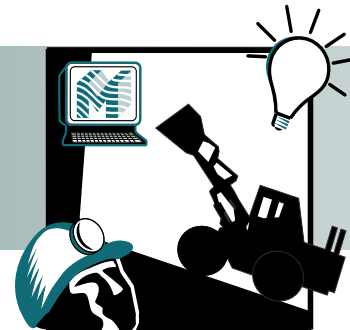


# MINING

## Project Fact Sheet



## ROBOTICS TECHNOLOGY FOR IMPROVING MINING PRODUCTIVITY

### BENEFITS

- Estimated energy savings of 11.6 trillion Btu per year by 2020
- Increases underground mine safety
- Increases productivity and revenue of underground mines

### APPLICATION

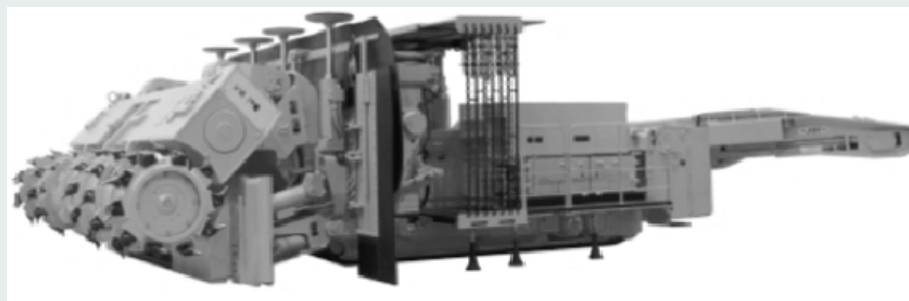
This new technology can be used in underground mining operations to increase productivity and worker safety.

### NEW ROBOTIC SENSORS WILL INCREASE PRECISION OF EXCAVATING MATERIALS

Underground mines are dark, cramped, and often full of airborne dust. They are also very rough and hazardous environments. Under these conditions, operators drive equipment and excavate material often with requirements of high accuracy and precision. It is difficult for operators to see and accurately control mining equipment plus systems. Visual cues are not available to aid the operators. Automation and advanced control systems would increase productivity and decrease the health and safety hazards to mining workers.

Sensors mounted on the mining equipment can accurately measure the machine's position, orientation, and motion. These sensors will assist operators standing at a safe distance to precisely control the machine. Increases in operating precision will increase productivity in underground mining and will decrease the health and safety hazards to mining workers. This technology can also feed information into a control system to permit semiautonomous operation, further reducing the risk to miners.

### CONTINUOUS MINER



**Sensors will be placed on a continuous mining machine to measure the machine's position, orientation, and motion.**



## Project Description

**Objective:** To use advanced sensors mounted on underground mining equipment to increase the precision of material removal and thus reduce re-cuts and reduce the amount of energy used in hauling and excavating materials.

This project requires expertise in human factors engineering. It will evaluate the (1) interface between the new technology and operators, (2) navigation systems to provide direction and orientation information, (3) advanced control systems to guide the equipment and (4) robotic expertise to be able to implement advanced technologies in remote operations. Basic robotic technology and expertise will be provided as well as facilities to conduct tests and simulate underground conditions. A test bed and a continuous miner will be used for testing prior to underground operation. Final field trials will be conducted by actual machine operators in actual underground conditions on production equipment.

## Progress and Milestones

This project includes the following activities:

- Develop and mount prototype robotic sensors for testing
- Field test the sensors in an underground mine
- Analyze underground test results, and provide recommendations for methods to improve the interaction between the operator and the machine
- Develop prototype autonomous control system
- Conduct and report on further underground testing of the improved system



### PROJECT PARTNERS

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