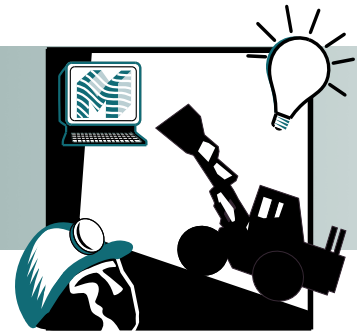


MINING

Project Fact Sheet



HORIZON SENSING™

BENEFITS

- Saves energy by maximizing cutting efficiency
- Increases recovery and quality of run-of-mine product
- Allows for deeper mining
- Increases mine worker safety

APPLICATION

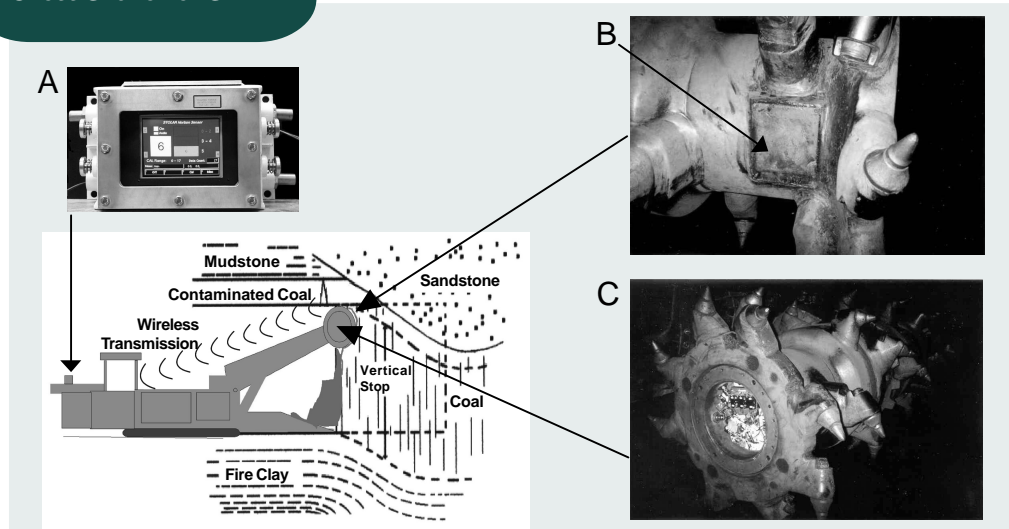
Remote sensing and imaging at the cutting edge of mine equipment will be used in both surface and underground mines to mine cleaner coal, trona, and potash; help increase productivity; and ensure mine safety.

REMOTE SENSING AND IMAGING TO CUT CLEAN-COAL AND OTHER MINERALS MORE EFFICIENTLY

This project will demonstrate the feasibility and benefits of real-time horizon sensing and bit drag and side force measurements on cutting drums of longwall shearers and continuous mining machines. The sensing technology can also be applied to boring machines, front-end loaders, and drag lines. The application of cutting-edge technology to mining machines will reduce dust exposure to machine operators; enable mining of clean-coal, trona, and potash; minimize waste rock; increase energy-efficient recovery and yield; and enable automation of machines mining metal and nonmetal deposits.

In both surface and underground mines there are barriers beyond which extraction may not occur. In undulating seam deposits, remote sensing can prevent cutting through thin contaminated layers next to the bounding sedimentary rock layer. Because of biological and chemical reactions occurring at the time of peat-coal burial, thin layers of boundary coal contain higher percentages of sulfur, ash, and heavy metal such as mercury. Leaving the boundary layer behind will result in clean-coal mining. Seam boundary contamination also occurs in other mineral deposits. A cutting-edge sensor can reduce the amount of waste rock and increase yield in coal, trona, and potash mining. Real-time sensor signals will enable automated vertical control and not require an operator to be in close proximity to the machine. This reduces dust exposure to mine personnel. Leaving the boundary layer of coal, trona, and potash will improve ground control and prevent roof falls. Monitoring bit forces will optimize bit location on the cutting drum bit for maximum cutting efficiency. All of these benefits contribute to increased productivity and mine safety.

CROSS SECTION OF SEAM



Horizon Sensing for Continuous Miners is comprised of the following: (A) Display readout outby on machine, (B) Coal thickness sensor and data transmission antenna, and (C) Electronic package in drum end (cover plate removed).



Project Description

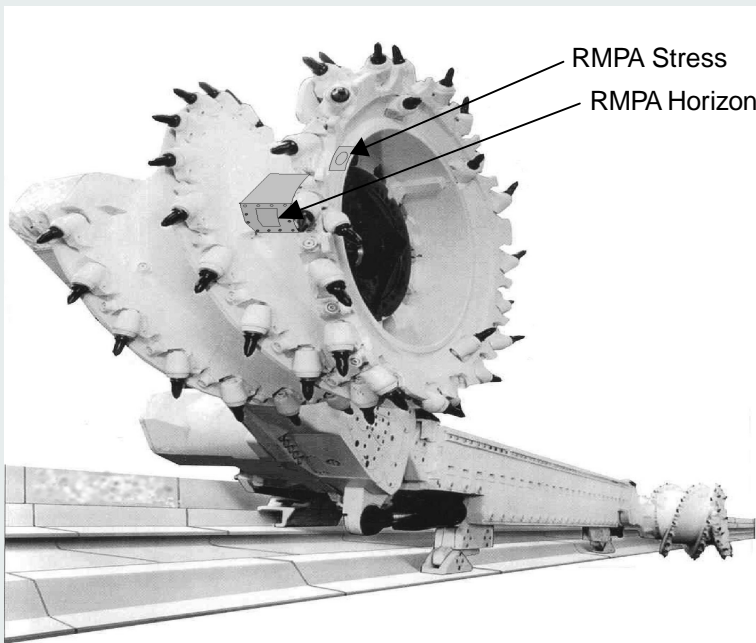
Objective: To test remote sensing and imaging technology on the cutting edges of mining equipment to make real-time measurements of mining conditions. Researchers hope to develop a cutting-edge sensor that will improve worker safety by preventing mining into high-pressure water/carbon dioxide cavities, and by allowing greater remote control of equipment while improving the efficiency of mining operations.

Progress and Milestones

Activities to be completed in this project include:

- Install electronic measuring instrumentation and Resonant Microstrip Patch Antenna (RMPA) sensors on cutting drums, rotating arms, and buckets. Instrumentation will achieve Mine Safety and Health Administration flameproof approval for measurement electronics in coal and trona deposits.
- Develop Neural Network Software and algorithm enhancements for the drum sensor application. Modify software as necessary to achieve the desired graphical presentation to machine operating personnel. Graphical enhancements include display of uncut coal thickness, and detection of hazardous conditions ahead of mining (water- and carbon dioxide-filled cavities).
- Conduct in-mine tests for continuous miner, bore miner, and bucket.

LONGWALL HORIZON/STRESS SENSOR



Proposed mounting of RMPAs and explosion-proof enclosure on shearer drum. The explosion-proof enclosure is welded between the face bit ring and vein of the drum. The RMPA sensors are protected by Lexan plates and mounted at the approximate level of the bit block.



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