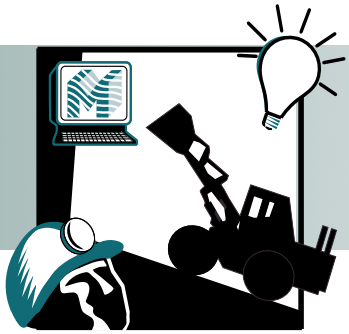
MINING

Project Summary Sheet



MINING INDUSTRY OF THE FUTURE RESEARCH

Benefits

- Increases health and safety
- Decreases environmental impacts
- Advances technology for resource identification
- Advances technology for mineral processing
- Improves mining productivity
- Energy savings of over 480 trillion Btu's by the year 2010
- Reduction in carbon emissions of over 200 thousand metric tons by the year 2010

Application

The results of these research activities will help the mining industry save energy, increase productivity, and reduce waste and pollution. Research results are disseminated through industry conferences, final reports, and other media.

The US Department of Energy, Office of Industrial Technologies, Mining Industry of the Future recently awarded 10 projects that address industry research priorities as defined in the *Mining Industry Roadmap for Crosscutting Technologies*. This cost-shared research will benefit the metal, coal, and industrial mineral mining industries through improved safety, enhanced economic competitiveness, reduced energy consumption, and reduced environmental impacts.

The following is a description of the proposals selected for funding.

Imaging Ahead of Mining

Objective: To use the Internet, instrumentation advances, and newly developed modeling and analysis software to accurately image the volume of material ahead of mining, thereby improving the quality of mined ore, reducing wear on mining machinery, facilitating mine operations, and reducing cost.

Partners: Sandia National Laboratories; West Virginia University; Stolar Horizon, Incorporated; CONSOL Inc.; Kennecott Exploration

Development and Deployment of Automated Machine Fluid Analysis Systems

Objective: To implement advanced in-line and on-line systems for machine condition diagnostics and prognostics based on analysis of lubricating oils and hydraulic fluids.

Partners: Pacific Northwest National Laboratory; ASARCO, Inc.; Oil Analysis Laboratory, Inc.; Belhaven Applied Technologies

Drilling and Blasting Optimization

Objective: To use seismic analysis and x-ray fluorescence spectroscopy to characterize rock structures and to develop more efficient blasting strategies. Use of these combined technologies will optimize rock breakage, which will lower energy requirements for grinding and crushing of the extracted rock.

Partners: Lawrence Berkeley National Laboratory; Phelps Dodge Mining Company; Thunderbird Pacific Corp.; University of Arizona

High Temperature Superconductors in Underground Communications

Objective: To develop and apply high temperature superconductors in underground communications to improve safety, productivity, and energy efficiency. The use of superconducting materials in communication equipment will increase the range of through-the-earth communications and make underground wireless networks a practical reality.

Partners: Los Alamos National Laboratory; Hecla Mining Company; CONSOL Inc.; Cyprus Amax Minerals Company; ASARCO Incorporated; Phelps Dodge Mining Company; Raton Technology Research; Harris Communications; Waste Isolation Pilot Plant; Colorado School of Mines

Hydride-Fuel Cell Mining Vehicles

Objective: To develop a new low-cost method of safely storing hydrogen for fuel-cell-powered, mining vehicles based on metal hydride technology. The hazards of diesel exhaust particulates in underground mines have driven the development of clean alternative fuel cell power supplies for mining equipment and vehicles. Safe and cost-effective hydrogen storage is needed to enable this new technology.

Partners: Savannah River Technology Center; Fuel Cell Propulsion Institute; Hydro Quebec; University of South Carolina

Mine Compatible Laser Analysis Instrument for Ore Grading

Objective: To better understand the composition of ore at the rockface and during transport to ore processing facilities using new laser analysis technology. Use of this handheld and rugged technology will improve the efficiency of mining and processing of ore by limiting the need to move excess topsoil or overburden.

Partners: Idaho National Engineering and Environmental Laboratory; Advanced Power Technology Incorporated; JR Simplot; Baker Hughes Process; University of Utah

Mining By-product Recovery

Objective: To implement a by-product recovery process to increase the amount of product generated per ton of material and to reduce the amount of waste and toxic materials generated by mineral processing activities. This project will also analyze the economics of this separations technology that is expected to have wide applicability for recovery of numerous by-product minerals.

Partners: Oak Ridge National Laboratory; SepraDyne Corporation; Colorado School of Mines

Robotics Technology for Improving Mining Productivity

Objective: To use advanced sensors mounted on underground mining equipment to increase precision and reduce the amount of energy used to haul and excavate materials.

Partners: Idaho National Engineering and Environmental Laboratory; CONSOL Inc.; Joy Mining Machinery; Carnegie Mellon University

Selective Flocculation of Fine Mineral Particles

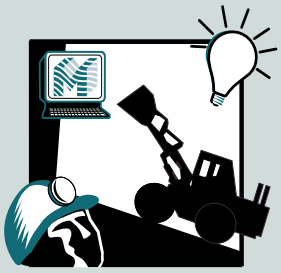
Objective: To better understand the parameters that affect selective concentration and separation of fine mineral values from waste minerals, and to integrate selective flocculation technology into the beneficiation schemes for phosphate, coal, and other minerals. Selective flocculation will improve fine particle recovery and increase energy efficiency in the minerals-processing industry.

Partners: DOE Albany Research Center; JR Simplot; Florida Institute of Phosphate Research; Peabody Group; Ciba Specialty Chemicals USA; University of Kentucky-Center for Applied Energy Research; Pennsylvania State University; University of Idaho

Three-Dimensional Simulation of Charge Motion in SAG and Ball Mills for Energy Efficiency

Objective: To develop a three-dimensional simulation software to optimize the operation of grinding mills. The throughput of grinding mills depend on the motion of charge within the mills which in turn depends on the lifter design and mill speed. For various mill designs, the best motion of charge that converts the input electrical energy into maximum breakage of feed ore is identified. Implementation of this technology could increase the grinding efficiency by 30 percent over current practices.

Partners: Idaho National Engineering and Environmental Laboratory; Barrick Goldstrike Mines, Inc.; Kennecott Utah Copper Corporation; Process Engineering Resources, Incorporated; University of Utah



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Washington, D.C. 20585-0121

October 1999