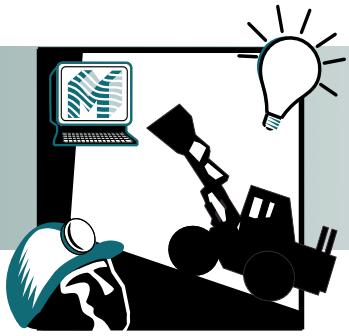
MINING

Project Fact Sheet



CastCon Process for Mining Applications

Benefits

- Increases energy savings through components lasting longer without blunting edge
- Decreases volume of drilling fluid released to the environment
- Permits smaller and more stable underground openings
- Reduces operating costs

Application

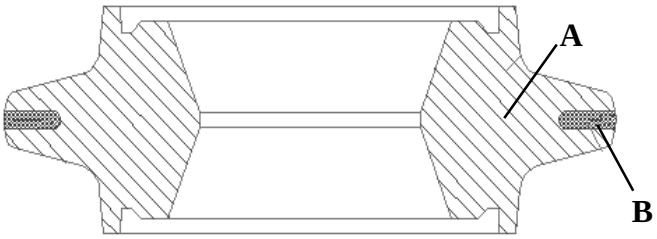
Advanced materials apply to industry research priorities such as enhanced exploration and resource characterization, material wear properties, and new materials for wear resistance. Since drilling, cutting, digging, crushing, and grinding play such a large role in mining, these advanced materials can be used throughout the mining industry.

Advanced materials double the useful life of vital components

This project will explore new materials and manufacturing technology applications in the mining industry in order to improve competitiveness. Specifically, this project will increase the wear resistance of rock drill bits and disc cutters. Among the various wear components used in the mining industry rock drill bits and disc cutters play a critical role in the production process. The mining process, overall, involves a great deal of rock fragmentation in the form of drilling, cutting, digging, crushing, and grinding. The tools that apply the fragmentation energy are subjected to severe impact and wear conditions. The ultimate failure of these tools significantly effects mine productivity. Increased wear resistance will reduce downtime, increase processing rates, and reduce overall production costs.

The key to improving the performance of these components is to increase both hardness and impact resistance of the insert or cutting materials. In order to improve both properties from a material science point of view, the microstructure or grain size of the materials must be very fine. Recent development in nanometer materials have shown the possibility of increasing both toughness and hardness of hard materials. This project will double the useful life of the components. This will increase energy efficiency and reduce total operating costs.

Disc Cutter Structure



The disc cutter body material (A) surrounding a hard material insert (B) will be HIPped in one step by the CastCon Process.

Project Description

Objective: To develop an efficient means for producing rock drill bits and rock disc cutters that last longer, increase energy efficiency and penetration rates, and lower overall production costs.

This research will explore the opportunities of applying new materials and manufacturing techniques on the wear components used by the mining industry. Initially two key wear components, rock drill bits and disc cutters, used in exploration and mining will be targeted for development. These key components play an important role in increasing efficiency, reducing downtime, and lowering production cost of excavation. Successful research and consequent industrial applications of the new technology will have the potential to double the life and penetration rates of wear components and will greatly reduce energy consumption and operating costs in exploration and mining.

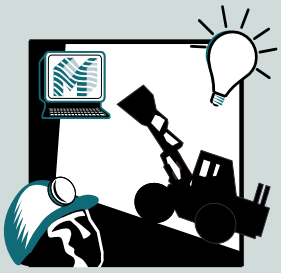
Progress and Milestones

Activities to be completed in this project include:

- Material selection, macro composite structure design, and specimen production and evaluation in preparation for the blasthole bit and disc cutter prototypes.
- Successful production of the new bit and cutter prototypes, preliminary property evaluation of the prototypes, and performance characterization of the prototypes in comparison with current components.
- Completion of field testing of the new wear components, industrial production assessment, economic assessment, and initiation of technology marketing.

Commercialization Plan

The Institute of Materials Processing is the leading division at Michigan Technological University in technology transfer. A majority of the technologies licensed by Michigan Technological University to industry have come from the Institute. The proposed manufacturing technology is related to two existing patents developed at the Michigan Technological University and an invention disclosure describing the new development of this technology concept is on file with the University. Intellectual property associated with the new development will be owned by the University. Accordingly, the most expeditious way to disseminate the complete technology package to interested parties is to license the technology. Interested organizations will have both the business incentive and technical background needed for rapid implementation of the process to commercial operations.



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