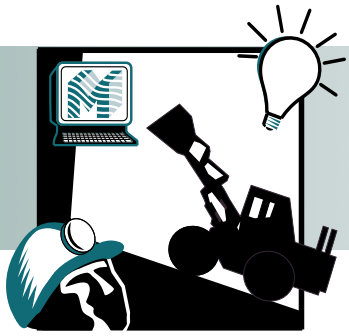
MINING

Project Fact Sheet



HYDRIDE-FUEL CELL FOR MINING VEHICLES

BENEFITS

- Estimated energy savings of 1.7 trillion Btu per year by 2020
- Elimination of diesel exhaust fumes in underground mines
- Operational cost savings due to decreased ventilation requirements in underground mines

APPLICATION

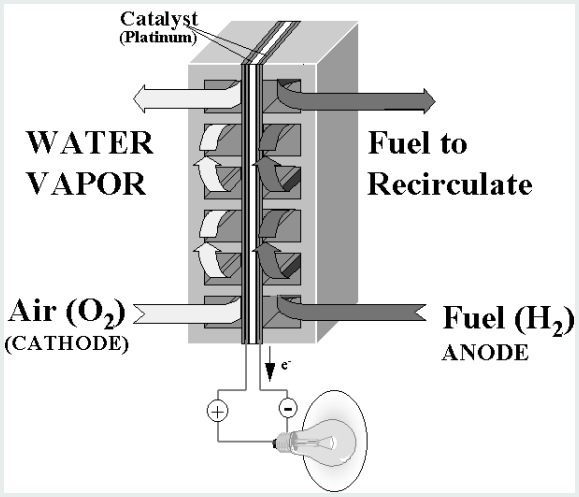
With safe, low-cost hydrogen storage, the total market for fuel cells in underground mining is estimated to be 3600 MWe. There are approximately 10,000 diesel haulage vehicles in the coal industry alone, and a production rate of 1,200 vehicles that could be converted to fuel cell vehicles.

NEW PROCESSING TECHNOLOGY ALLOWS SAFE HYDROGEN STORAGE FOR CLEAN FUEL CELL POWER

The hazards of diesel exhaust particles in underground mines have driven the development of clean alternative power supplies for mining equipment and vehicles. Fuel cell electric power systems are an emerging technology that offers reduced emissions, reduced noise, and improved energy efficiency in vehicles. Although hydrogen is the fuel for fuel cells, most new fuel cell systems use hydrocarbons to store the hydrogen. Using hydrocarbons to store hydrogen is difficult in underground mining, thus development of safe and cost-effective hydrogen storage is needed to enable this new technology.

Current hydrogen storage methods for fuel cells, including liquid hydrogen and high-pressure gas, raise numerous safety concerns for mining applications. Metal hydrides are a special class of compounds that store hydrogen in a solid metal powder, making it safe for use in underground mines. One historic problem with metal hydrides is the relatively high capital cost of the technology. This project will use mechanical alloying, a new metal processing technique, to develop lower cost, better performing metal hydrides for safe hydrogen storage.

FUEL CELL



Fuel cells use hydrogen and oxygen to produce electrical energy with water as the only by-product.

Project Description

Objective: To develop a new low-cost method of safely storing hydrogen for fuel cell-powered mining vehicles based on metal hydride technology.

Mechanical alloying will be used to develop new metal hydride materials. Testing of the metal hydrides as well as development of hydrogen storage systems and fuel cell operations are key steps in the research project. Collecting valuable industry data and conducting technical and commercial market analyses for the new hydrogen storage systems are the final steps in the project.

Progress and Milestones

This project includes the following milestones:

- Development of new metal hydride materials
- Design of mine compatible storage container
- Fabrication of prototype mine storage bed
- Demonstration of storage system onboard existing fuel cell vehicle
- Demonstration of a low-pressure refueling option in conjunction with a hydrogen generator

Project Partners

Savannah River Technology Center
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Fuel Cell Propulsion Institute
Denver, CO

University of South Carolina
Columbia, SC

Hydro-Quebec
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Stuart Energy Systems, Inc.
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November 1999
(Revised August 2001)