

# Industrial Technologies Program

## Infrastructure for Integrated Data Environments and Analysis (IIDEA) for Mining and Processing Systems

### Data Integration Leads to More Efficient Process Control

Modern mines employ technology and equipment that generate increasingly more data, such as geological databases, material handling monitoring systems, and enterprise systems. As efforts for developing information continue, an additional problem is arising: how to go from data accumulation, to creating knowledge, and to action that can save money and energy in an operation. New tools are needed to analyze these huge datasets to generate useful and actionable information.

Researchers at the University of Arizona will develop the core components of the IIDEA: an Infrastructure for Integrated Data, Environments and Analysis. This is a set of methodologies, information models, software architectures, and analysis and simulation tools. This new mine engineering/management toolbox is specifically for 1) analyzing mining data and processes, 2) generating process knowledge, and 3) designing and validating actions that would improve the mining system.

The project approach involves extracting, cleaning, and integrating data from multiple sources such as mine planning software, process monitoring systems, and enterprise systems.

Automated controls or decision support tools need to be developed to translate this data into specific action strategies. At a particular mine site, an IIDEA would be a networked set of computers with specialized software and data servers.

Two test models will be developed and deployed at operating mines to prove that IIDEA can enable and facilitate the creation of highly effective process control. These models will include:

- A small-scale materials handling energy consumption model (ECM) that calculates and reconciles the energy expenditure in the shovel/truck portion of a materials handling system. Additionally, a large-scale ECM that calculates and reconciles the energy consumption in the production chain from the face through to the Solution Extraction / Electro Winning (SX/EW) plant.
- Mine-to-leach (M2L) process control model that tracks the variables of the production chain from face to leach-pad, and can identify changes in the mine that would improve performance of the heap leach process. Programs to reduce the variability of blast results, define ideal fragmentation distribution, accurately measure fragmentation distribution, and track the flow of material, are just a few examples of M2L.

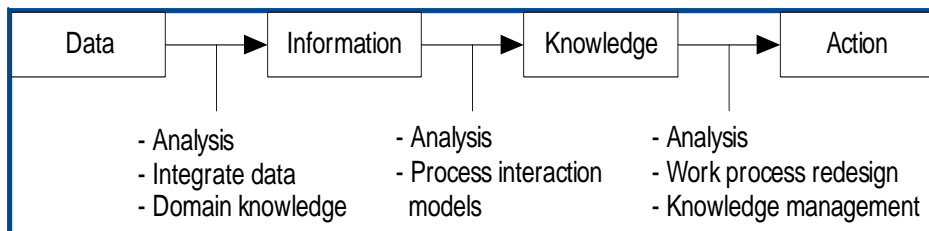


### Benefits for Our Industry and Our Nation

- Improves metal recovery of heap leach operations by 10%
- Decreases mining dilution by 5%
- Decreases misdirected tons (ore vs. waste) by 1%
- Improves crushing efficiency by 10%
- Reduces energy consumption by 16%

### Applications in Our Nation's Industry

These research tools can be applied across the metals mining industry.



Evolution of Data to Action

## Project Description

Objective: To lower energy costs in all phases of mining and processing through better monitoring and understanding of the production processes with an infrastructure for integrated data environments and analysis (IIDEA) modeling software for mining and processing systems.

The project addresses the common issue of being 'data rich but information poor.' This project's technical objectives are twofold: 1) research and develop an infrastructure that will facilitate the development of data-driven improvements, and 2) test the IIDEA by creating and deploying process control models. The M2L and ECM models are used as a means to test the effectiveness of using an IIDEA.

The research team for this multidisciplinary project includes four universities, two software technology suppliers, and the largest U.S. copper producer.

## Milestones

- Track energy consumption of truck and shovel operations and conveyors
- Test three IIDEA components: integrated data, analysis and validation
- Develop a complete Mine-to-Leach optimization plan, and global ECM model from mine face to leach-pad
- Expand IIDEA by incorporating multiple data types and sources

## Project Partners

University of Arizona  
Tucson, AZ

Phelps Dodge Corporation  
Safford, AZ

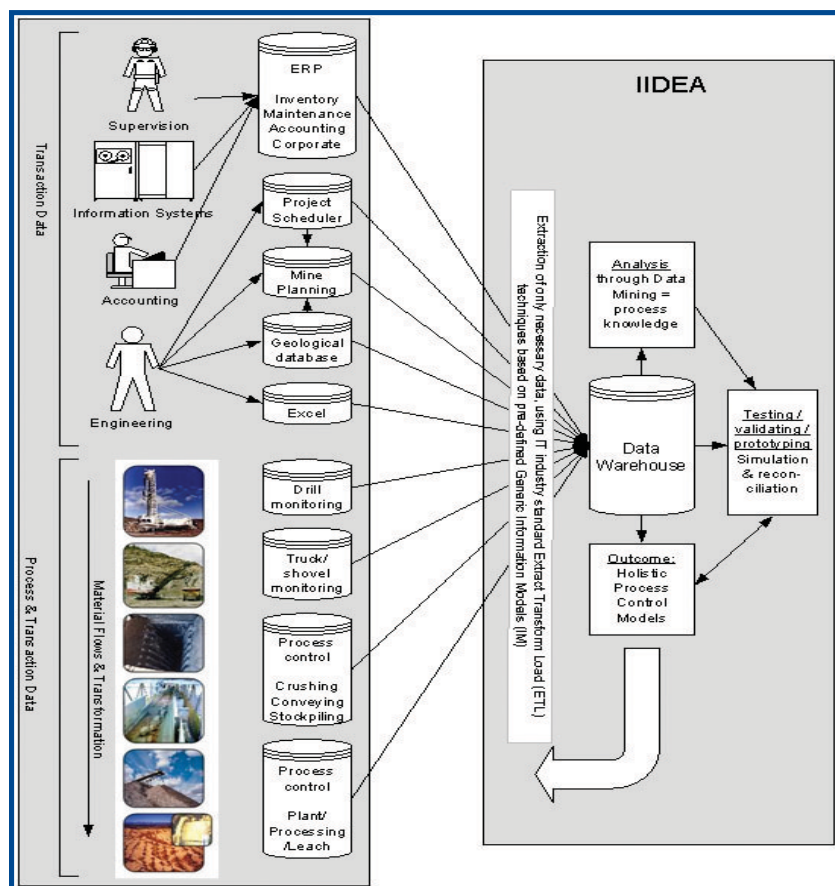
Mintec, Inc.  
Tucson, AZ

Dimension Technology Solutions  
Littleton, CO

University of Alaska, Fairbanks  
Fairbanks, AK

The Pennsylvania State University  
State College PA

Virginia Polytechnic Institute and State University  
Blacksburg, VA



Technical Concept of the IIDEA

## A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.

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