Development of a Novel Dry Coal Processing Technology

High-Density Deshaling Unit at the Point of Extraction will Lead to Energy Savings Downstream

The extraction of coal typically results in the recovery of unwanted rock that ranges from small to very large quantities depending on seam thickness and other characteristics. Deshaling is the process of removing unwanted rock from run-of-mine coal. In some areas of the United States, large quantities of rock are being extracted in order to recover the coal, reportedly resulting in 60%-70% of the raw material being rejected as waste. The haulage, processing, pumping, and storage of the rock represent significant energy inefficiency and have negative environmental impact.

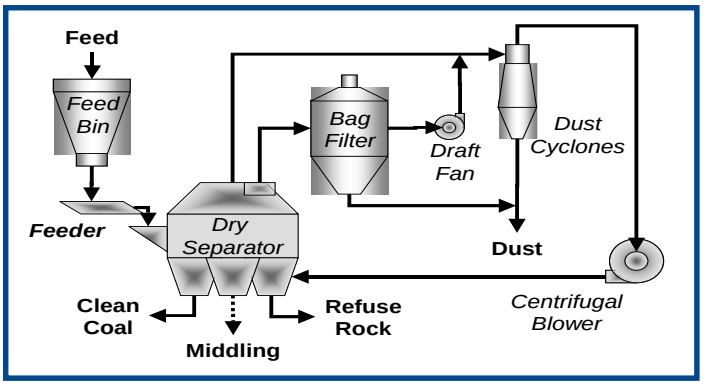
Researchers at the University of Kentucky are proposing to develop and evaluate a mobile dry coal cleaning (deshaling) process near the extraction point or working face of a mining operation that will provide a high-density (2.0 specific gravity) separation for the removal of unwanted rock. In the eastern U.S. coalfields, the content of high-density rock in the raw feed is increasing with current values being around 40-60%, while western coals contain around 5-10% by weight.

Removing pure rock material near the extraction point would reduce the energy required for material haulage from the mine site to the preparation plant or load-out facility, and from the preparation plant to the refuse disposal area.

Wet-based separation processes are the most commonly employed cleaning units for removing rock from coal. The problems with the most frequently used wet deshaling separators are their generally massive size, immobility, and requirement of water addition and a slurry treatment system. Dry processes are preferable but typically are inefficient in preventing the loss of coal to the reject stream. The best practice pneumatic density-based separator has a probable error value of around 0.3.

The dry deshaling system being developed is expected to meet the following requirements:

- Achieve 2.0 specific gravity (with a probable error of 0.15-0.25);
- Prevent the loss of coal to the reject stream;
- Mobile system;
- Require low maintenance;
- Low (or no) water requirements;
- Low operating and capital costs.



Flowsheet of the Dry Compound Separator System

Benefits for Our Industry and Our Nation

- *Improves plant efficiency by at least 1%, which is roughly equivalent to a 20% improvement in overall mine profitability.*
- *Increases mass recovered by 2.8% more than the best practice pneumatic dry deshaling. technology, resulting in 5% energy savings.*
- *Reduces materials handling needs by 1%, resulting in downstream electrical savings by reducing the amount of processing required for the same coal production.*
- *Decreases environmental impact by reducing SO_x and trace element emissions, and waste storage utilization.*

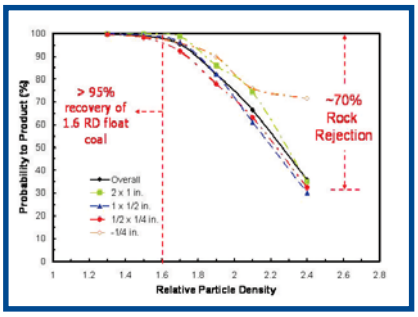
Applications in Our Nation's Industry

Utilizing this dry separator near the point of extraction will enable recovery of a large part of the raw material in the extraction of coal at surface mines.

Project Description

Objective: To develop and evaluate a novel dry deshaling technology that is mobile and can be integrated into mining operations for the purpose of removing high ash content material prior to loading and hauling to further coal cleaning or load-out facilities.

The University of Kentucky is leading this effort with the help of Virginia Tech, a major process equipment manufacturer (Eriez Manufacturing) and three leading coal mining companies (Peabody Energy, Massey Energy, and Falkirk Mining/North American Coal). The three mining companies make up 20% of the total U.S. coal production and will provide 4-5 test sites that are located in West Virginia, North Dakota, Texas, and New Mexico. The evaluation of the deshaling unit at these surface mine test sites will be conducted on lignite, sub-bituminous and bituminous coals. Eriez will supply a 5 ton/hr pilot-scale unit of the dry, density-based separator and technical assistance in the operation of the unit.



Performance Curves Achieved From Dry Cleaning Bituminous Coal From Utah

Mobile 5 ton/hr Cleaning Unit

Milestones

- Create and develop the new cleaning technology. (2005)
- Deploy the new technology at test sites on the east and west coasts. (2006)
- Modify technology based on site test results and redeploy the new technology on the east coast for a second test. (2006)
- Conduct an economic and energy efficiency feasibility study. (2006)
- Conduct near-face extraction application: deshaling application for rock removal prior to transport. (2007)

Commercialization

The research team heading this project is comprised of a major equipment manufacturer as well as two other significant companies that would benefit from the project's completion. If the project is successful in reaching its objective, the results of the study will be presented to the coal industry at professional meetings and workshops by the investigators. Other major commercialization pathways include:

- Requests for quotes were issued for three 200 ton/hr units. The purchase has been submitted as part of the companies annual budget request. Decision has not been announced.
- Eriez Manufacturing represents the technology and is eager to successfully realize the first commercial application of the FGX unit.
- University of Kentucky and Virginia Tech provides a strong team of researchers who will assist in product development, performance evaluation and application assessments.
- Modifications identified during the initial test program may improve performance and expand the application.

Project Partners

University of Kentucky
Lexington, KY

Virginia Tech University
Blacksburg, VA

Massey Energy
Charleston, WV

Peabody Energy
St. Louis, MO

The Falkirk Mining Company/North American Coal Corporation
Underwood, ND

Eriez Manufacturing
Erie, PA

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.

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

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Ending in FY 2007