

Kentucky May Coal Gains Quick Return on Ash Analyzer

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Coal companies continually strive to improve bottom line profitability by implementing processes that reduce overall production costs. These cost reduction efforts coupled with the establishment of mutually beneficial relationships with coal-fired electric generators can pay large dividends. Operating in a free market economy requires diligent effort to optimize coal quality and price relationships.

Online analysis is one tool that plays a key role in minimizing costs at the mine and the power plant. The different conditions encountered while extracting coal from the seam yield a significant variation in ash content due to dilution from the mine's roof, floor, and rib, and from clay, rock, and other debris. At the mine, online analysis provides the opportunity to control the ash content, enabling the mine to match production to contract specifications.

Physically extracting samples from a coal stream flowing on a conveyor has significant limitations with respect to using these samples to resolve the instantaneous variations, which occur in the feed stream from the mine mouth and to the furnace. The best of modern combustion controls unassisted cannot always cope with the rapid variations in coal composition and load that have to be accommodated. At the mine and in the power plant, online analysis improves the ability to cope with these instantaneous variations.

M&T MINE INSTALLS ONLINE ASH ANALYZER

Kentucky May Coal Co. produced about 20,000 tons per month (tpm) from its M&T mine located near Long Fork in Pike County, Ky. The M&T mine uses a Fairchild miner to extract coal from the Lower Elkhorn seam.

At times, significant quantities of low ash coal are mined, but when cuts are taken near the roof and the floor, high-ash material enters the coal stream. The ash content of the run-of-mine (RoM) coal averages about 23%, and ranges from 6% to 34%.

A tool for separating lower-ash from higher-ash coal, such as an online analyzer, would maximize the benefits derived from recovering greater quantities of coal. The ash analyzer also could help the mine ship coal that more closely meets coal contract specifications—bottom line profitability could be improved.

Kentucky May Coal Co. installed an Energy Technologies, Inc. (ETI) Ashmeter to give the M&T mine the capability to sort its production into preselected ash fractions. The Ashmeter was installed on the 42-inch mainline convey-

or belt located near the portal. Kentucky May Coal selected 12% as the set point for sorting the lower-ash from the higher-ash coal. Coal with an ash content less than 12% is sorted into one stockpile for direct shipment to utilities that require low-ash coal. Coal with an ash content greater than 12% is directed into another stockpile and hauled to Kentucky May Coal Co.'s Arnold Fork prep plant, which produces a final washed coal with 6.5% to 7% ash content.

A flop gate, fabricated by ETI, provides the mechanism required to separate the RoM coal into the two ash fractions. The distance from the Ashmeter to the flop gate is 60 feet (ft), which is sufficient to allow the ash analyzer's control software to collect and evaluate the necessary data. A signal is sent in a timely manner to actuate the flop gate control mechanism to sort the coal into the desired ash fractions.

HOW DOES THE ANALYZER SEPARATE THE FRACTIONS?

The Ashmeter is a nuclear gauging device that uses sealed radioactive sources. It's a rugged, belt-mounted device assembled in a dust- and waterproof unit bolted to the conveyor frame. The source head, containing two gamma particle sources, is mounted above the belt and collimates a radiation beam down through the material to be gauged. A radiation energy sensitive detector is mounted in the beam path under the belt.

The measurement principle is based on the different attenuation characteristics of gamma particles as a function of energy. This difference depends on the atomic number of the gauged material such that the gauge response can be interpreted as a change in the ratio of

groups of elements having different average atomic numbers.

The analyzer's data acquisition and control system, equipped with menu-driven software, provides an operator interface with the system. An analog output signal provides instantaneous measurements compiled into percent ash and tons-per-hour direct readouts.

The control panel allows the mine to manually control the sorting process in the event of a malfunction. The control panel's sorting buttons function just like the computer-controlled sorting operations, although the control panel allows the computer control to be overridden.

The sort gate is a process control device with manual and automatic modes that provide operation flexibility and control. Digital output contacts are connected to alarms to support sorting set points and provide sorting control.

The data processing device assembly at the mine consists of the Ashmeter enclosure, a computer system with a modem, a computer monitor, input/output equipment, a control panel, and a line printer.

The software provides the interface between the belt-mounted assembly and the user display equipment. The software allows users to observe the processed ash, tonnage, moisture (predetermined, fixed value), and as-received heating values of the measured coal. Outputs are observed on a monitor and adjustments can be made to the ash set points as needed.

The Ashmeter installation does require licensing by the Nuclear Regulatory Commission (NRC). ETI assisted Kentucky May Coal Co. with the NRC licensing process.

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Table I—Recovery Rates Improve Greatly After Installing the Ash Analyzer.

Date	Production (tons)	Customer (tons)	Prep plant (tons)	Washed (tons)	Reject (tons)	(%) Recovery	(%) Reject
Dec. '96							
Tons	22,524	578	1,946	13,245	8,701	60.4%	39.7%
% Ash		16.90		6.70			
% Sulfur		0.56		0.61			
Dry Btu		11,485		14,077			
MAF Btu		14,896		15,088			
May '97							
Tons	19,067	12,399	6,668	4,847	1,820	72.7	27.3
% Ash		13.20		7.00			
% Sulfur		0.68		0.63			
Dry Btu		12,060		14,008			
MAF Btu		14,974		15,062			

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The assembly was bolted onto the existing belt structure without modifications. Installation time was minimal. The mine provided a 120-volt AC, 60-hertz electrical source required to operate the ash analyzer. ETI installation personnel installed a conduit from the power source to the Ashmeter.

OUTSTANDING RESULTS

The Ashmeter has become a valuable sorting instrument to M&T's mining and operating personnel because of its unlimited flow capacity and near instantaneous measurement of total ash and tonnage.

The top size of coal analyzed by M&T mine with the analyzer typically ranges from 0 to 6 inches, but can accommodate up to 12-inch thick material. While the ash analyzer can accommodate coal flow variations ranging in depth between 1 and 14 inches, a uniform coal flow on the belt provides the best results.

The mine owner preselects the time interval that is used to actuate the flop gate, e.g., three, six, or nine seconds, after which the software actuates the flop gate motor. The flop gate changes the direction of coal flow from one stockpile to the other when the coal ash quantity passes through the ash set point, which in the case of M&T mine is 12%.

Kentucky May Coal Co. has increased M&T's recovery rate from approximately 60% to about 73%. Before installing the ETI Ashmeter, about 40% of production was rejected. After installing the Ashmeter, the reject rate dropped to about 27%. A recovery rate improvement of 22% based on Table I adds substantially to bottom line profitability.

Installing the Ashmeter reduced the delivered ash content and enhanced the heating value. Prior to the Ashmeter installation, Kentucky May Coal Co. was penalized heavily for ash contents exceeding and heating values below contract specifications.

The analyzer enabled the mine to ship 60% of its RoM production directly to customers without washing, which resulted in an annual savings of nearly \$500,000. The savings resulting from the 144,000 tons of RoM coal shipped directly to the customer paid for the purchase and installation of the equipment in less than two months. The \$482,000 savings represents a 40% reduction in coal prep costs. CA

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