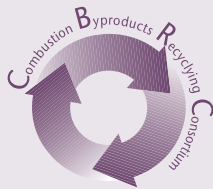


Project Facts



Promoting and supporting the commercially viable and environmentally sound recycling of coal combustion byproducts for productive uses through scientific research, development, and field testing.



Department of Energy
National Energy Technology
Laboratory

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Environmental Performance Evaluation of Filling and Reclaiming a Surface Coal Mine with Coal Combustion Byproducts

Project Objectives:

- Develop environmental chemistry knowledge on the interaction of coal combustion byproducts (CCBs) and water in mined land
- Establish neutralization value and document formation of chemical precipitates
- Obtain field-scale hydrologic and water quality data
- Conduct in-depth analysis for metals chemistry in pore water from cores obtained from laboratory experiments

Background

U.S. electric utilities produce more than 105 million tons of CCBs each year. Approximately 30 percent of CCBs are put to beneficial use and the rest are disposed of in landfills and impoundments. CCBs possess chemical and physical characteristics that are desirable for beneficial use. CCBs placed in mines can reclaim mine lands for productive use in an economic and environmentally sound manner. Using CCBs in mine filling can eliminate the need for converting lands near power plants to landfills and impoundments. However, perceptions and lack of reliable scientific data continue to create obstacles for increasing or even retaining the current use of CCBs in active and inactive mines. Because millions of tons of CCBs can be beneficially used in mine-filling operations on an annual basis, this is an attractive high-volume use option.

Description

Use of CCBs in filling mines has recently received attention from environmental groups and the U.S. Environmental Protection Agency (EPA). In a May 22, 2000, regulatory determination, EPA stated its intent to develop national regulations under Subtitle D of the Resource Conservation and Recovery Act (RCRA) or upgraded Surface Mining Control and Reclamation Act (SMCRA) controls for CCB wastes used to fill surface or underground mines to ensure protection of human health and the environment. EPA specifically noted concerns about certain practices, such as placement directly into groundwater. Therefore, research that develops scientific insights into the environmental chemistry of CCBs in mines to alleviate groundwater quality concerns is critical to assuring that the regulations will be developed so that they are no more stringent than necessary to protect human health and the environment.

This research project is designed to develop information on the geochemistry and hydrology for conducting environmental performance evaluation of a surface mine that has been filled with CCBs. At least 18 months of hydrologic, geochemical, and water quality data will be collected and analyzed for chemical, mineralogical, and hydrologic parameters. The data will be analyzed using appropriate statistical, graphical, and modeling techniques.

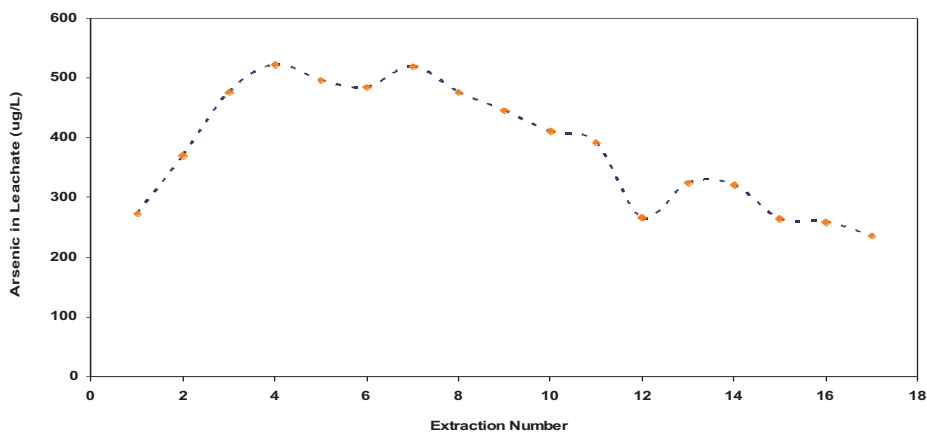
Preliminary Results and Status

The study site, located near Terre Haute, Indiana, was a surface coal mine final pit. Cinergy Corporation (formerly PSI Energy) purchased the property to dispose of coal ash from its nearby coal-fired power plant. From 1988 to 2003, Cinergy filled the former mine pit with approximately 1.6 million tons of fly ash. A five-foot soil cover and revegetation were placed on top of the ash material to maintain the land as a wildlife refuge. The Indiana Department of Natural Resources permitted the disposal of coal ash in the mine pit and required monitoring of groundwater and surface water at a number of locations. Researchers have monitored 44 chemical parameters on a quarterly basis since 1988 and will continue this monitoring through 2006.

This CBRC-funded research effort began in 2001 and includes five primary components. First, researchers installed 16 additional monitoring wells and obtained eight rounds of groundwater quality

data to develop a field-scale evaluation of leaching, attenuation, and migration of the ash constituents. The final groundwater sampling event was completed in February 2005. Next, researchers created a database of all Cinergy compliance monitoring data and the CBRC research monitoring data so that time-series and other statistical analyses could be completed to determine release, attenuation, and migration characteristics. During the third component of the project, researchers performed laboratory studies on batch and column leaching experiments to better understand generation and sustaining of leaching for the target inorganic constituents. Then researchers conducted laboratory column experiments to dynamically evaluate leaching and attenuation of arsenic and boron for the coal ash and the spoil materials from the site. Finally, the project team collected and analyzed groundwater and surface water samples for isotopic ratios of boron, sulfur, and strontium to better identify sources of the constituents in groundwater and surface water at the site.

Sequential Leaching of Arsenic from Coal Ash



Sequential Leaching of Boron from Coal Ash

