

**THE U.S.D.I. OFFICE OF SURFACE MINING
INITIATIVES RELATED TO
COAL COMBUSTION PRODUCTS (CCPs)¹ AND BY-PRODUCTS (CCBs)^{2,3}**

by

Kimery C. Vories⁴

Abstract. Beginning in May of 1994, the Office of Surface Mining (OSM) has taken an active role in encouraging and promoting technological advances, research, and technology transfer related to the use and disposal of those material residues remaining after the combustion of coal to produce electrical power. The primary activities and accomplishments of OSM in this area have been the establishment of a multi-interest group steering committee that has: (1) conducted one national interactive forum in October of 1996 at Southern Illinois University in Carbondale; (2) published and distributed hundreds of copies of the post-forum proceedings; (3) developed and managed an Internet Website dedicated to providing a user friendly guide to CCB and CCP literature, organizations, and events; and (4) initiated a national technical interactive forum on "The Use and Disposal of CCBs at Coal Mines" that will be held in April of 2000. In addition, OSM has signed a Memorandum of Understanding with the U.S. Department of Energy, Federal Energy Technology Center (FETC) to collaborate on CCB and CCP research and issues and has assigned staff to serve on the: (1) national steering committee of the Emission Control By-Products Consortium in order to assist in directing CCP research efforts; and (2) technical program committee for the biennial International Ash Symposium conducted by the University of Kentucky, Center for Applied Energy Research.

¹Coal Combustion Products (CCPs) - A collective term for materials or residues produced from the combustion of coal or cleaning of stack gasses for which there is a commercial market and are reprocessed, sold, or stored for commercial use.

²Coal Combustion By-Products (CCBs) -A collective term referring to any large volume material or residue produced from the combustion of coal or cleaning of stack gasses regardless of ultimate commercial application or disposal. Specifically, it includes fly ash, bottom ash, boiler slag, fluidized bed combustion ash, and flue gas desulfurization material.

³Paper presented at the Western Region Ash Group 2nd Annual Coal Combustion Products (CCPs) Forum - CCP Utilization in Mining Applications. August 17, 1999, Scottsdale, Arizona.

⁴Kimery C. Vories, Ecologist, USDI OSM Mid-Continent Regional Coordinating Center, Alton, IL, 62002

Introduction

In May of 1994, OSM solicited recommendations for technical studies and applied research topics from the States, industry, and public interest groups. A wide variety of responses to this outreach identified CCBs as a priority topic for consideration by OSM. OSM initiated a survey in September of 1995 to determine interest in holding a national technical interactive forum on the topic of CCBs. Based on the results of this survey, OSM organized a multi-interest group steering committee in February of 1996, to plan for and hold such a forum. The remainder of the paper will document the highlights of the CCB and CCP initiatives that OSM has undertaken since that time.

Coal Combustion By-Products Associated with Coal Mining Interactive Forum

In cooperation with the Mining Engineering Department at Southern Illinois University at Carbondale, OSM produced a post-forum proceedings (Chugh, 1996) that includes a series of 28 papers summarizing topics related to coal combustion by-products and their application at surface coal mines nationwide. Topics include activities related to beneficial use and disposal. The papers are presented by university researchers, State regulatory personnel, industry experts, consultants, and citizen interest groups. The papers are presented in the categories of:

(1) Coal Combustion By-Product Characterization; (2) Site Characterization; (3) Regulatory Requirements; (4) Designing/Engineering/Planning; (5) Environment: Land and Water; (6) Monitoring and Evaluation; and (7) Case Studies. An edited discussion section provides a summary of the issues raised, different perspectives, and controversies brought out

during the forum. The results of subject category workgroups at the forum outline remaining issues needing further work and attention.

The following remarks summarize relevant comments concerning the disposal or use of CCB materials on the mine site made by the then Acting Director of OSM, Kathrine Henry (Henry, 1996). Back when the Surface Mining Control and Reclamation Act (SMCRA) was passed in 1977, planning for any significant utilization or disposal of coal combustion by-products at surface coal mines did not seem like much of a concern. OSM regulations provide guidance for protecting surface and ground water quality. They also require specific plans for the disposal of coal cleaning wastes and non-coal wastes normally associated with on-site repair shop facilities. Neither SMCRA nor the OSM regulations, however, specifically address the use or disposal of the by-products of electric power generation at surface coal mines, even though a truly systematic plan for producing and using coal would logically take into consideration what to do with the final waste products, things like ash, for instance. After all, according to the First Law of Ecology, *Everything Has To Go Somewhere*.

Although a major emphasis of the administration and the electric utility industry has been to recycle coal combustion by-products into economically viable products, the recycling of coal combustion by-products has remained steady at around 25 percent over the last decade. Potential uses on the mine site include:

(1) injection as a fill into old underground mines for reduction of subsidence effects; (2) use as a soil amendment to neutralize acidic spoil and thereby reduce acid mine drainage; and (3) as an ingredient in synthetic substitutes for traditional underground mine timbers.

OSM supports those efforts to recycle coal combustion by-products into commercial items for use on or off the mine site. Despite everything that's been done to create economically viable products for those residues, however, only about one-quarter of them are used in that way. The other 75 percent of the coal combustion by-products still has to be stockpiled or disposed of, *somewhere*. Interest in coal mines as potential disposal facilities or markets for new products produced from coal combustion by-products has gone up with the dramatic cost increases and mounting difficulties involved in handling those residues on site at coal fired power plants.

In 1993, the Environmental Protection Agency issued its final regulatory determination that coal combustion by-products were deemed non-hazardous and were to be regulated by the individual States under Subtitle D of the Resource Conservation and Recovery Act when disposed of as a solid waste. As a result, the States have been challenged to develop appropriate strategies for integrating the concerns of State solid waste programs with SMCRA programs when disposal occurs on permitted State primacy coal mine sites.

When the use or disposal of coal combustion by-products happens at surface coal mines, State coal mining regulators are involved to the extent that SMCRA requires: (1) the mine operator to ensure that all toxic materials are treated, buried, and compacted, or otherwise disposed of, in a manner designed to prevent contamination of ground or surface water; (2) making sure the proposed land use does not present any actual or probable threat of water pollution; and (3) ensuring the permit application contains a detailed description of the measures to be taken during mining and reclamation to assure the protection of the quality and quantity of surface and ground water systems, both on- and off-site, from adverse

effects of the mining and reclamation process, also to assure the rights of present users of such water are protected.

Any disposal of coal combustion by-products at mine sites must be in accordance with those standards *and* with applicable solid waste disposal requirements. The States differ in their regulatory requirements for disposal of coal combustion by-products as solid waste. Trace element concentrations in coal combustion by-products vary according to where the coal was mined. Chemical and physical characteristics differ by region, as do mine site conditions. Accordingly, regulatory programs to allow use or disposal must be designed to handle those differences. At OSM, we are supportive of State efforts to develop appropriate methods and criteria. We will do what we can to help, on request.

Currently, the debate over use or disposal of coal combustion by-products at coal mines centers on the potential for the materials to release toxins back into the environment. We recognize that improved knowledge, of the risks and benefits associated with disposal and use of coal combustion by-products, is badly needed, as is a greater acceptance of that knowledge by regulators and the public. The more we know, the more options we have.

At the conclusion of the forum, the CCB Steering Committee met and identified the following five items as the most important needs identified by the 1996 forum: (1) a guidance document for the use and disposal of CCB materials within the coal mining environment; (2) acceptable monitoring procedures for evaluating the interaction of ground water at CCB disposal sites; (3) development of formal education and training opportunities on various aspects of CCB handling; (4) additional forums, workshops, or symposium to address various aspects of CCB handling that had not yet been

sufficiently addressed; and (5) develop better methods for communicating aspects of CCB handling to the public.

The CCB steering committee made the following recommendations to its sponsoring organization management: (1) the highest priority and energies of the sponsoring organizations should be to pursue the development of a "State of the Science Resource Manual" on the evaluation and handling of CCB materials on the mine site for use or disposal; (2) there should be a follow up forum to address concerns raised by the workgroups on aspects of CCB evaluation and handling that were not sufficiently addressed by the forum; and (3) assuming that recommendations A and B can be accomplished, efforts should be directed by OSM, in its role of technology transfer, to provide as a part of its National Technical Training Program, opportunities for mining personnel to learn basic methods for the handling and evaluation of CCB materials.

Coal Combustion By-Products
Information Network
Website

In March of 1997, the USDI Office of Surface Mining (OSM) invited resource agencies and organizations, that are working with or have access to significant information on CCBs, to participate as a voluntary Steering Committee that would develop a system for making this information accessible to potential users in the coal mining community. The Steering Committee developed a Website that can be accessed directly at <http://www.mcrcc.osmre.gov/ccb/home.htm> or through the OSM Home Page at www.osmre.gov that contains: (1) a user friendly guide, including abstracts, of existing scientific and technical literature; (2) sources and location of CCB literature; (3) access to the OSM library for copies of significant literature

for loan to potential users; (4) definitions of basic terminology; (5) name and phone numbers of State CCB contacts; (6) information and access to upcoming CCB special events; and (7) identification of related Websites that contain information on active researchers and research programs.

The Use and Disposal of
Coal Combustion By-Products
at Coal Mines:
A Technical Interactive Forum

Many of the questions and concerns raised at the 1996 Interactive Forum, however, have not yet been addressed. In response to these additional concerns, the CCB Steering Committee resolved to conduct an additional technical interactive forum in the year 2000 to address the more important concerns and new developments related to coal mining and CCBs that were either identified at the 1996 forum or since that time.

The purpose of this technical interactive forum, that will be held on April 12 & 13, 2000, at the facilities of the U.S. DOE Federal Energy Technology Center in Morgantown, West Virginia, is to provide: (1) an organized format for discussion of issues concerning the use and disposal of CCBs at coal mines; (2) an easily understood, state of the art summary talk by knowledgeable speakers; (3) a published proceedings that summarizes the presentations and participant discussions; (4) access to the discussions for all interested participants at the forum; (5) opportunity for poster presentations on CCB projects and research; (6) opportunity for exhibits of CCB use, technology, services, and equipment; and (7) optional technical CCB Workshops and Field Trips on April 14, 2000.

The talks will be presented covering four topic categories. The first topic category of **CCB Basics**, will cover the subtopics of:

(1) characterization; (2) classification; (3) origin; and (4) destinations. The second topic category on **Regulatory** will include the subtopics of: (1) status; (2) trends; and (3) legal liabilities. The third topic category of **Beneficial Uses on the Mine Site** will include the subtopics of: (1) treatment of acid forming material; (2) emerging technologies; and (3) subsidence control and Acid Mine Drainage reduction for underground mines. The fourth topic category of **Hydrologic** will include the subtopics of: (1) long term monitoring and (2) leachate toxicity.

Memorandum of Understanding (MOU)
Between
Office of Surface Mining and
Federal Energy Technology Center (FETC)

On February 10, 1999, OSM signed an MOU with FETC to collaborate on coal mining related and environmental issues. They agreed to cooperate in three principle areas:

(1) Technical Services and Equipment Utilization; (2) Technical Expertise; and (3) Information Exchange. Areas of mutual interest potentially related to CCBs included: (1) Mine drainage prevention, elimination, and treatment, (2) remining/reprocessing coal waste; (3) coal combustion by-product disposal, and (4) preservation of the hydrologic balance.

OSM staff participate with FETC on the newly formed Steering Committee for the Emission Control By-Products Consortium that is attempting to develop technologies for use by the coal utilities and their suppliers that will be useful in solving problems related to the handling of by-products from their clean coal processes. The main strategy of the consortium is to: (1) characterize product streams from flue gas desulfurization materials and low nitrous oxide burners; (2) develop a list of potential

market opportunities and disposal options; and (3) develop and implement research and demonstration programs around identified priority topics.

1999 International
Ash Utilization Symposium
Center for Applied Energy Research
University of Kentucky

OSM staff has been providing assistance to the technical program committee planning for the above event to take place October 18-20, 1999, in Lexington, Kentucky. The biennial event will cover all aspects of coal combustion by-product utilization. The program will include recent research findings in over a dozen topical areas. The OSM staff has been actively encouraging the presentation of papers by experts in the areas of mine disposal, underground injection, and the treatment of acid forming materials.

Literature Cited

- Chugh, Y.P., B.M. Sangunett, and K.C. Vories (eds). 1996. Proceedings of Coal Combustion By-Products Associated with Coal Mining - Interactive Forum. Southern Illinois University at Carbondale. 304 p.
- Henry, K.L. 1996. IN Chugh, Y.P., B.M. Sangunett, and K.C. Vories (eds). 1996. Proceedings of Coal Combustion By-Products Associated with Coal Mining - Interactive Forum. Southern Illinois University at Carbondale. pp 37-39.