

# **THE U.S. DOI, OFFICE OF SURFACE MINING: INITIATIVES RELATED TO COAL COMBUSTION BY-PRODUCTS (CCBs)**

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**KEYWORDS:** Coal Combustion By-Products, Office of Surface Mining, surface coal mining and reclamation, environmental protection, ground water quality.

## **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. organized national interactive forums on **The Use and Disposal of Coal Combustion By-Products (CCBs)** at Coal Mines in October of 1996 at Southern Illinois University, in April of 2000 at the National Energy Technology Laboratory in Morgantown, West Virginia, and April 16-18, 2002 in Golden, Colorado;
2. edited, published, and distributed hundreds of copies of the forum proceedings;
3. provided technical assistance to ASTM on draft guidance for CCBs on mine sites; and
4. developed and managed an Internet Website dedicated to providing a user-friendly guide to CCB literature, organizations, rule-making, and educational events.

In addition, OSM has signed a Memorandum of Understanding with the U.S. Department of Energy, National Energy Technology Laboratory (NETL) to collaborate on CCB and CCP research and issues. OSM staff also serve on the: (1) national steering committee of the Combustion By-Products Recycling Consortium in order to assist in directing CCB research efforts; and (2) the technical program committee planning for the biennial International Ash Symposium conducted by the University of Kentucky Center for Applied Energy Research. The OSM staff is currently working with the U.S. Environmental Protection Agency and the Interstate Mining Compact Commission to evaluate regulatory methods for improving permitting, monitoring, and environmental protection related to CCB placement on coal mine sites.

## **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.

## OSM CCB INITIATIVES

The following summary outlines the highlights of the CCB initiatives that OSM has undertaken.

### 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)<sup>1</sup> 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. Subject category workgroups at the forum outlined the remaining issues needing further work and attention. 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 symposia to address various aspects of CCB handling that have 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 work groups on aspects of CCB evaluation and handling that were not sufficiently addressed by the forum; and
3. assuming that recommendations 1 and 2 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.

### Summary of OSM Director Comments on CCBs and Mining at 1<sup>st</sup> CCB Forum<sup>2</sup>

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).

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 remainder 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 the 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-sites, from adverse effects of the mining and reclamation process also to assure that 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.

#### 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/> 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;
7. Copies of CCB Forum Proceedings from 1996 and 2000;
8. a chronology of relevant dates and events related to rule-making by the U.S. EPA; and
9. 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<sup>3</sup>

Many of the questions and concerns raised at the 1996 Interactive Forum, however, remained. 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 on April 12 & 13, 2000, at the facilities of the U.S. DOE National Energy Technology Laboratory in Morgantown, West Virginia, was 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 22 talks covered four topic in the following categories:

1. CCB Basics;
2. Regulatory;
3. Beneficial Uses at the Mine Site; and
4. Hydrology.

At the conclusion of the forum, the participants recommended that the steering committee focus on the following initiatives for future actions:

1. provide assistance to the U.S. EPA on documentation of mine related damage cases;
2. provide assistance to ASTM on development of improved standard testing methods for CCBs on mine sites;
3. conduct region specific technical forums; and
4. enhance educational and Internet outreach on CCB issues and information.

#### Memorandum of Understanding (MOU) Between Office of Surface Mining and National Energy Technology Laboratory (NETL)

On February 10, 1999, OSM signed an MOU with NETL to collaborate on coal mining related and environmental issues. They agreed to cooperate in three principal 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. re-mining/reprocessing coal waste;
3. coal combustion by-product disposal; and
4. preservation of the hydrologic balance.

#### Combustion By-Products Recycling Consortium National Steering Committee

OSM staff participates with NETL on the National Steering Committee for the Combustion By-Products Recycling 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.

Of the 18 research projects awarded funding in 1999 (\$1.2 Million over two years), eight projects are applicable to the placement of CCBs on coal mine sites. In 2000, 17 research projects (6 for the East, 6 for the Midwest, and 5 for the West) will be funded for \$1.8 million over the next 2 years. Six of these projects concern environmental aspects of CCBs at coal mines.

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

OSM staff provided assistance to the technical program committee planning for the above event that took place October 18-20, 1999, in Lexington, Kentucky and the current event October 22-24, 2001. The biennial event covers all aspects of coal combustion by-product utilization. The program includes recent research findings in over a dozen topical areas. The OSM staff encourage the presentation of papers, present technical papers, assist in panel presentations, and serve as session co-chair in the areas of mine disposal, underground injection, and treatment of acid forming materials.

#### ASTM Standard Guide for The Use of Coal Combustion Products (CCPs) for Surface Mine Reclamation

Since June of 2000, the OSM staff and the CCB Steering Committee has been actively participating with the American Society for Testing Materials (ASTM) in the development of a standard guide for technical methods to be used in evaluating CCBs for use or disposal at mine sites. Committee members are actively reviewing and commenting on draft guidance documents being prepared by ASTM. The OSM staff has provided information to ASTM on how the Surface Mining Control and Reclamation Act is utilized to regulate the placement of CCBs on surface coal mines.

#### U.S. Environmental Protection Agency (EPA) Rule-making on CCBs Related to their Use and Disposal on Mine Sites.

##### *U.S. EPA Proposed Hazardous Waste Determination*

EPA published its Notice of Availability on April 28, 1999, for the EPA's Report to Congress on Fossil Fuel Combustion Wastes not previously studied: including oil, natural gas, and certain coal combustion wastes. EPA purposed to determine whether the remaining fossil fuel combustion wastes should retain their exemption from hazardous waste regulations referred to as the Bevill Exemption. Of potential concern to the mining community, EPA stated that "The Agency currently has insufficient information on managing fossil fuel combustion wastes in surface and underground mines in order to assess the potential for risks associated with this practice, whether for disposal or beneficial uses such as mine reclamation." During the comment period, OSM provided extensive input on the requirements of the Surface Mining Control and Reclamation Act as well as pertinent research results related to the use of CCBs at mine sites. OSM provided letters from its

Director as well as from the Assistant Secretary of the Interior in support of the position that listing of CCBs at mine sites under Subtitle C (Hazardous Waste) under RCRA was not warranted based on the following observations:

- \$ EPA wrongly proposes to place the burden for the determination of toxicity for these materials on the receiver (the mine) rather than on the producer of the materials (usually a power plant). This is inconsistent with the “Polluter pays” principle, and it takes responsibility out of the hands of those who are in the best position to make toxicity determinations based on knowledge of the composition of the materials in the first place.
- \$ The EPA requirements for ground water monitoring and liners of mine filling sites are likely to produce conflicts with the Surface Mining Control and Reclamation Act (SMCRA) bond release and liability requirements for reclamation.
- \$ The EPA conclusions concerning the use and disposal of Coal Combustion By-Products (CCBs) on SMCRA mining sites are not adequately supported by scientific data. First of all, none of the scientific data upon which EPA bases its conclusions specifically addresses the potential for CCB toxicity on mine sites. EPA examples of toxicity are exclusively on electric power plant associated disposal sites. EPA ignores the preponderance of scientific data from university research, the Department of Energy (DOE), and the Electric Power Research Institute that shows that less than 1 percent of tested CCBs show any potential generation of hazardous leachates. EPA further ignores university research showing that coal mine spoil tends to absorb any potential leachate from CCB disposal.
- \$ EPA makes no distinctions that recognize the vastly different circumstances under which CCBs are handled. The risks associated with CCBs can vary dramatically depending on the environmental setting of the mine, the region of the country where it is located, and differing geology and climate. For example, there are drastic differences in alkalinity and acidity problems depending on whether the mining is in the East or the West. There are also considerable differences depending on the regulatory requirements and mining practices of coal versus non-coal mining, surface versus underground mining, and active versus abandoned mine reclamation. DOE and Interior (USGS) have the capability to address some of these research questions, but more time is needed than EPA is allowing.
- \$ EPA proposes no method for testing and certification that any CCB is non-hazardous and exempt from regulation as a waste. In other words, EPA is going from a policy of blanket exemption from RCRA to blanket inclusion in RCRA, regardless of site-specific analyses.
- \$ The EPA decision will have a negative impact on the current national effort to recycle these materials into beneficial economic uses on the mine site. This is counter to EPA’s emphasis on recycling as a means of minimizing the need for waste disposal. It also exacerbates the existing dilemma of inadequate availability of landfill facilities.

- \$ The EPA decision will have a negative impact on the beneficial environmental uses of this material for control of acid mine drainage, reclamation of abandoned mine sites, and subsidence control. Beneficial uses include filling voids in underground mines, shoring up underground mines to reduce the likelihood of surface subsidence, and amending soils to improve revegetation at mine sites.
- \$ The EPA decision does not recognize the potential for the existing SMCRA programs to regulate and oversight the use and disposal of CCBs on coal mine sites. Rather than exploring ways to provide the needed environmental assurances within the existing regulatory regime of SMCRA, EPA proposes to introduce a RCRA-based mechanism on top of existing SMCRA-based regulation at mine sites.
- \$ The EPA decision does nothing to address EPA's stated concerns about the lack of uniform minimum State standards for disposal of these materials. In essence, it would impose a more costly regulatory mechanism without removing the risk that some States would ineffectively implement the new requirements.
- \$ There is no indication that EPA's imminent determination is being subject to the scrutiny one would ordinarily expect for decisions of this environmental magnitude under the National Environmental Policy Act. Because of the degree to which the effects on the quality of the human environment are likely to be highly controversial, EPA needs to more fully analyze the impacts before making a decision, including, if necessary, performing an environmental impact statement.
- \$ The current EPA decision is a radical departure from the direction EPA stated in the public record of its report to Congress on April 28, 1999. Concerned Federal agencies, including OSM, Energy, and Agriculture, only learned of this new direction on March 6, 2000, and have had insufficient time for review and interagency discussion of the impacts of the determination.
- \$ Other Interior bureaus that will be impacted by this decision have not been included in the interagency briefings. OSM has been informed by the Bureau of Land Management that at least seven or eight Federal coal mine leases dispose of CCBs at the mine site in New Mexico, Colorado, Wyoming, and North Dakota. OSM is aware of at least one mine on the Navajo Nation in Arizona that disposes of CCBs on the mine site, which would involve the Bureau of Indian Affairs, and the Navajo Nation.

#### *U.S. EPA Proposed Solid Waste Regulations for CCBs at Coal Mines*

In its decision on May 22, 2000, the U.S. EPA determined that national regulations under subtitle D (Solid Waste) of the Resource Conservation and Recovery Act (RCRA) [and/or possible modifications to regulations under the Surface Mining Control and Reclamation Act (SMCRA)] were warranted when these wastes are used to fill surface or underground mines. EPA believes this is necessary so that CCBs will be consistently managed across all waste scenarios.

On September 14, 2000, EPA met with OSM to initiate a dialog between the two agencies concerning EPA rulemaking for CCBs used as fill at surface and underground mine sites. During

the course of this discussion, EPA informed OSM that EPA expects to have a proposed rule out under Subtitle D of RCRA (Solid Waste) in 2003 and a final rule by 2004.

EPA has also invited OSM staff on a series of joint tours of mines sites where CCBs are being used as fill. To date, tours have taken place in the anthracite mining districts in Pennsylvania and in Northern West Virginia where Fluidized Bed Combustion Ash is being returned to the mine site to support reclamation and as a seal for acid forming materials. A tour was also conducted in the State of Indiana where the State made a presentation on how the State program handled CCBs on the mine site. Extensive discussions took place on the merits of the programs ability to protect the public and environment. The field sites included one electric utility CCB disposal area, three mine sites where CCB disposal was currently taking place and two mine sites that were permitted to accept CCBs but where disposal had not yet taken place. Additional tours are planned in other States during 2001.

Concerns that EPA has expressed to OSM as to why they feel EPA regulation under RCRA may be necessary are:

- \$ EPA has found a small number (less than 12) of unlined solid waste disposal facilities at electric utilities where leachates from the facility have been determined to contain elements at levels of toxicity determined to be detrimental to public health and/or the environment. Although they have not found any such examples at mine sites, they feel that the similarities between these utility disposal sites and mine sites where CCBs are placed as fill warrant similar regulation.
- \$ Ground Water monitoring at SMCRA mine sites may be inadequately designed to detect toxicity.
- \$ Bonding of SMCRA mine sites (a minimum of 5 years after reclamation and revegetation has been completed) may be of insufficient duration to detect toxicity.

Concerns OSM has expressed to EPA as to why EPA rulemaking for mine sites may not be warranted include:

- \$ OSM believes that the SMCRA regulations already provide at least as much protection of the public health and environment as anything as yet proposed by EPA. The extensive mining and reclamation designs, environmental investigations, leachate testing, requirements to protect or replace drinking water sources, performance bonding, and post reclamation monitoring requirements of SMCRA make mine sites significantly more protective of the environment than what is found at electric utility ash disposal sites where toxic leachate has occurred and therefore are not similar to them.
- \$ It is not valid to compare utility CCB disposal sites where toxic leachate has occurred with SMCRA mines sites as they differ significantly in terms of regulatory requirements, geology, geography, hydrology, characteristics of CCBs used as fill, and reclamation practices. Electric utility disposal sites where toxic leachates have occurred are typically

characterized by geographic placement in a floodplain, a geologic setting of alluvial sand and gravel usually close to a river, ground water that is plentiful and of high quality, all types of CCB materials are placed in these facilities in a wet slurry without any chemical characterization of the material, reclamation is accomplished with a shallow layer of fill over the area and revegetated, and the area is usually covered by the Clean Water Act during operation and State Solid Waste regulations at disposal. CCB placement at mine sites typically is characterized by a geographic placement in an upland position, a geologic setting of bedrock sandstone, shale, and limestone underlain by an impermeable fire clay below the lowest coal seam that was mined, ground water is limited and of poor quality, only those CCBs that are tested and approved in the SMCRA permit are allowed for placement on the mine site, reclamation is accomplished with a deep layer of spoil over the area followed by topsoil and then revegetated, and at all phases the placement is regulated by the environmental protection permitting and performance standards of SMCRA which include the requirements of the Clean Water Act and applicable State Solid Waste program requirements.

- \$ EPA has yet to bring forward any data or scientific evidence that CCBs used as fill at mine sites under SMCRA have resulted in any toxicity that would pose a threat to public health or the environment.
- \$ The SMCRA performance bond lasts as long as is necessary to determine that the environmental performance requirements of the SMCRA program and the applicable permit have been met. The release of the bond is not determined by time but by performance.
- \$ SMCRA permits must include detailed information on potential pollutants of ground and surface water, a detailed hydrologic protection plan, and a ground and surface water monitoring plan.
- \$ SMCRA water quality performance standards require that disturbances to the hydrologic balance be minimized by protecting ground and surface water from pollutants and include requirements for the replacement of water supplies impacted by contamination and require water monitoring based on probable impacts.
- \$ There has been extensive research over the last 20+ years related to effects of CCBs used as mine fill, subsidence control, as seals for acid forming materials, for the reduction of acid mine drainage, soil substitutes, and reclamation of abandoned mine lands. To date, all of this research has indicated that the use of CCBs at mine sites is beneficial to public health and the environment in most cases and at a minimum has no negative effect on public health or the environment.

## CONCLUSION

OSM staff have been extensively involved with the development and distribution of technical information related to the placement of CCBs at coal mine sites since 1995. Because of the complexity of the issues involved and the importance of protection of public health and the

environment during surface coal mining, OSM is very supportive of additional research into the potential environmental effects of CCB placement at coal mine sites. Any additional Federal regulation of CCB placement at SMCRA mine sites, however, should be based on sound scientific evidence that the existing regulatory framework is not adequate.

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