

November 6, 2003

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Dear Ms. Vandivort:

Subject: Project Final Report; CBRC Project Number 01-CBRC-W1

Enclosed please find the original and two hard copies of the project final report for the FIRST SEARCH database project. Also enclosed is an electronic copy and a request for Patent Clearance for Release of Contracted Research Documents form.

Should you have any questions, please contact me by phone at (701) 777-5296.

Sincerely,

Tera D. Buckley  
Marketing Research Specialist

TDB/cs

Enclosure

# DEVELOPMENT OF A DATABASE OF COAL ASH PUBLICATIONS

Final Report

*(For the period September 1, 2002 – December 31, 2003)*

*Prepared for:*

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CBRC Project Number 01-CBRC-W1

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## **DEVELOPMENT OF A DATABASE OF COAL ASH PUBLICATIONS**

### **ABSTRACT**

At the time this project was proposed, there was not a system in place that allowed for universal information sharing within in the coal combustion byproduct (CCB) industry. By providing a forum to support technology transfer between producers, regulators, and end users, the FIRST SEARCH database plays a key role in removing barriers at the national, state, and local levels. The FIRST SEARCH database provides those with a vested interest in CCBs with a Web-based information-sharing tool that allows them to stay abreast of research and, in turn, bridge the gap between research and commercialization.

Developed by the University of North Dakota Energy & Environmental Research Center with funding from the Combustion Byproducts Recycling Consortium and the Western Region Ash Group, the FIRST SEARCH database contains abstracts and full paper instructions to over 600 publications from more than 40 publishers, making the FIRST SEARCH database the first place to go for CCB information. The FIRST SEARCH database is accessible at [www.underc.org/carrc/firstsearch](http://www.underc.org/carrc/firstsearch).

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# **DEVELOPMENT OF A DATABASE OF COAL ASH PUBLICATIONS**

## **INTRODUCTION**

The coal combustion byproduct (CCB) industry has expanded and become more sophisticated, yet its ability to communicate to the government sector and end users has not kept pace. Much information has been developed on CCB engineering and environmental performance, demonstration, and commercialization of CCB applications, but it is difficult to access. The FIRST SEARCH database provides a forum to support technology transfer between producers, regulators, and end users and plays a key role in removing barriers at the national, state, and local levels to beneficially utilize CCBs.

## **EXECUTIVE SUMMARY**

It is the stated objective of the Combustion Byproducts Recycling Consortium (CBRC) “to develop and demonstrate technologies for solving problems related to the utilization of byproducts from coal combustion processes.” At the time this project was proposed, there was not a system in place that allowed for universal information sharing within in the CCB industry. By providing a forum to support technology transfer between producers, regulators, and end users, the FIRST SEARCH database plays a key role in removing barriers at the national, state, and local levels to beneficially utilize CCBs.

Articles in the FIRST SEARCH database support the environmentally acceptable, cost-effective uses of CCBs and focus on the CBRC priority areas of civil and structural engineering uses, agriculture applications, mine land reclamation, and construction materials.

With over 600 publications from more than 40 publishers, the FIRST SEARCH database is the industry’s first place to go for information concerning CCBs. The database can be quickly searched using the “Quick Search” tool or by using the “Advanced Search” tool; it can be searched for a specific title, author, source/publisher, or abstract text. Users may also browse all publications in alphabetical order by title. Unless prohibited by copyright issues, each publication has an abstract. All publications either link back to the full electronic text or a method is provided to acquire the full text. In many instances, full text is provided free-of-charge by following the full text instructions.

Papers published after 1995 were sought for inclusion in the database, although there are a select number of publications in the database prior to 1995. Upon CBRC’s recommendation, papers from Southern Illinois University–Carbondale, University of Kentucky, CBRC, U.S. Department of Energy National Energy Technology Laboratory, and the Ohio Coal Development Office were specifically targeted. Other major sources of publications included Elsevier, the American Coal Ash Association, the Office of Surface Mining, and the Energy & Environmental Research Center (EERC). Several journal articles are also included.

In addition to the Internet database, an electronic data entry system was created to perform automatic updates. This system will allow a database administrator to continue adding publications to the database after the close of the project. Any new information added to the database will still require the applicable copyright approvals.

The EERC's *WebTrends* Log Analyzer software was also installed (this software was not purchased with project funds). This Web traffic-tracking software measures a variety of variables including how many visitors hit the database home page, how many pages a user visits, and how much time a user spends in the database.

The EERC continues to seek funding to expand the database contents and anticipates that the automated updating system will allow easy and instant updates at minimal cost. Visit the FIRST SEARCH database at [www.undeerc.org/carrc/firstsearch](http://www.undeerc.org/carrc/firstsearch).

## **EXPERIMENTAL**

The work plan for this effort included the following tasks:

1. Assembling coal ash-related publications
2. Organizing publications into a searchable database
3. Creating a searchable Web-based database
4. Attending a CCB related meeting or conference

### **Task 1**

Task 1 involved searching the Internet for various publications related to CCBs. Federal agencies, trade associations, university research organizations, and scientific journals were all targeted.

Papers published after 1995 were sought for inclusion in the database, although there are a select number of publications in the database prior to 1995. Upon CBRC's recommendation, papers from Southern Illinois University–Carbondale, University of Kentucky, CBRC, U.S. Department of Energy National Energy Technology Laboratory, and Ohio Coal Development office were specifically targeted. Other major sources of publications included Elsevier, the American Coal Ash Association, the Office of Surface Mining, and the Energy & Environmental Research Center. Several journal articles are also included.

Once abstracts were identified, the publishers were contacted to obtain permission to post abstracts in the database. Publishers not granting permission were either omitted from the database or the publications citation was included without the abstract.

## **Task 2**

Publications were assembled into an Excel spreadsheet during Task 2. The spreadsheet was divided into fields, such as title, author, and, publisher, which allowed the data to be easily incorporated into the Web database.

## **Task 3**

During Task 3, the EERC's graphics and computer-programming departments worked with the principal investigator to create a Web-based database. The principal investigator presented a database design sketch to the database team and worked with the team to make sure it looked and functioned according to the original design. The graphics department created the top bar and navigation buttons. The top bar appears on every page and links back to each sponsors' Web site. The computer-programming department wrote the program that allows the database to function and created a data entry program that allows a database administrator to add additional publications to the database. Once data are entered into this system, the database will automatically update. This system will not be available to the general public, as any new information added to the database will require appropriate copyright approval.

## **Task 4**

Travel expenses were designated in the proposal to present the resulting database at a CCB meeting or conference. The principal investigator presented the FIRST SEARCH database at a joint Western Region Ash Group and American Coal Ash Association Meeting in Las Vegas, Nevada, on October 7, 2003. Meeting attendees were presented a brief overview of the effort and given a tutorial of the database.

## **RESULTS AND DISCUSSION**

The resulting FIRST SEARCH database is accessible on the Internet at [www.undeerc.org/carrc/firstsearch](http://www.undeerc.org/carrc/firstsearch). With over 600 publications from more than 40 publishers, the FIRST SEARCH database is the first place to go for information concerning CCBs.

As shown in Figure 1, the database can be quickly searched using the "Quick Search" tool or by using the "Advanced Search" tool; it can be searched for a specific title, author, source/publisher, or abstract text. Users may also browse all publications in alphabetical order by title.

Figure 2 illustrates a full display of an individual publication entry. Each entry contains a full citation including title, author, date, volume/number, source, publisher, and page number. Unless prohibited by copyright issues, each publication has an abstract. All publications either link back to the full electronic text or a method is provided to acquire the full text. In many instances, full text is provided free-of-charge by following the full text instructions.



**Quick Search**

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**Advanced Search**

<b>Title</b>	<input type="text"/>
<b>Author(s)</b>	<input type="text"/>
<b>Source/Publisher</b>	<input type="text"/>
<b>Abstract Text</b>	<input type="text"/>

**Browse All Files**

Figure 1. FIRST SEARCH database home page.

The FIRST SEARCH database was activated on September 12, 2003. *WebTrend's* log statistics indicate that 509 visitors opened the FIRST SEARCH database from September 12 – November 1, 2003. Weekly statistics are presented in Figure 3. These numbers are only numbers of visits, not the number of unique visitors, hits, or page views. A visit is counted when someone opens the FIRST SEARCH site. For example, if a user visits the FIRST SEARCH site and clicks on 75 different pages, this is counted as one visit. If the user then closes the Web browser, instantly opens another Web browser window, and goes right back to the FIRST SEARCH site, this counts as a second visit. It is important to note that only visitors outside of the North Dakota University System are counted. The University of North Dakota Web structure does not allow the *WebTrend's* software to filter only EERC visits; so all visitors from any North Dakota university domain name are filtered and not included in the number of visitors. Because EERC staff visit the FIRST SEARCH site often, it was important to exclude those visitors from the statistics.

The impact of this effort is especially broad because it addresses technology transfer rather than the development of a technology. The FIRST SEARCH database is easily accessed by anyone through the Internet, allowing it to support technology transfer between producers, regulators, and end users. It is anticipated that the FIRST SEARCH database will play a key role in removing barriers at the national, state, and local levels to beneficially utilize CCBs. The database addresses the goals of CBRC and the U.S. Environmental Protection Agency (EPA)

[Search Results](#)   [New Search](#)   [Modify Search](#)

**Title: Physical and Engineering Properties of Coal Combustion By-Products**

**Author(s):**

Yoginder P. Chugh  
Debasis Deb  
C.B. Raju

*Department of Mining and Mineral Resources Engineering, Southern Illinois University at Carbondale*

**Source:** In Proceedings of The Use and Disposal of Coal Combustion By-Products at Coal Mines: A Technical Interactive Forum, April 10–13, 2000

**Publisher:** U.S. Department of the Interior, Office of Surface Mining; U.S. Department of Energy, National Energy Technology Laboratory; Coal Research Center, Southern Illinois University

**Date:** April 2000   **Volume:**   **Number:**   **Page:** 12 pages

**Full Paper Instructions:** Electronic (PDF) full text is available at [www.mcrc.osmre.gov/PDF/Forums/CCB2/1c.pdf](http://www.mcrc.osmre.gov/PDF/Forums/CCB2/1c.pdf). If you experience technical difficulties, visit [www.mcrc.osmre.gov/Forum.htm](http://www.mcrc.osmre.gov/Forum.htm).

**Abstract:** Coal combustion by-products (including flue gas desulfurization by-products) are complex, non-homogeneous materials with significant variability from plant to plant. The materials have potential for beneficial use in a variety of applications including construction materials, mine land reclamation, soil amendment, structural fills, and extraction of valuable trace elements. The use of physical and engineering properties must be evaluated for each project both because of high variability in properties, and because currently established tests may not be representative of the field performance. Tremendous opportunities exist to develop meaningful beneficial use applications for CCBs—using their appropriate physical and engineering properties—with some applied research to make each project successful.

[Search Results](#)   [New Search](#)   [Modify Search](#)

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Figure 2. Full display of individual publication entry.

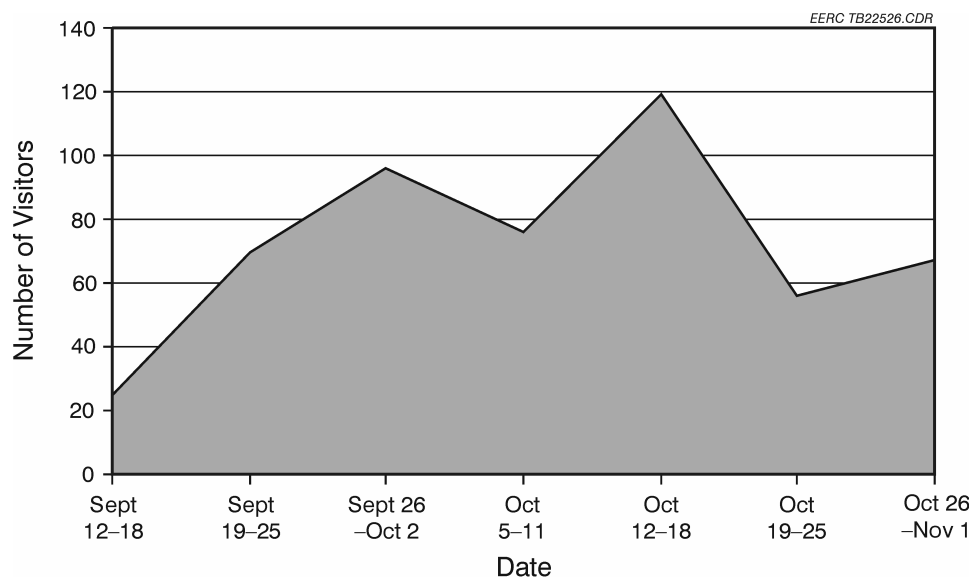


Figure 3. Weekly WebTrend's FIRST SEARCH statistics.

Coal Combustion Product Program (C<sup>2</sup>P<sup>2</sup>). FIRST SEARCH may also serve to strengthen the link between the U.S. Department of Energy National Energy Technology Laboratory and EPA.

## **CONCLUSION**

By providing a forum to support technology transfer between producers, regulators, and end users, it is anticipated that the FIRST SEARCH database will play a key role in removing barriers at the national, state, and local levels. The FIRST SEARCH database provides those with a vested interest in CCBs with a Web-based information-sharing tool that allows them to stay abreast of research and, in turn, bridge the gap between research and commercialization.

The EERC continues to seek funding to continue this effort and anticipates that the automated updating system will allow easy and instant updates at minimal cost. It is the opinion of the EERC that if this database effort does not continue, the initial cost will eventually be lost as the database becomes outdated.

## **REFERENCES**

Not applicable.