

CONF-9506/62-49

DOE/MC/28060-96/C0542

Liming Efficacy and Transport in Soil of a Dry PFBC By-Product

Authors:

Warren A. Dick

Contractor:

Dravo Lime Company
3600 One Oliver Plaza
Pittsburgh, PA 15222

RECEIVED

NOV 14 1995

OSTI

Contract Number:

DE-FC21-91MC28060

Conference Title:

Advanced Coal-Fired Power Systems '95 Review Meeting

Conference Location:

Morgantown, West Virginia

Conference Dates:

June 27-29, 1995

Conference Sponsor:

U.S. Department of Energy, Morgantown Energy Technology Center
(METC)

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED *WW*

MASTER

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This report has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from the Office of Scientific and Technical Information, 175 Oak Ridge Turnpike, Oak Ridge, TN 37831; prices available at (615) 576-8401.

Available to the public from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, VA 22161; phone orders accepted at (703) 487-4650.

DISCLAIMER

Portions of this document may be illegible electronic image products. Images are produced from the best available original document.

PB.9a

**Liming Efficacy and Transport in Soil
of a Dry PFBC By-Product**

CONTRACT INFORMATION

Contract No.	DE-FC21-91MC28060
Contractor	Dravo Lime Company Research Center 3600 Neville Road Pittsburgh, PA 15225
Other Funding Sources	Ohio Coal Development Office, CDO/D-89-35 Electric Power Research Institute, RP2796-02 American Electric Power Company, C-8276 Ohio Edison Company, EPRI collaborator Dravo Lime Company, RF768342
Principal Investigator	Warren A. Dick
METC Project Manager	Scott Renninger
Period of Performance	December 1, 1991 to December 31, 1995

ABSTRACT

The by-products of pressurized fluidized-bed combustion (PFBC) systems are mixtures of coal ash, anhydrite (CaSO_4), and unspent alkaline sorbent. Because PFBC by-products are alkaline and contain large concentrations of readily soluble bases (Ca and in some cases Mg) and other essential plant nutrients such as S and K, they have potential use as soil amendments, especially in acidic soils. PFBC by-products (particularly those with large Mg contents) may cause excessively high soluble salt concentrations when applied to soil. This could be detrimental to plant growth and might also impact the release of trace elements from the coal ash component of the by-product. In field experiments on three acidic soils, the liming effectiveness of a PFBC by-product, its effects on corn and alfalfa growth, and its impacts on crop, soil, and water quality were investigated. The PFBC by-product was applied at rates from 0 to 2 times the liming requirement of the three soils (0 to 70 Mg ha⁻¹), and incorporated to a depth of 10 cm. Amendment with PFBC immediately increased surface (0-10 cm) soil pH (up to 7) and extractable concentrations of Ca, Mg, S, and B. Soluble Al, Mn, and Fe concentrations in the surface soil were decreased. Within 1 year of application, pH began to increase below 10 cm, and Ca, Mg, and S concentrations decreased in the surface and had leached to a depth of 60 cm. Within 2 years, increased Ca, Mg, and S were measured at depths up to 100 cm. With the exception of a small, short-lived increase in soil B, PFBC

application did not cause measurable changes in soil extractable concentrations of trace elements. Surface runoff water concentrations of Ca, Mg, and S were increased in the first year after application, however, there were no effects on trace element concentrations. Alfalfa yield was increased by PFBC amendment, but corn grain yield was not affected. Alfalfa and corn leaf tissue concentrations of Ca, Mg, and S were increased while Al, Fe, and Mn were decreased by FGD, with no evidence of any plant toxicity. Application of PFBC up to two times the lime requirement of acid soils improved production of acid-sensitive crops with no detrimental effects on soil or water quality.