

**OHIO COAL DEVELOPMENT OFFICE
ANNUAL PROJECT ABSTRACT
AS OF DECEMBER 2004**

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The Ohio State University
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5. Project Title: Use of clean coal technology products in the construction of low permeability liners

6. Project Term: From: February 1, 2000 To: June 30, 2004

7. Project Update OR Final Report

<u>Budget:</u>	<u>Co-Sponsor's Name</u>	<u>Cost Share</u>
	OCDO	\$445,480
	The Ohio State University	\$469,062
	Emission Control Byproducts Consortium	\$25,258
	Zande & Associates	\$10,000
	TOTAL PROJECT VALUE	<u>\$949,800</u>

ABSTRACT

9. OVERVIEW OF PROJECT & OBJECTIVES: The goal of this project was to establish field-verified time-dependent relationships for the structural behavior and permeability of liners constructed from Flue Gas Desulfurization (FGD) material. This goal was accomplished with a coordinated program of testing and analyzing small-scale laboratory tests, medium-scale field wetlands, and a full-scale demonstration pond. The performance of the FGD material was monitored for a period of at least three years.

As a result of this project, several critical questions about the structural behavior and environmental effects of constructed FGD facilities will be answered. This should lead to the promotion of the use of Ohio's high sulfur coal by demonstrating re-use alternatives to the present practice of landfilling the FGD material. It is estimated that the direct cost benefit for a medium sized landfill will be \$10 to \$30 million and the long term indirect economic benefit will be the saving of increasingly scarce landfill space. The benefits to the development of agricultural industries in Ohio are particularly important. The productive use of a portion of the

approximately 0.5 million acres of reclaimed strip-mined lands in Eastern and Southeastern Ohio is critical to the economic development of the region.

10. WORK TO DATE & CONCLUSIONS: Phase II research program was conducted at The Ohio State University from February 1, 2001 to August 31, 2004 to investigate the long-term use of stabilized flue gas desulfurization (FGD) materials in the construction of low permeability liners for ponds and wetlands. The small-scale laboratory tests and monitoring of the full-scale FGD lined facility (capacity of one million gallons) shows that stabilized FGD materials can be used as low permeability liners in the construction of water and manure holding ponds. Actual long-term permeability coefficients in the range of 10⁻⁷ cm/sec (3 x 10⁻⁹ ft/sec) can be obtained in the field by compacting lime and fly ash enriched stabilized FGD materials. Leachate from the FGD material meets Ohio's non-toxic criteria for coal combustion by-products, and for most potential contaminants the national primary and secondary drinking water standards are also met. The low permeability non-toxic FGD material investigated in this study poses very minimal risks, if any, for groundwater contamination. The FGD wetland experiments indicated no significant differences in phosphorus retention between the clay and FGD-lined basins. The FGD-lined basins had a greater richness of plant species but lower total plant productivity than did the clay-lined basins.

11. PLANS FOR COMING YEAR: Future research work investigating the use of FGD materials in the construction of landfill caps and liners, and wetland experiments at the medium to full-scale level is recommended.

12. HIGHLIGHTS/ACCOMPLISHMENTS: Developing economical alternatives to landfilling FGD material is of vital importance to the State of Ohio. The identification of these materials as acceptable safe alternatives to existing supplies of natural clays for liners and in engineered fills could significantly reduce the cost of electric power and help conserve the state's natural resources.

13. ARTICLES/PRESENTATIONS:

Butalia, T., Wolfe, W., and Walker, H., Use of Coal Combustion By-Products as Low Permeability Liners for Manure Storage Facilities, In Animal Waste Containment in Lagoons edited by L. Reddi, ASCE Manual and Reports of Engineering Practice No. 105, American Society of Civil Engineers, 2004.