ANNUAL PROJECT REPORT
AS OF DECEMBER 1996

1. PROJECT SPONSOR:

CONSOL, Inc.
20325 Center Ridge Road
Rock River, OH 44116

2. PROJECT MANAGER:

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3. OCDO GRANT NO: CDO/D-902-9

4. PROJECT: Final Report

5. PROJECT TITLE: Coolside Waste Management Demonstration

6. PROJECT TERM: FROM July 31, 1991 **TO** June 30, 1996

7. PROJECT	**NAME**	**COST-SHARE**
CO-SPONSORS	OCDO	$ 376,054
	CONSOL	110,304
	DOE/METC	749,900
	UK/CAER	301,800
TOTAL PROJECT COST:		$1,538,058

I. ABSTRACT

8. OBJECTIVES:

Waste management is important for the development of any advanced flue gas desulfurization (FGD) process. The objectives of this project are to specify criteria for landfill disposal of waste from one advanced FGD process (the Coolside process) and to evaluate the potential utilization in road construction of wastes generated from three advanced SO_2 control processes (the Coolside, LIMB, and fluidized bed combustion (FBC) processes). Improved options for disposal and utilization of the wastes can reduce the cost of these advanced SO_2 control technologies and benefit Ohio's high sulfur coal industry. The Coolside and LIMB processes were successfully demonstrated at the Ohio Edison Edgewater Station in Lorain, Ohio.

9. WORK DONE AND CONCLUSIONS:

Four large-scale test landfill cells (field lysimeters) were filled in the autumn of 1992 with Coolside waste at three different degrees of compaction and with one fly ash. The cells were monitored continuously for 3½ years to determine moisture and temperature profiles, pressure changes and leachate characteristics. The field lysimeters were excavated to determine geotechnical properties and mineralogy of the waste after 3½ years of natural weathering. Tests were conducted simultaneously with laboratory column lysimeters. The laboratory and field test results show that the geotechnical properties and leachate of Coolside waste are affected by degree of compaction during placement. The compressive strength increased, permeability decreased, and leachability of major elements decreased with increasing compaction. Coolside waste in the field lysimeter with 95% proctor compaction and optimum moisture content developed high compressive

strength (average 1,629 psi) and low permeability coefficient (average 2.2 x 10^{-6} cm/sec) and had low leachate concentrations of Ca, Na, CI, K, and SO_4^{-2}. However, the leachate pH and the leachability of certain trace elements (such as AS and V) also increased with increasing compaction. Mineralogic characterization indicates that CO_2 uptake can affect the geotechnical properties and stability of Coolside waste. The data obtained are useful for the design of environmentally and economically acceptable landfills.

The utilization potential of fluidized-bed combustion (FBC) waste in both pelletized and unconsolidated forms was evaluated for use as highway construction materials. A flexible bituminous pavement test was constructed in April 1995 with 1.5 ton synthetic aggregate made from a 65/35 blend of FBC waste and p.c. fly ash to evaluate its durability under heavy traffic and natural weathering conditions . The evaluation ended May 30, 1996, as planned. Inspections revealed no visible degradation of the patch or aggregate after 13 months. Monthly analysis of core samples showed that the degradation rates of the FBC waste aggregate and the limestone aggregate were similar. FBC waste in unconsolidated form was evaluated as a chemical admix in road base stabilization. Slow swelling of the admixture would require special precautions to be taken for this application and indicate that laboratory swelling tests should be conducted before using any alkaline FGD by-product in road base construction.

10. PLANS FOR COMING YEAR:

The experimental aspects of this project ended in June 1996.

II. HIGHLIGHTS/ACCOMPLISHMENTS

11. The Coolside waste field lysimeter tests were completed after 3½ years of natural weathering. The lysimeter contents were excavated and evaluated. The information obtained is useful for the design of environmentally and economically acceptable landfills. A flexible bituminous test patch was monitored to evaluate the durability of FBC waste pellets under heavy truck traffic at natural weathering conditions. After 13 months, the test patch has maintained its integrity well. Analysis of core samples indicate that the FBC waste pellets maintained their integrity as well as the limestone aggregates. This demonstrates the potential for using FBC waste pellets as aggregate in road construction.

III. ARTICLES/PRESENTATIONS

12. None in 1996