ANNUAL PROJECT REPORT
AS OF DECEMBER 1997

1. PROJECT SPONSOR:

The Cincinnati Gas & Electric Company
139 East Fourth Street
Cincinnati, Ohio 45202

2. PROJECT MANAGER:

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Dravo Lime Company
Project Manager
Telephone: (412) 777-0723

3. OCDO GRANT NO: CDO/D-91-6

4. PROJECT UPDATE ____OR
FINAL REPORT __X__

5. PROJECT TITLE: Advanced ThioClear Process

6. PROJECT TERM: FROM December 1, 1992 TO December 31, 1997

7.

PROJECT	NAME	COST-SHARE
CO-SPONSORS	OCDO	$1,068,690
	CG&E	$95,000
	DLC	$1,071,583
TOTAL PROJECT COST:		$2,235,273

I. ABSTRACT

8. OBJECTIVES:

The Clean Air Act Amendments (CAAA) offer incentives for use of high efficiency SO_2 removal technologies through a provision which allows the accumulation of excess emission allowances if scrubber performance exceeds CAAA requirements. These allowances can be used to meet reductions required at other effected generating units, offset emissions from new units, or be traded for cash. Wet scrubbing is the leading proven commercial post-combustion FGD technology available to meet the SO_2 reductions. Thiosorbic or magnesium-enhanced lime FGD systems with their capability to efficiently scrub flue gas generated from high sulfur coals similar to those found in Ohio have a strong position in the market. By 1995, Ohio will have five generating stations with a combine capacity of 4725 MW utilizing this type of FGD system.

One drawback of wet FGD systems is the cost associated with disposal of the calcium based waste. Typically this waste requires capital cost in land procurement for landfills. Operating costs are incurred for fixation to stabilize the waste and for transportation to delivery the waste to the landfill. Therefore, determining what improvements and advancements that can be made to wet FGD processes to reduce the costs and generation of landfill materials is important.

To reduce costs associated with the magnesium-enhanced lime FGD process, Dravo Lime Company has developed the ThioClear process. ThioClear is an ex-situ forced oxidation process which maintains the same high efficiently SO_2 removal associated with existing magnesium-enhanced lime FGD systems. It differs from the conventional process in that the FGD by-products are wallboard quality gypsum and magnesium hydroxide, an excellent reagent for water treatment. Therefore, provided market conditions are suitable, landfilling of these FGD by-products will not be necessary.

In this project three areas of investigation are planned. The first phase will optimize the process so as to reduce its associated capital and operating costs. The second phase will determine operating methods which enhance the purity of the gypsum and magnesium hydroxide by-products. Thirdly, the process will be demonstrated in an advanced horizontal scrubber at absorber gas velocities up to 30 ft/sec.

9. WORK DONE AND CONCLUSIONS:

Testing of the ThioClear process was completed in December 1994. The Final Report has been submitted to OCDO.

The following objectives were demonstrated in this project:

- The ThioClear® process generated gypsum and magnesium hydroxide as FGD by-products.
- SO_2 removals of +95% were achieved at low liquid to gas ratios in a vertical spray/tray scrubber and in a horizontal packed absorber operating at gas velocities of 10 ft/sec and 25 ft/sec, respectively.
- The ThioClear® process has excellent load following capabilities.
- Large gypsum crystals which average 80 microns have been produced.
- Revised capital and levelized operating costs for a standard vertical spray/tray tower are respectively 23% and 20% lower than the limestone forced oxidation process and similar costs were respectively 26% and 20% lower when the horizontal packed absorber option was used in the comparison..

10. PLANS FOR COMING YEAR:

- The project has been completed.

II. HIGHLIGHTS/ACCOMPLISHMENTS

11.

- The process generated sufficient magnesium hydroxide to control the pH of the absorber liquor as well as provide a product stream.
- Large gypsum crystals which are favorable for wallboard production were produced.
- Optimization studies of the regeneration tank and the oxidizer for preliminary economic evaluations were conducted.

Modifications to improve gypsum purity and magnesium hydroxide recovery were completed. The resulting gypsum by-product was +98% $CaSO_4 \bullet 2H_2O$.

A horizontal absorber was installed and successfully evaluated for SO_2 removal capabilities with both the Thiosorbic and ThioClear® processes. SO_2 removals +95% were demonstrated at absorber velocities of 25 ft/sec.

III. ARTICLES/PRESENTATIONS

12. "Results of ThioClear Testing: Magnesium-Lime FGD with High SO_2 Removals and Salable By-Products", presented at the 1995 SO_2 Control Symposium, Miami, FL, March 1995.

"Results of ThioClear Testing: Magnesium-Lime FGD with High SO_2 Removals and Salable By-Products", presented at the Fourth International Conference on FGD and other Synthetic Gypsum, Toronto, Canada, May 1995.

"ThioClear: Low Cost, High Velocity, Magnesium-Lime FGD with Salable By-Products", presented at the Eleventh Annual US-Korea Joint Workshop on Coal Utilization Technology, Hidden Valley, PA, October 1995.

"Phase II: The Age of High Velocity Scrubbing", presented at POWER-GEN'95 Americas, Anaheim, CA, December 1995.

"Phase II: The Age of High Velocity Scrubbing", presented at Clean-Air'96, Orlando, FL, December, 1996.