

**ANNUAL PROJECT REPORT
AS OF DECEMBER 1991**

1. PROJECT SPONSOR:

The Cincinnati Gas & Electric Co.
139 East Fourth
Cincinnati, OH 45202

2. PROJECT MANAGER:

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TELEPHONE: (513) 287-2266

3. OCDO GRANT NO#: CDO/D-87-76

4. PROJECT: Final Report

5. PROJECT TITLE: Advanced Wet Flue Gas Desulfurization and Denitrification Process Pilot Plant Project

6. PROJECT TERM: FROM August 1988 TO November 1991

7. PROJECT	<u>NAME</u>	<u>COST-SHARE</u>
CO-SPONSORS:	OCDO	\$2,500,000
	CG&E	275,103
	DLC	<u>3,788,945</u>
TOTAL PROJECT COST:		\$6,564,048

I. ABSTRACT

8. OBJECTIVES

1. Establish system and equipment design requirements for a magnesium enhanced flue gas desulfurization (FGD) system that are up to thirty (30) percent lower in capital cost and significantly lower in operating costs than existing limestone FGD systems.
2. Establish that a low cost technology using metal chelate additives in the scrubbing liquor will achieve significant (seventy [70] percent) NO_x removal without adversely affecting SO₂ removal efficiency.
3. Establish if process modifications can convert scrubber sludge into a commercial quality gypsum.

The magnesium enhanced flue gas desulfurization process is a high SO₂ removal process (>95%) that is well suited for use with high sulfur coals typical in Ohio.

9. WORK DONE AND CONCLUSIONS:

Detailed engineering and equipment procurement was completed in April, 1989. Construction of the pilot plant was completed in late October, 1989. Construction of the pilot plant was completed in late October, 1989. Equipment shakeout and operator training were completed by end of November. Testing of scrubber performance started in December of 1989. Counter current scrubber performance testing was completed in August of 1990. Co-current scrubber testing was completed in November, 1990.

Dewatering testing was performed on the filtercake generated both during scrubber performance testing and during dedicated dewatering runs.

Improved cake solids content of up to 50% were recorded by the use of additives in the slaked lime and optimization of the scrubber and slurry pumps operation.

The oxidizing/crystallizing portion of the gypsum production process (the Thioclear process) was prepiloted at the Mitchell Power Station of Allegheny Power Systems and then installed as part of the integrated pilot facility at Miami Fort. Testing demonstrated that effective scrubbing of SO₂ was possible while simultaneously producing gypsum and magnesium hydroxide as products. SO₂ removal efficiencies in excess of 90% were maintained. This testing at Miami Fort started in August 1990 and was completed in September, 1990.

Testing was conducted on the metal chelate NOx removal process. Testing demonstrated that NOx removal using the process was possible with up to 30% NOx removal and over 99% SO₂ removal recorded at commercially feasible L/G. This testing was completed in December, 1990.

Long duration testing of the advanced scrubbing system held at process operating parameters established as part of the test program was conducted for two months. Trouble free operation at 90% removal efficiency and over 98% efficiency was demonstrated. This testing was completed in March, 1991.

The final report was submitted to CG&E and approved for publications to OCDO in November, 1991.

10. PLANS FOR COMING YEAR:

This project has been completed.

II. HIGHLIGHTS/ACCOMPLISHMENTS

11. Evaluations of counter-current scrubber performance yielded SO₂ removal efficiencies as high as 99%. Co-current scrubber performance testing yielded SO₂ removal efficiencies as high as 98%. An understanding of the equipment mass transfer capability for different scrubber internal design configurations was derived.

The gypsum production process was successfully operated, yielding SO₂ removal efficiencies comparable to the baseline counter-current scrubber testing and yielding byproducts of magnesium hydroxide and gypsum in saleable quantities and purities.

The metal chelate NOx removal process was successfully operated yielding high SO₂ removal efficiencies and moderate NOx removal efficiencies.

Long duration testing of the advanced scrubber at high SO₂ removals was successful.

III. ARTICLES/PRESENTATIONS

- 12. September, 1989 . . . Pittsburgh Coal Conference;
1 Technical paper presented
- May, 1990 EPRI FGD Symposium;
1 Technical paper presented
- June, 1990 OCDO Technology Transfer Open House at the Pilot Plant
4 Technical papers presented
- August, 1990 Pittsburgh Coal Conference
1 Technical paper presented
- June, 1991 Air & Waste Management Association Annual Meeting
1 Technical paper presented