

**ANNUAL PROJECT REPORT
AS OF DECEMBER 1998**

1. PROJECT SPONSOR: The Cincinnati Gas & Electric Company
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2. PROJECT MANAGER: Bruce W. Lani
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Project Manager
Telephone: (412) 777-0723
3. OCDO GRANT NO: CDO/D-90-18
4. PROJECT UPDATE OR
FINAL REPORT X
5. PROJECT TITLE: High Performance Wet Scrubber Testing
6. PROJECT TERM: FROM February 1, 1992 TO March 31, 1998
7. PROJECT NAME COST-SHARE
- | | | |
|---------------------|---------------|-------------|
| CO-SPONSORS | OCDO | \$769,109 |
| | CG&E | \$17,661 |
| | DLC | \$838,101 |
| | EPRI | \$156,400 |
| | Munters Corp. | \$20,000 |
| TOTAL PROJECT COST: | | \$1,801,271 |

I. ABSTRACT

8. OBJECTIVES:

The Clean Air Act of 1990 requires substantial reduction of SO₂ emissions from coal-fired electric generating facilities and offers incentives to exceed targets by accumulation of excess emission allowances. Wet scrubbing is the leading proven technology available to achieve this reduction. The Thiosorbic®, or magnesium enhanced, lime process was developed by Dravo Lime Company specifically for scrubbing flue gas from high-sulfur coal similar to those found in Ohio. Continued innovative advancements of this technology are essential to reduce costs and promote this technology. Two areas of investigation are planned within this project.

The first phase of testing will optimize and evaluate a magnesium enhanced clear liquor scrubbing process developed by the Electric Power Research Institute. This process utilizes a combined recycle/thickener tank which is expected to improve the settling and dewatering characteristics of the FGD waste byproduct. Capital and operating cost savings are expected from the elimination of tankage, reduction in the size of the secondary dewatering equipment and lower disposal costs associated with the lower moisture containing FGD waste byproduct.

The second phase will determine design and operating conditions which will allow achievement of 98% SO₂ removal at absorber gas velocities of 15 to 25 ft/sec. Additionally, evaluations of demisters to remove the entrained scrubbing solution from the gas will be conducted. Operating at high absorber velocities will allow fewer absorbers to be installed or, alternatively, allow the absorber diameter to be reduced. Savings in both capital and operating expenditures will be realized.

9. WORK DONE AND CONCLUSIONS:

The first phase of testing pertaining to the EPRI process was completed in 1992 and the results reported in the Ohio Coal Development Agenda for 1993.

High absorber gas velocity testing was initiated in January 1993. Ten weeks of parametric testing was completed between January and March. The test program evaluated three configurations of vertical mist eliminators at scrubber velocities of 10, 14, 16, 18, 20 and 22 ft/sec in a spray tower and the same demisters at velocities of 10, 14 and 16 ft/sec while operating a spray/tray tower. Horizontal mist eliminator tests were conducted at absorber gas velocities of 24, 26, 28 and 30 ft/sec in a counter-current spray absorber and at velocities of 26, 28, 30 and 31 ft/sec in a co-current mode. Sulfur dioxide removals of 98% were achieved in all tests with an inlet sulfur dioxide concentrations of 2500 ppm.

The trend that reductions in the liquid to gas (L/G) ratios can be accomplished while maintaining the same sulfur dioxide removal when the absorber gas velocity is increased was demonstrated in these tests. In the spray tower vertical mist eliminator evaluations, the L/G was reduced from 78 to 12 as the corresponding absorber velocity was increased from 10 ft/sec to 22 ft/sec. Similarly in the tray tower vertical demister studies, the L/G was reduced from 67 to 27 as the scrubber gas velocity was increased from 10 ft/sec to 16 ft/sec. The mist eliminators were able to limit the carryover emissions to less than 0.2 grains/acf at a velocity of 16 ft/sec in the spray tower mode and at a velocity of 15 ft/sec in the tray tower mode. At velocities greater than these, the more efficient horizontal mist eliminator would be necessary to minimize excessive carryover.

10. PLANS FOR COMING YEAR:

The project has been completed.

II. HIGHLIGHTS/ACCOMPLISHMENTS

11. High velocity scrubber testing and mist eliminator evaluations were completed.

Increasing the absorber gas velocity above the conventional design parameter of 10 ft/sec enhances the utilization of the available alkalinity of the scrubber liquor allowing a lower L/G to achieve the same sulfur dioxide removal.

Commercially available vertical mist eliminators can be utilized to maintain carryover emissions below 0.2 grains/acf while operating at absorber velocities up to 15 ft/sec.

Economic evaluations show that a magnesium-enhanced lime FGD scrubber island's capital costs are 80% less than those of a conservative LSFO system and 45% less than those of an advanced LSFO system.

III. ARTICLES/PRESENTATIONS

12. "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.

"Phase II: The Age of High Velocity Scrubbing," presented at the NO_x/SO₂/Particulate Controls "Mega" Symposium, Washington D.C., August, 1997,