

**ANNUAL PROJECT REPORT
AS OF DECEMBER 2001**

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| 1. PROJECT SPONSOR:

City of Hamilton, Ohio
Department of Electric
345 High Street
Hamilton, Ohio 45011-2709 | 2. PROJECT MANAGER:

Mr. Michael Perry
Director of Electric
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3. OCDO GRANT NO.: CDO/D-922-10 4. **PROJECT:** UPDATE

5. PROJECT TITLE: FLS miljø (AirPol) Gas Suspension Absorber System Demonstration

6. PROJECT TERM: 9-15-94 TO 12-31-01

7. BUDGET:	<u>NAME</u>	<u>COST SHARE</u>
	OCDO	\$ 4,553,729
	City of Hamilton, Ohio	7,158,043
	FLS miljø, Inc. (AirPol, Inc.)	1,747,215
	SFT, Inc.	203,729

TOTAL PROJECT COST:	\$13,662,716
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I. ABSTRACT

8. **OVERVIEW OF PROJECT AND OBJECTIVES:**

The objectives of this project are to demonstrate the applicability of the FLS miljø, Inc. (AirPol) Gas Suspension Absorber System (GSA), Flue Gas Desulfurization process on Ohio coals containing high sulfur, and determine reliable design and operation conditions for acceptable SO₂ removal efficiencies. Design parameters will also be defined for future scale up for larger commercial systems. Based on the results obtained from the GSA demonstration, operation, technical, and economic comparisons with other Flue Gas Desulfurization technologies will be made.

These objectives are to be accomplished through design, construction, operation, and testing of the 50 MW GSA system at the City of Hamilton, Ohio's Municipal Power Plant.

9. WORK DONE AND CONCLUSIONS:

The project engineering began in December 1994 and the construction of the GSA facility was completed in June of 1997. System check-out and commissioning were completed in June 1997. Phase II works, Demonstration Testing was slated for immediate initiation following the June 1997 commissioning. A number of the system components were placed in operation while firing low sulfur coal. However, the GSA system could not be placed in operation due to the Ohio Environmental Protection Agency's requirement for a Permit to Install (PTI). Previously, the City had been informed that a PTI would not be required.

The City of Hamilton received the needed PTI in February 1999. In addition, the method of disposal of the GSA byproduct came under review and evaluation by the Ohio Environmental Protection Agency. Provisions were established to dispose the byproduct in a sanitary landfill until the material can be evaluated to determine if it is acceptable for beneficial use. A demonstration feedlot pad was constructed at the Tom Study Farm, Oxford Township in September 1999. It is now in use and is well received by the Study's.

Initial start up of the GSA system in preparation for the Phase II Demonstration Testing works took place in late May of 1999 with the boiler firing low sulfur coal. Equipment reliability testing occurred during the interval of June through August. Performance Demonstration Testing of the GSA system began on August 30, 1999 and completed on September 24, 1999. The test data obtained indicate very favorable results with high SO₂ removal rates. Testing with boiler firing high sulfur coal began on September 28. Throughout the summer operation interval of 1999, a number of mechanical problems related to equipment over-sizing were encountered with the GSA feeder screws. During the high sulfur test runs, problems were experienced that caused the boiler and GSA to be tripped off-line many times; the last of which resulted in explosion damage to a coal mill on the boiler. Demonstration Testing was temporarily suspended in early October of 1999 for boiler repairs and investigation and resolution of both the mechanical and operational trip problems.

In August of 2000, retrofit modification works to resolve sizing issues of the GSA feeder screws, as well as certain other additions and improvements as derived from investigation of the 1999 operations were installed. A major improvement was the installation of additional monitoring instrumentation and recording log equipment to the GSA that provides both a historical track of conditions as well as potentially being a means of alerting operators at the onset of the previously encountered positive pressure excursions. Demonstration Testing was resumed in late September 2000 under low sulfur coal firing of the boiler and moved to high sulfur coal firing in late October 2000. The previously encountered mechanical sheering and breaking problems related to the GSA feeder screws appeared to be resolved by the retrofit modifications. However, boiler and GSA trips continue to present themselves. Frequency of trips had been reduced, but not eliminated with the presence of the additional instrumentation. Demonstration Testing was temporarily suspended on November 1, 2000 for further investigation.

The City of Hamilton, in conjunction with their consultants and FSL, determined that the scrubber as designed could not effectively handle the high sulfur coal, primarily due to the inability of the ash handling system to keep the system evacuated during times of high lime injection rates. The City procured a 2.7% sulfur coal to use during the testing period. During March, under the supervision of FLS, Plant personnel operated the system with a two-thirds/one-third blend of high sulfur and compliance coal in order to consume the inventory of the 4% plus sulfur coal.

During the spring shutdown, FLS personnel commenced with design changes developed during their technical review. This included larger ash overflow screws, an air lock on the discharge of the overflow screws, and baffles and shrouds at the discharge of the re-circulation screws. These modifications were made in an attempt to eliminate fluidization of the ash in the feeder box thought to be the primary cause of over-feeding of the re-injection ash. Additional improvements were also made to the mounting brackets of the lance to insure proper alignment, and clean-out doors were added at the lump crusher with additional slope to the elbow hopper. These changes were implemented to eliminate slugging of the reactor. However, slugging continues to be a problem at this time.

Testing of the system began in May with FLS technical experts from Denmark. They recommissioned the entire system, while fine-tuning control loops and improving temperature measurement sensitivity and ash handling cycling methods. The system was operating very well and the test plan was implemented. A few days into the testing, the east re-circulation screw broke again. It was removed and sent out for repair. Inspection of the other screw showed hairline cracks. Repairs were made in place. The Denmark experts procured materials to build a support and install a second bearing on the outboard end of the screws to support the weight of the gearbox and motor. The system was re-started and testing was resumed and completed in late June.

Two days after the completion of the testing, failure of the I.D. damper caused a positive pressure excursion, similar to the one that had occurred in 1999. The same coal mill experienced an explosion. Although not directly related to the GSA, it was, however, experienced on high sulfur coal. The decision was made for safety and plant protection reasons to suspend the combustion of the high sulfur coal and the GSA operation until a steam inerting system could be installed on the coal mills to suppress the potential of future explosions. This was completed in December of 2001 and start-up of the GSA was scheduled for January 2002.

10. PLANS FOR COMING YEAR:

With testing completed and data gathered, the City is waiting to review the FLS final project report. We hope to submit this report to OCDO in 2002. In addition, additional testing and real world operation of the GSA continues.

II. HIGHLIGHTS/ACCOMPLISHMENTS

The project ground breaking took place on July 27, 1995, at the City of Hamilton Power Plant with dignitaries of the State, City, various governmental and industrial representatives at the ceremony.

Construction of the facility began in March 1996.

Construction of the facility was completed in June 1997.

Initial start-up and testing in May 1999.

Construction of demonstration feedlot pad in September 1999.

Return to testing in August 2000.

Finalized testing in June 2001.

III. ARTICLES/PRESENTATIONS

- 12.** July 27, 1995: City of Hamilton, Ohio
Power Plant - Hamilton, Ohio
Ground Breaking Ceremony
- August 2-4, 1995: Maumee Bay Conference Center, Toledo, Ohio
SFT, Inc. Seminar
Power Plant and Cogeneration Seminar
The Installation of an SO₂ Scrubber at the
City of Hamilton Municipal Power Plant

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(TO OWNER)**

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SFT, Inc.