ANNUAL PROJECT REPORT
AS OF DECEMBER 1992

1. PROJECT SPONSOR:

Ohio Coal Development Office
Babcock & Wilcox Company

2. PROJECT MANAGER:

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3. OCDO GRANT NO#: CDO/R-89-28

4. PROJECT: Final Report

5. PROJECT TITLE: Advanced Coal Reburning and Sorbent Injection

6. PROJECT TERM: FROM September 3, 1990 **TO** February 28, 1992

7. PROJECT	**NAME**	**COST-SHARE**
CO-SPONSORS:	OCDO	$149,947
	B&W	75,000
TOTAL PROJECT COST:		$224,947

I. ABSTRACT

8. OBJECTIVES

There are currently more than 25000 MW_e of cyclone boilers in operation contributing approximately 21% and 15% of the nationwide NO_X and SO_2 respectively. At present, there are no commercially demonstrated combustion modification techniques for cyclone boiler that reduce NO_x emissions. Also, the majority of cyclone boilers are not equipped with any type of scrubber for reducing SO_2 emissions because the boilers were built prior to the EPA New Source Performance Standard (NSPS). The emerging reburning technology offers cyclone boilers owners a promising alternative to expensive flue gas cleanup techniques for NO_x emission reduction. Therefore, the objective of this project is to evaluate simultaneously coal reburning and in-furnace SO_2 control using a high sulfur Ohio coal in a cyclone-equipped pilot facility.

Specifically, the goals of the project were to reduce NO_X and SO_2 50% with technically feasible operating conditions without sacrificing boiler operation and reliability.

9. WORK DONE AND CONCLUSIONS:

The pilot-scale combustion tests were performed in B&W's 6-million Btu/hr Small Boiler Simulator

(SBS) located in Alliance, Ohio. For this project, the SBS was fired by a single, scaled-down version of B&W's cyclone furnace. The small cyclone was attached to the front wall of the SBS. A single advanced reburn burner was installed in the center of the rear wall of the SBS just above the centerline of the cyclone furnace. Overfire air was introduced through two ports on the rear wall of the SBS just above the new reburn burner. The existing dry scrubber module was used to spray atomized water into the flue gas stream for the tests with humidification. The entire SBS facility was instrumented for real-time acquisition of combustion air solids flow data as well on-line gas analysis.

The pilot-scale combustion testing was broken down by test objective into three categories. These categories were: baseline tests, reburning tests, and SO_2 control tests. The baseline tests were performed to identify the benchmark data to which all subsequent test results were compared. Reburning was not used during the baseline testing. The goals of the reburning tests were to achieve 50% NO_X reduction and evaluate the in-furnace corrosion potential of the new reburn burner. Coal was used as the reburning fuel and the furnace was held at full load during the reburning tests.

During the pilot-scale evaluation, a 40 - 60% overall NO_X emission reduction was achieved with the coal reburning technology. The lower in-furnace reburning zone stoichiometry of 0.85 provided the best overall NO_X reduction. Addition of flue gas recirculation (FGR) to the reburn burner improved the overall NO_x reduction. The potential side effects of the reburning technology such as increased FEGT (furnace exit gas temperature), unburned combustible loss, and fireside corrosion were investigated. From the pilot-scale results, the impact of the aforementioned side effects was minimal. However, site specific evaluation is required for future retrofit applications.

An SO_2 reduction of 50 - 70% was achieved with a Ca/S molar ratio of 2 using either upper furnace or in-duct sorbent injection. Flue gas humidification was necessary to achieve the goal of 50% SO_2 reduction at a Ca/S ratio of 2.

10. <u>PLANS FOR COMING YEAR:</u>

OCDO's comments were incorporated in the draft final report and the final report was submitted to OCDO.

II. HIGHLIGHTS/ACCOMPLISHMENTS

11. During the past year, preparation of the final report was completed.

Prior to this project natural gas was promoted as a reburning fuel, because it was believed that coal would not provide adequate NO_x reduction due to it's low volatility and intrinsic nitrogen content. This project provides first-of-a-kind data using high-sulfur Ohio coal in coal reburning. The successful completion of this pilot-scale evaluation enables the cyclone-owners to continue using coal in cyclone boilers.

III. ARTICLES/PRESENTATIONS

12. None.