ANNUAL PROJECT REPORT
AS OF DECEMBER 1990

1. PROJECT SPONSOR:

Babcock & Wilcox Company
1562 Beeson Street
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2. PROJECT MANAGER:

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3. OCDO GRANT NO#: CDO/R-88-4

4. PROJECT: Final Report

5. PROJECT TITLE: SO_X-NO_X-RO_X-Box Systems Integration Studies

6. PROJECT TERM: FROM March 1, 1989 **TO** March 1, 1991

7. PROJECT	**NAME**	**COST-SHARE**
CO-SPONSORS:	OCDO	$149,974
	B&W	74,987
TOTAL PROJECT COST:		$224,961

I. ABSTRACT

8. OBJECTIVES

The objective of this research project was to further develop process improvements to the SO_X-NO_X-RO_X Box (SNRB) process, which injects a sorbent and ammonia (NH_3) upstream of a high-temperature baghouse (600-900 degrees F) to simultaneously remove sulfur dioxide (SO_2), nitrogen oxide (NO_x), and particulates (RO_x) in a single unit operation. The research target for SO_X and NO_X removal was 90% for each, with a minimum acceptable level of 70% for each. The specific objectives of this program include:

-- Evaluate SO_2 removal and baghouse operability at air-to-cloth ratios from 2-6 ft/min.

-- Integrate the Norton SCR catalyst into the bag filter assembly least affect baghouse operation.

-- Investigate hydrated lime injection at temperatures greater than 1000 degrees F.

-- Determine the feasibility of recycling the baghouse solids to improve overall sorbent utilization.

The SNRB process represents a potential cost-effective approach for control of SO_X, NO_X, and particulates, which will expand the markets and uses of Ohio coal.

9. WORK DONE AND CONCLUSIONS:

9.1 Hot Baghouse Tests: SO_2 removal and baghouse operability were evaluated at air-to-cloth ratios from 1.8-5.6 ft/min. SO_2 removal and lime utilization were not affected at the higher air-to-cloth ratio (smaller baghouse). However, the baghouse pressure drop increased at the higher air-to-cloth ratios.

Hydrated lime was evaluated over injection temperatures from 800-1100 degrees F. Lime utilizations and SO_2 removal improved with increasing temperatures up to 1000 degrees F, with a slight drop-off from 1000-1100 degrees F. SO_2 removals of 75-85% were achieved at an injection temperature of 1000 degrees F and $Ca(OH)_2$: SO_2 stoichiometry of 2. NO_X removals of 80-85% were measured at an NH_3:NO_X stoichiometry of 0.9 and a catalyst bed temperature of 800 degrees F.

9.2 Catalyst Integration: Two integrated bag/catalyst configurations were designed by B&W, Norton (catalyst supplier), and ETS (baghouse testing firm). These catalyst configurations were evaluated for bag cleaning efficiency using an ambient, plexiglass baghouse at ETS. Various cleaning techniques were evaluated including pulse-jet, reverse air, on-line, and off-line cleaning. The tests were successful in that both catalyst designs could be effectively cleaned either on-line or off-line.

9.3 Recycle Tests: Baghouse solids from the hot SNRB baghouse tests were rehydrated using a pressure hydrator. The rehydrated SNRB solids were then tested for reactivity in a bench-scale test facility at the University of Texas. The preliminary results have shown that the rehydrated solids are not significantly reactive with SO_2.

10. PLANS FOR COMING YEAR:

All experimented work has been completed, and the final report was prepared.

II. HIGHLIGHTS/ACCOMPLISHMENTS

11. Pilot baghouse tests demonstrated that air-to-cloth ratios of 4-5 are feasible for the SNRB process. At higher air-to-cloth ratios, a smaller baghouse and fewer number of bags are required, thus, reducing the capital costs for the SNRB process. Two integrated bag/catalyst configurations were developed, and effective bag cleaning was demonstrated for both designs.

III. ARTICLES/PRESENTATIONS

12. No formal papers were presented in 1991. A paper was presented at the 1989 Pittsburgh Coal Conference in Pittsburgh, Pennsylvania. The paper discussed the results from the 1988 OCDO/B&W SNRB pilot tests.