Project Status Report for: July 2001

Project Title: Ultra Low NOx Integrated System for Coal-Fired Power Plants

Project Number: 91890460 **Project Manager:** John Marion

Customer Name: U.S. DOE / Performance Projects **Project Leader:** Charles Maney

GOALS AND OBJECTIVES:

Develop low cost, retrofit NO_x control technologies to address current and anticipated, near term emissions control legislation for existing coal fired utility boilers. Specific goals include:

- Achieve < 0.15 lb/MMBtu NO_x for eastern bituminous coals
- Achieve < 0.10 lb/MMBtu NO_x for western sub-bituminous or lignitic coals
- Achieve economics at least 25% less than SCR-only technology
- Validate NOx control technology through large (15 MWt) pilot scale demonstration
- Evaluate the engineering feasibility and economics for representative plant cases
- Provide input to develop commercial guidelines for specified equipment
- Provide input to develop a commercialization plan for the resultant technologies

WORK PLANNED FROM PREVIOUS REPORT:

Task 2.4 – Advanced Control System Design

- Obtain preliminary results of the flame scanner data.

Task 3.3 – Combustion Testing and Cleanup

- Finalize scope of cleanup from the second combustion test period in the BSF.

Task 5 – Engineering Systems Analysis & Economics

- Select the units for and define the parameters to be evaluated during the performance of the final economic analysis task.

ACCOMPLISHMENTS FOR REPORTING PERIOD:

Task 2.4 – Advanced Control System Design

- *Obtain preliminary results of the flame scanner data.*

During the second combustion test period, flame scanner signals were recorded using both UV and IR detectors looking at the top elevation of coal flames on the West side of the BSF. The analog signals from the scanners were recorded on tape and later digitized, saved as data files, and processed. Data

was obtained from 28 of the conditions tested in the BSF with data points from both the Powder River Basin (PRB) and high volatile bituminous coals.

Correlation of the flame scanner signals with furnace operating conditions and NOx emission levels is currently underway. Preliminary results show that the flame scanner signal is a function of the main burner zone stoichiometry as illustrated in Figure 1. A significant increase in the UV signal was seen as the flame intensity / temperature increased with main burner zone stoichiometry.

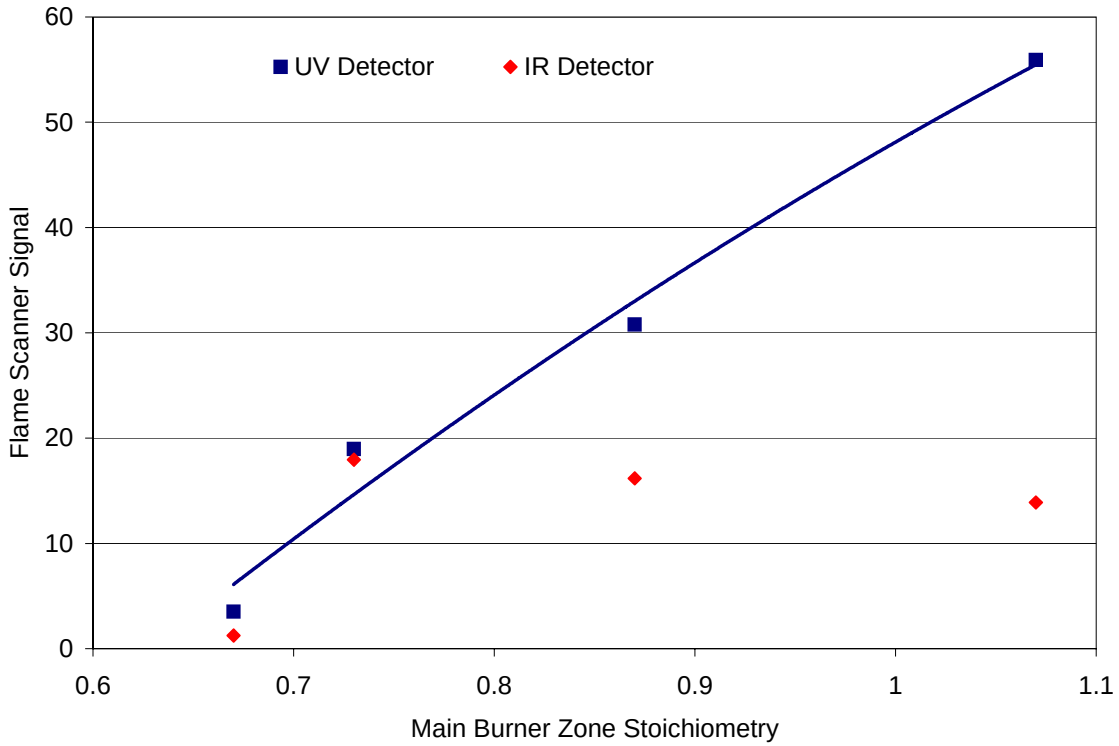

Figure 1. Flame scanner signal vs main burner zone stoichiometry for hvb coal.

As expected, the flame scanner signal increased with increasing boiler load for the PRB coal as shown in Figure 2. Note that the main burner zone stoichiometry was held constant as a function of load. Also, as shown in Figure 3, there was little variation in the flame scanner signal for 2 cases where the main burner zone was held constant and the overfire air location was varied. These results suggest that the repeatability of the flame scanner technique may be reasonable.

In summary, the analysis of the flame scanner results is currently underway. There appears to be a good correlation between the main burner zone stoichiometry and UV flame scanner signal. More analysis is needed to determine if the flame scanner signals correlate with the local nozzle stoichiometry, etc. to fully assess the range of applicability of the flame scanner signal for advanced boiler control.

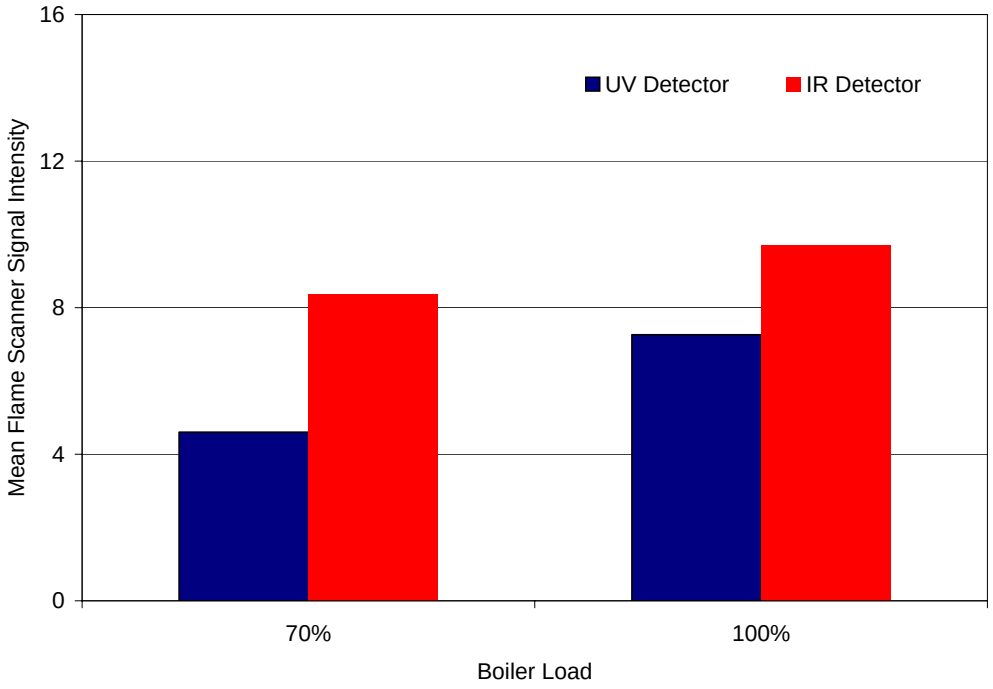

Figure 2. Flame scanner signal vs boiler load for PRB coal.

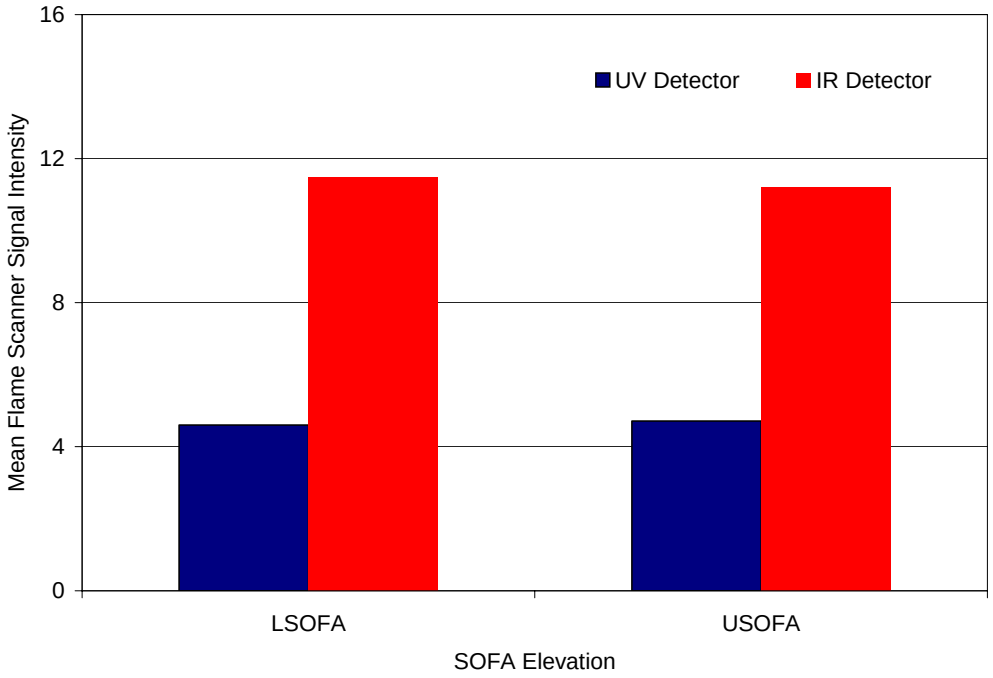

Figure 3. Flame scanner signal vs SOFA elevation for PRB coal.

Task 3.3 – Combustion Testing and Cleanup

- *Finalize scope of cleanup from the second combustion test period in the BSF.*

All excess coal from this project was disposed of in a landfill. The last remaining BSF cleanup task to be completed is to deslag the furnace and dispose of the hopper ash. This task should be completed in August.

Task 5 – Engineering Systems Analysis & Economics

- *Select the units for and define the parameters to be evaluated during the performance of the final economic analysis task.*

To cover a broad a range of low NOx retrofit scenarios, the economic analysis will be performed for 2 units, one firing a Powder River Basin coal and the other a midwest bituminous coal. The units selected for the analysis are the Scottish Power (PRB) and the IP&L (bit) units recommended by the advisory panel in our Jan. 31, 2001 meeting. The economic analysis of the unit firing the bituminous coal will also include the cost of a fuel switch to fire PRB.

Note that analysis of 2 units is not within the current project scope and budget. However, as a result of the strong Business Unit interest in this topic, Alstom has agreed to provide support to cost the different low NOx retrofit cases at no cost to the project. This additional financial support will enable a more comprehensive economic analysis to be performed within the current task budget.

Cases to be evaluated include:

1. Baseline – as fired
2. TFS 2000™ firing system
3. Ultra Low NOx firing system
4. Baseline + SCR
5. Ultra Low NOx firing system + CBO™ device
6. Fuel switch to PRB

The final definition of the evaluated subsystems and / or operating conditions will be made in August.

WORK PLANNED FOR NEXT REPORTING PERIOD:

Task 2.4 – Advanced Control System Design

- Finalize results of the flame scanner data.

Task 3.3 – Combustion Testing and Cleanup

- Complete cleanup from the second combustion test period in the BSF.

Task 5 – Engineering Systems Analysis & Economics

- Finalize matrix of test cases and begin the final economic analysis.

Task 7 – Data Compilation and Final Report

- Develop outline of the final project report.