

emissions limits, will simultaneously reduce Hg and acid gas (HF and HCl) reductions. This information will give utilities more flexibility when choosing emission control options and will keep Ohio high-sulfur coal a viable fuel source.

9. WORK DONE AND CONCLUSIONS:

Simultaneous flue gas mercury (Hg) measurements were made at the scrubber inlet and outlet (stack) of a southern Ohio utility firing Ohio coal during the week of May 19-21, 1998. Three paired samples were collected. The average total Hg concentration in the flue gas at the scrubber inlet was $17.82 \pm 1.05 \mu\text{g}/\text{m}^3$ (PRSD of 6%). The Hg speciation at the scrubber inlet indicated that 71% of the mercury was in the oxidized (Hg^{++}) form and 29% was in the elemental (Hg^0) form. The average total Hg concentration in the flue gas at the scrubber outlet (stack) was $7.49 \pm 0.50 \mu\text{g}/\text{m}^3$ (PRSD of 7%). The Hg speciation at the scrubber outlet indicated that 17% of the mercury was in the oxidized (Hg^{++}) form and 83% was in the elemental (Hg^0) form. The measured Hg removal across the FGD system was between 53% and 63% and averaged 58%. Including the Hg absorbed on the ash (bottom and ESP ash), resulted in a total Hg removal across the boiler system was between 60% and 67% and averaged 62%. The Hg material balance closures for the three test days were 105%, 100%, 92%, and averaged 99%.

The Hg removed from the flue gas by the FGD system reported to the FGD solids. The FGD solids from this plant are fixated (blended with fly ash and lime) and land filled. The standard EPA leachate test (TCLP) procedure was conducted on both the "neat" FGD solids and the fixated materials using three solutions with pH values of 2.6, 4.9, and 7.7, respectively. No Hg was found in the leachate (detection limit of 0.01 mg/L). Mercury analysis conducted on the filtered solids from these leaching tests showed that no Hg was solubilized. Samples of both "neat" and fixated FGD solids were also subjected to a series of volatilization tests. The volatilization tests indicated that no Hg was lost from either sample when the sample was maintained at 140 °F (60 °C) for a period of 11 weeks.

The average HCl removal rate across the FGD was 98%. The average HF removal rate was >94%.

10. PLANS FOR COMING YEAR:

A program will be proposed to OCDO to repeat the test program since low-NO_x burners have been installed at the host utility. It is possible the new burner design will impact the ratio of oxidized-to-elemental Hg and may increase the carbon content of the fly ash. Both of these conditions can impact Hg removal. CONSOL will continue the evaluation of the stability of Hg in the FGD solids and will evaluate at least three additional FGD materials and present this information at national forums.

II. HIGHLIGHTS/ACCOMPLISHMENTS

11. This program showed that ESP-FGD systems at coal-fired boilers can remove >60% of the Hg. The program demonstrated that 90% of the oxidized Hg is removed by the scrubber. The Hg removal is dependent of the ratio of oxidized to elemental Hg in the

flue gas. The FGD solids characterization work indicated that the Hg reporting to the FGD sludge is stable and there is no potential for leaching or re-volatilizing based on our test results. This information will keep Ohio high sulfur coal competitive with out-of-state compliance coal. The knowledge that the Hg removed by the FGD system is stable in the FGD solids will diminish perceived environmental concern and should lead to more utilization opportunities.

III. ARTICLES/PRESENTATIONS

DeVito, M.S. and Rosenhoover, W.A. "Flue Gas Mercury and Speciation at Coal-Fired Utilities Equipped with Wet Scrubbers" 15th Annual International Pittsburgh Coal Conference, Pittsburgh, PA, September 14-18, 1998.

DeVito, M.S. and Rosenhoover, W.A. "Characterizing Total and Speciated Mercury Emissions from Coal-Fired Utilities Equipped with Wet Scrubbers" EPA/DOE/EPRI Workshop on the "Control of Hg Emissions for Combustion Sources", Research Triangle Park, NC, October 27-28, 1998.

DeVito, M.S. and Rosenhoover, W.A. "Flue Gas Hg Measurements from Coal-Fired Boilers Equipped with Wet Scrubbers", 92nd Annual Air & Waste Management Association Meeting and Exhibition, St. Louis, MO, June 20-24, 1999.

DeVito, M.S. and Rosenhoover, W.A. "Flue Gas Hg Measurements from Coal-Fired Boilers Equipped with Wet Scrubbers", International Energy Association Trace Element Workshop, Warwick University (UK), September 9, 1999.