EVALUATION OF SORBENT INJECTION FOR MERCURY CONTROL

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The power industry in the U.S. is faced with meeting new regulations to reduce the emissions of mercury from coal-fired plants. These regulations are directed at new units as well as the existing fleet of nearly 1,100 boilers. The existing plants are relatively old with an average age of over 40 years. Although most of these units are capable of operating for many additional years, there is a desire to minimize large capital expenditures because of the reduced (and unknown) remaining life of the plant to amortize the project. Injecting a sorbent such as powdered activated carbon into the flue gas represents one of the simplest and most mature technologies for controlling mercury emissions from coal-fired boilers.

This presentation will summarize results from testing at AmerenUE's Labadie Power Plant, the final of six test sites evaluated during this DOE/NETL program, DOE Award Number DE-FC26-03NT41986. This work is part of the Phase II DOE/NETL mercury control effort through the DOE Office of Fossil Energy's Innovations for Existing Plants program. The goal of the Phase II programs is to reduce the uncontrolled mercury emissions by 50 to 70% at a cost 25 to 50% lower than the baseline estimates of $50,000 to $70,000/lb mercury removed.

The objective of the ADA-ES test program was to evaluate the capabilities of activated carbon injection on a variety of coals and plant configurations. Test sites included: Sunflower Electric's Holcomb Station Unit 1, AmerenUE's Meramec Station Unit 2, Missouri Basin Power Project's Laramie River Station Unit 3, Detroit Edison's Monroe Power Plant Unit 4, AEP's Conesville Station Unit 6, and Labadie Power Plant Unit 2. The configurations tested represent 78% of the existing coal-fired generation plants in the US.

Approximately 25 GW of units firing PRB coal and several sites firing low-sulfur bituminous coal use SO_3 for flue gas conditioning. Many of these are planning to use sorbent injection for mercury control. Labadie Power Plant Unit 2 was selected as a test site because it has a marginally sized, cold-side ESP (SCA = 279 ft^2/kacfm) that requires SO_3 flue gas conditioning for enhanced particulate control when firing low- sulfur sub-bituminous coals from the Powder River Basin. Testing was planned to characterize the impact of SO_3 injection on activated carbon performance. An evaluation of options to improve sorbent effectiveness in the presence of SO_3 was also conducted.

The SO_3 system at Labadie is designed to provide SO_3 concentrations from 0-10 ppm. Activated carbon was injected both upstream and downstream of the air preheater and SO_3 injection location. Nine carbon-based sorbents, one coal additive, and two concrete friendly sorbents were evaluated in the full 630-MWg flue gas stream. Characterization of a novel sorbent enhancement process was also included.

The results from Labadie indicate that significant performance improvements could be achieved by injecting at the air preheater inlet and by a novel sorbent enhancement process. A summary of these results will be included in the presentation.