EVALUATION OF CONTROL STRATEGIES TO EFFECTIVELY MEET 70–90% MERCURY REDUCTION ON AN EASTERN BITUMINOUS COAL CYCLONE BOILER WITH SCR

Author:

Tom Campbell, Jean Bustard
ADA Environmental Solutions, Inc.
8100 SouthPark Way, Unit B
Littleton, CO 80120-4525
(303) 734-1727; (303) 734-0330 (fax)

ADA-ES, Inc., (ADA-ES) and Public Service of New Hampshire (PSNH) began work on a Cooperative Agreement with the Department of Energy in April 2006 to fully evaluate sorbent injection for mercury control at Merrimack Station Unit 2 (MK2). This work is part of the Phase III DOE/NETL mercury control effort through the DOE Office of Fossil Energy's Innovations for Existing Plants program. The goal of this project area 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. This project is key to helping PSNH, the New Hampshire (NH) legislature, and the NH Department of Environmental Services (DES) understand the technical feasibility and costs associated with different levels of mercury control. A bill has been enacted by the NH legislature that will require an 80% reduction in mercury emissions from PSNH's coal-fired power plants by 2013. In addition, PSNH will have to comply with the Clean Air Mercury Rule (CAMR) recently promulgated by EPA. Reaction Engineering International supported the testing program at MK2.

Merrimack was chosen as a test site for several reasons. Two primary reasons include the boiler type and elevated SO_3 from an upstream selective catalytic reduction (SCR) system. MK2 is configured with a cyclone boiler that burns a blend of bituminous and Venezuelan coals and uses a cold-side ESP for particulate control. There is limited mercury control data on this type of boiler. The SCR used for NOx control converts some SO_2 to SO_3. The presence of SO_3 is detrimental to mercury capture, both under baseline conditions and with sorbent injection. This project was designed to characterize the effectiveness of sorbent injection for mercury control combined with SO_3 mitigation techniques to attempt to achieve mercury control of at least 70% beyond baseline capture in a cost-effective manner.

Initial test phases included baseline, SO_3 mitigation co-benefit, and parametric evaluations. These phases were completed in 2007. The baseline test results indicated that the native mercury removal at Merrimack was typically less than 10% despite high LOI levels (>5%) and burning a coal blend that contains a 50% mix of bituminous and Venezuelan coals. During co-benefit testing, two dry SO_3 sorbents were tested at full scale. Lowering the SO_3 through alkaline sorbent injection did not improve native mercury removal. However, lowering the SO_3 levels in the flue gas permitted lower stack flue gas temperatures. Four powdered activated carbon (PAC) sorbents from Norit Americas and Calgon were evaluated during the parametric testing phase. These materials demonstrated

poor mercury removal in the flue gas stream at MK2. Three PAC sorbents and two SO_3 sorbents were included in the dual injection testing evaluation. Dual injection of PAC and an alkaline SO_3 sorbent resulted in greater than 50% mercury removal. Further enhancements of the dual injection approach demonstrated the potential to achieve greater than 70% mercury removal for short periods of time. Long term testing to evaluate mercury control and balance of plant issues began in late November 2007. Preliminary results will be available shortly.

This presentation will include a summary of results to-date and an outline of the remaining test program.