5th Annual AIChE Midwest Regional Conference

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Organized by the Chicago Local Section of the AIChE
Hosted by the Illinois Institute of Technology, Chicago, IL

Session Fr1B: 10:00am -11:30am, Friday February 1, 2013 (Room 007)
Air & Water Pollutions Controls for Fossil Power Plants
Session Organizer: Andrew Carstens, Sargent & Lundy LLC
Session Chair: Andrew Carstens, Sargent & Lundy LLC

10:00am: **Results of Emissions Testing with Fuel Additives, Activated Carbon, and an Evaluation of Mercury Re-emission at a Coal-fired Power Plant**
Ajay Jayaprakash, Sargent & Lundy LLC
In an effort to prepare for the Utility MATS (Mercury and Toxics Standards) Rule the Lower Colorado River Authority (LCRA) and Sargent & Lundy (S&L) developed and executed a testing program to evaluate control options for mercury and other HAP emissions at the Fayette Power Project. The Fayette Power Project is located in Fayette County, Texas and consists of three coal-fired units. Units 1 & 2 are 645 MW each and Unit 3 is rated at 470 MW. All three units fire Powder River Basin (PRB) coal and are equipped with electrostatic precipitators (ESP's) and wet limestone-based forced oxidation Flue Gas Desulfurization (FGD) systems.The full-scale test program was carried out on Units 2 and 3 and included the injection of halogenated and non-halogenated activated carbons into the flue gas upstream of the air heater, fuel additives onto the coal prior to combustion, and a consideration to add mercury re-emission prevention additives into the wet FGD systems. In addition to mercury concentrations in the coal and flue gas, measurements included hydrogen chloride, particulates, oxidation/reduction potential (ORP), and non-mercury metals. Fly ash was tested for its continued suitability for reuse in byproducts with both foam tests and air entrainment testing. This paper will review the protocols and procedures used in the test program, as well as the results of the emissions testing and process stream analysis. Emissions levels achieved during testing will be compared with the limits imposed by the Utility MATS. Additionally, the paper will discuss the degree of mercury re-emissions from a wet FGD system to affect emissions and the significance of FGD system measurements on these re-emissions.

10:30am: **Water = Power**
Diane Martini, Sargent & Lundy LLC
According to the United States Geological Survey (USGS), power plants account for over half of the surface water used in the US. This session will discuss the ways that power plants use water, how they treat the wastewater that is generated, and how they are working to reduce the amount of water that is used and discharged. We will briefly discuss the steam cycle, cooling tower use, ash sluicing, flue gas scrubbing, wastewater treatment and solids handling. We will also discuss how regulations are changing for using water and for discharging wastewater, and the meaning of Zero Liquid Discharge (ZLD).

11:00am: **CFD Applications in the Power Industry**
Emily Kunkel, Sargent & Lundy LLC
Achieving good flue gas flow distributions in ductwork is important to maximize the effectiveness of air quality control equipment as well as to minimize auxiliary power consumption in existing power plants. With more air quality control equipment retrofits being required for existing plants, ID fans need to overcome higher pressure drops and fans consume increasing quantities of auxiliary power to overcome the additional pressure drop. If pressure drop can be reduced by optimizing flow distribution through ductwork, significant reductions in operations and maintenance (O&M) costs can be realized. Computational fluid dynamics, or CFD, modeling can be used to mimic and predict flow patterns of flue gas through duct geometry. The modeling predicts problem areas that result in high/low velocity areas, high turbulence zones, and can also predict pressure drop through the course of ductwork. These results can then be analyzed and the problem areas can be mitigated before installation. The importance of addressing these problem areas ahead of time can result in improved equipment performance and reduce outage costs. This presentation will highlight the applications of CFD modeling in the power industry and illustrate examples of completed work.