

SOUTHERN RESEARCH
I N S T I T U T E

Sodium-Tetrasulfide Injection for Direct
Removal of All Forms of Mercury from
Coal-Derived Flue Gas

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Participants

- U.S. Department of Energy
Barbara Carney – *DOE COR*
- Southern Research Institute – *Prime*
- Southern Company
- Babcock Power Environmental, Inc.
- Tennessee Valley Authority
- American Electric Power
- Environmental Protection Agency
- Electric Power Research Institute

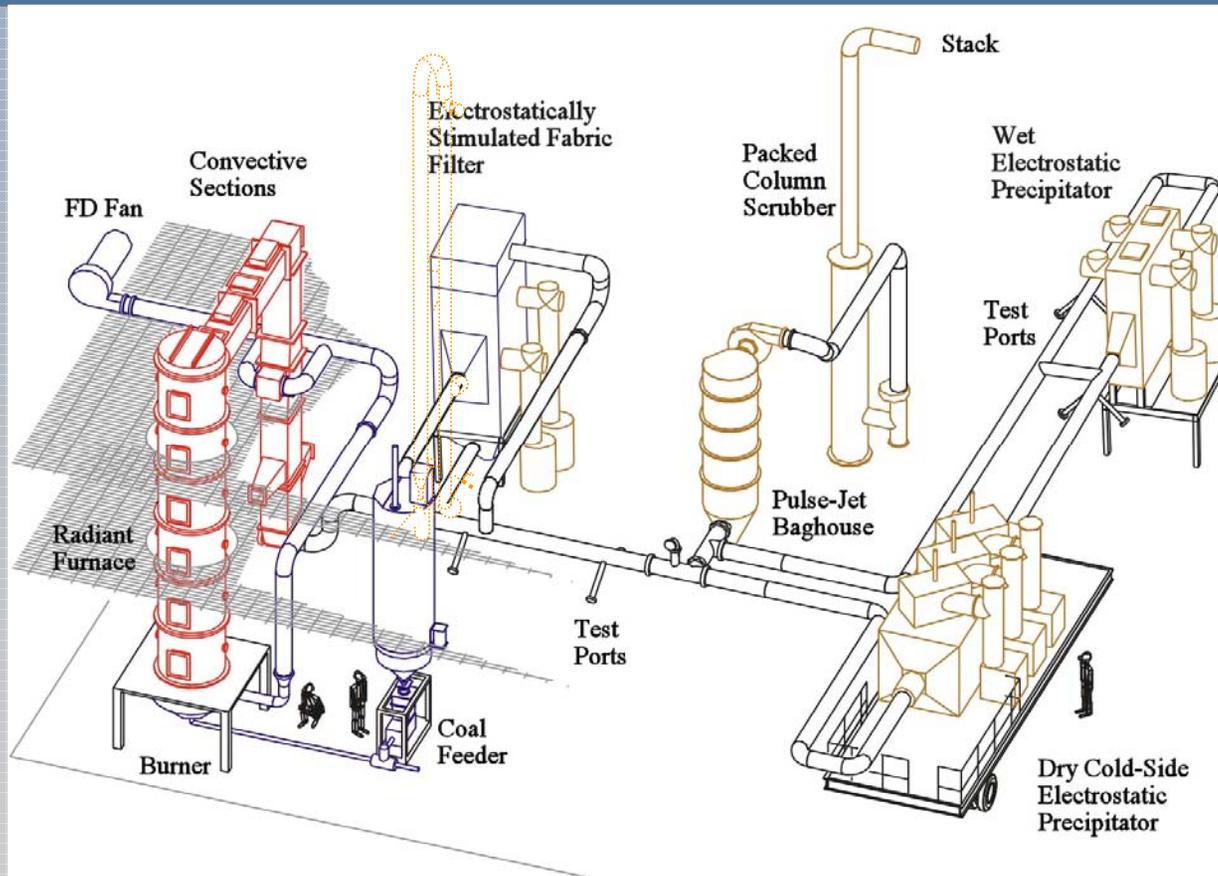


OBJECTIVE

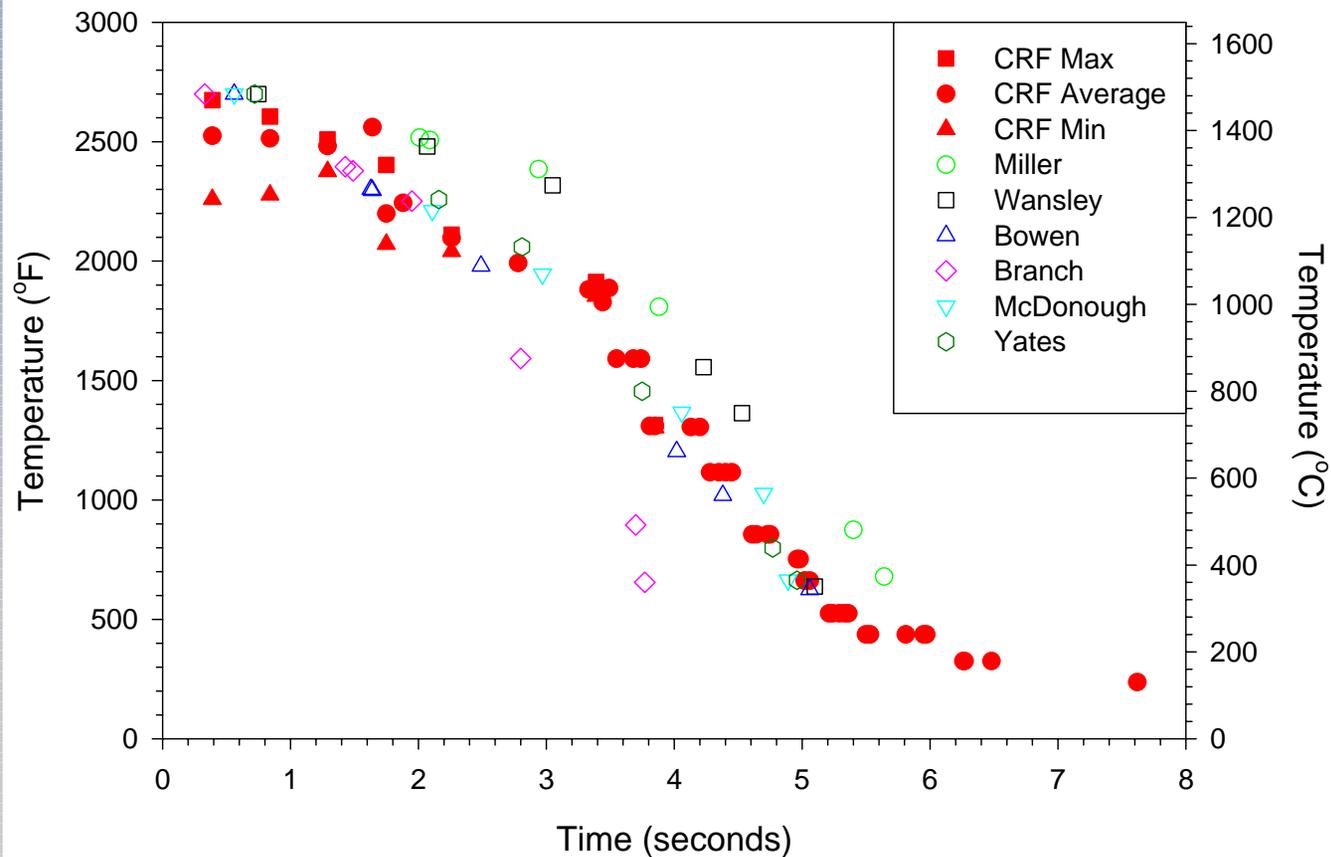
- The Objective of this project is to develop calcium-based sorbents and other alternative sorbents and chemicals to activated carbon, such as sodium tetrasulfide, for mercury removal in PC boiler systems.



Combustion Research Facility



CRF dT/dt Compared to Full-Scale

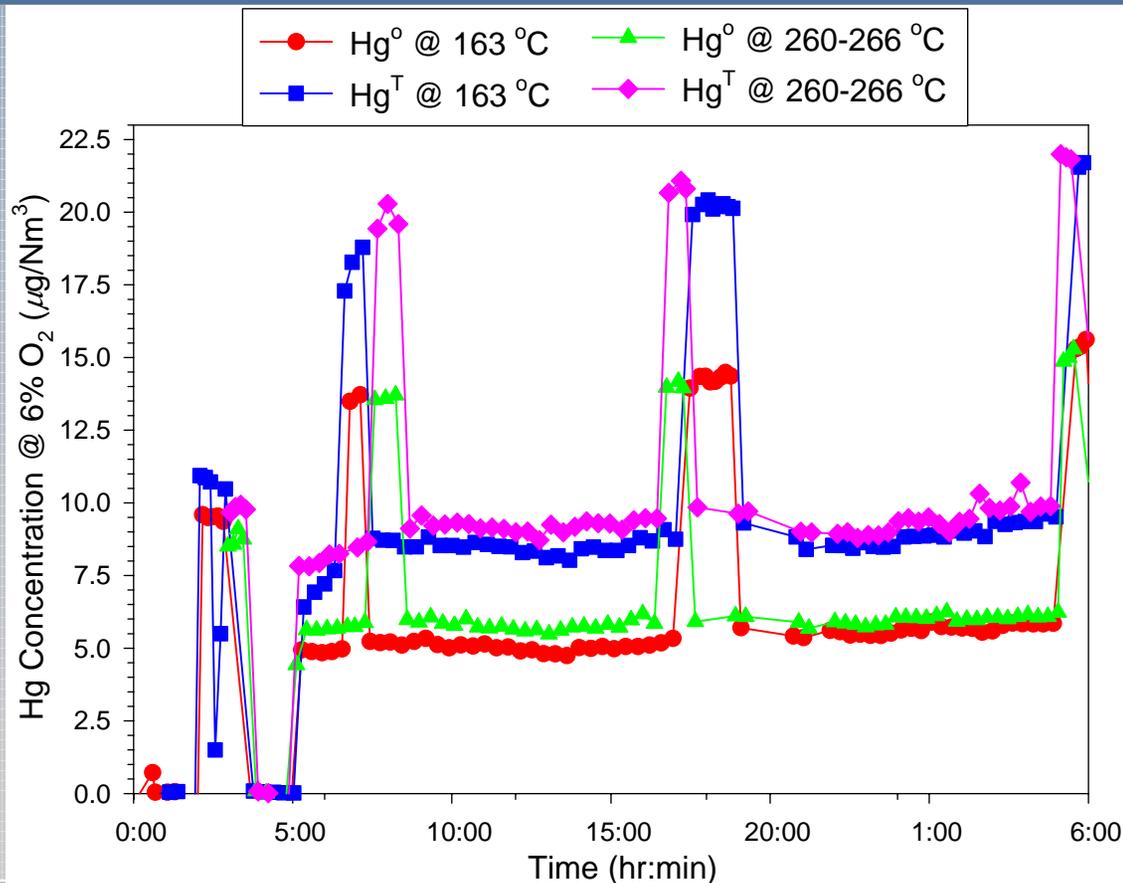


Hg-Monitoring System

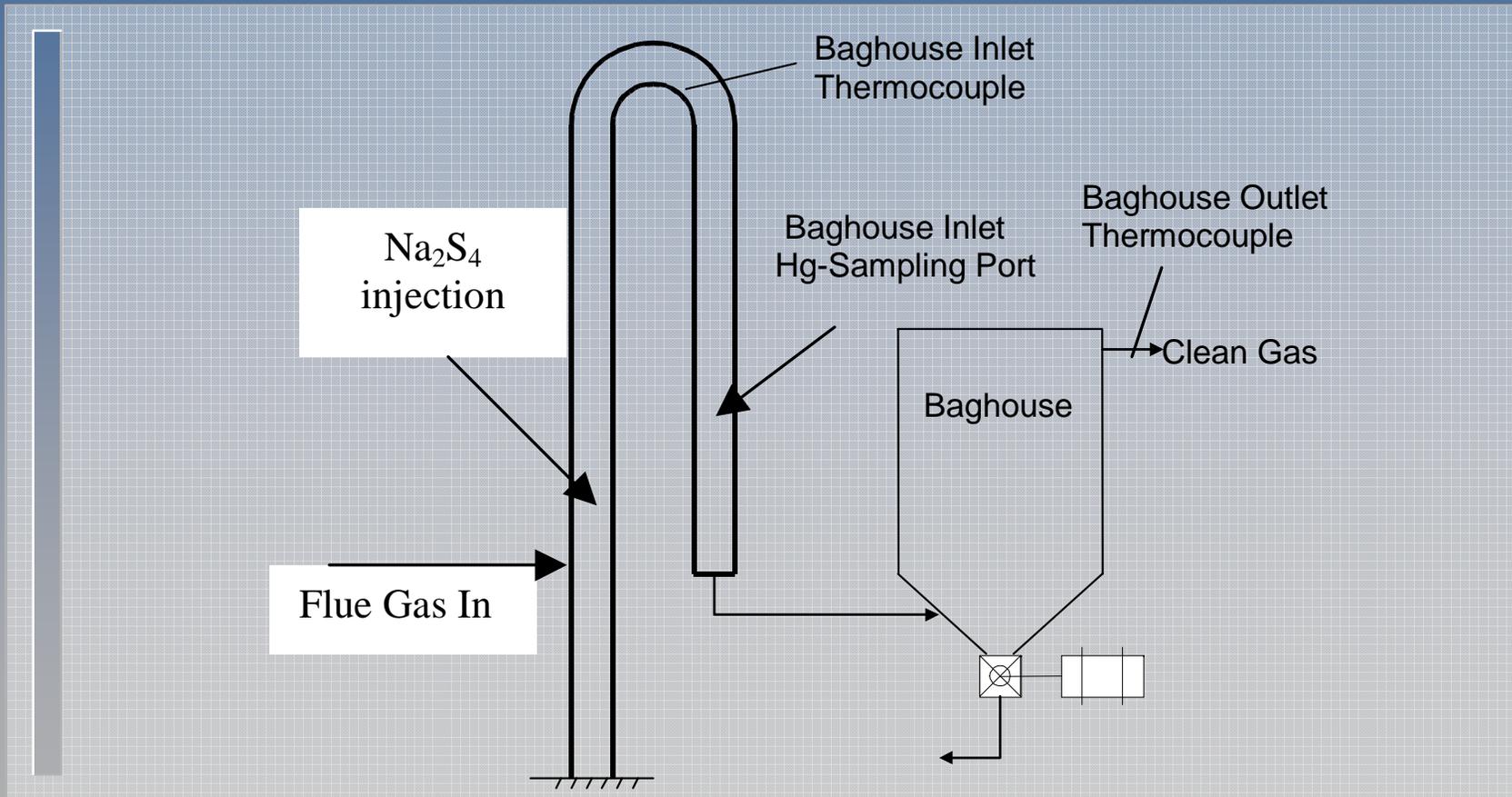
- Inertial Separation QGIS Probes
- Gold-Trap, Atomic-Fluorescence Hg Monitor
- Variable-Chemistry Wet-Gas Conditioning System
- Dilute, Steady, Quantitative, Spike at the tip of the sampling probe, for measurement validation.



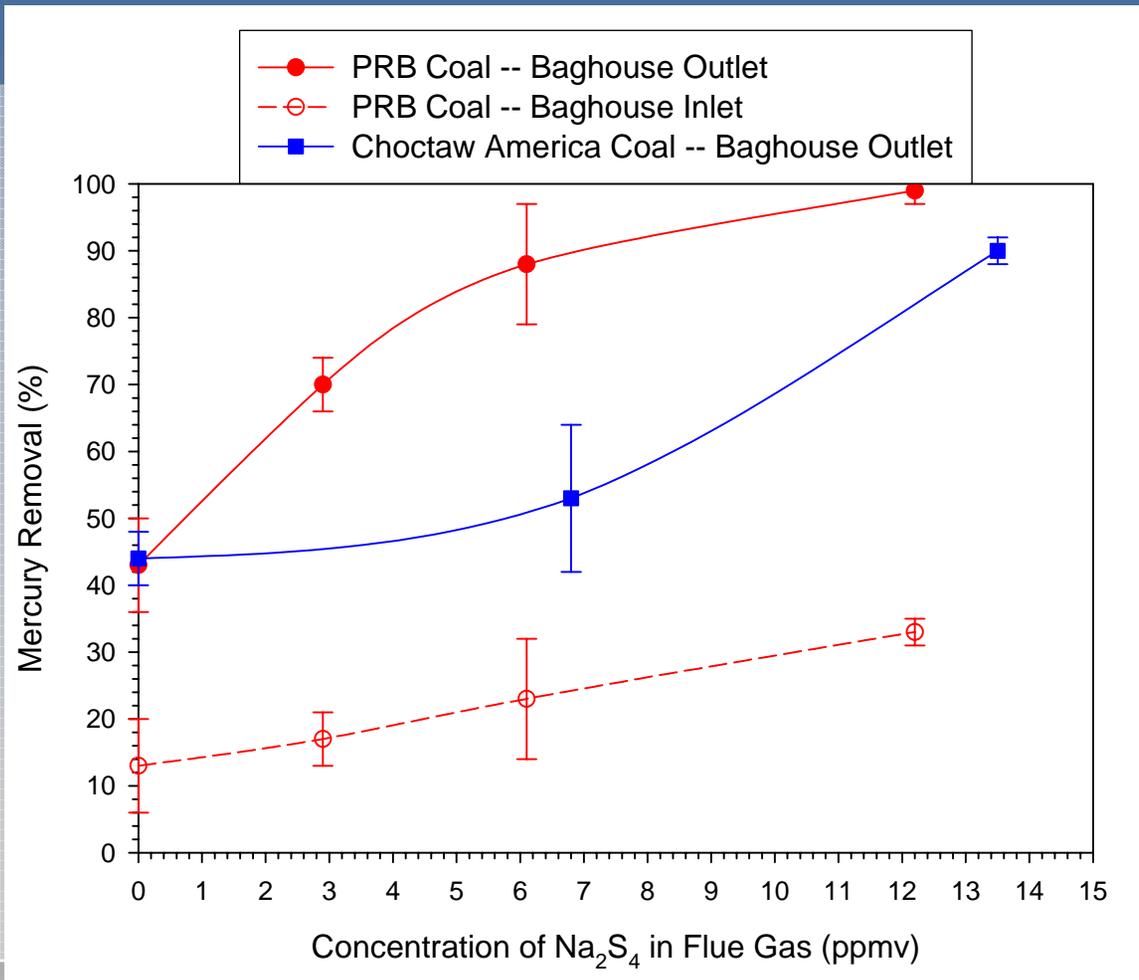
Example of Data from Monitor Using Spike and Recovery



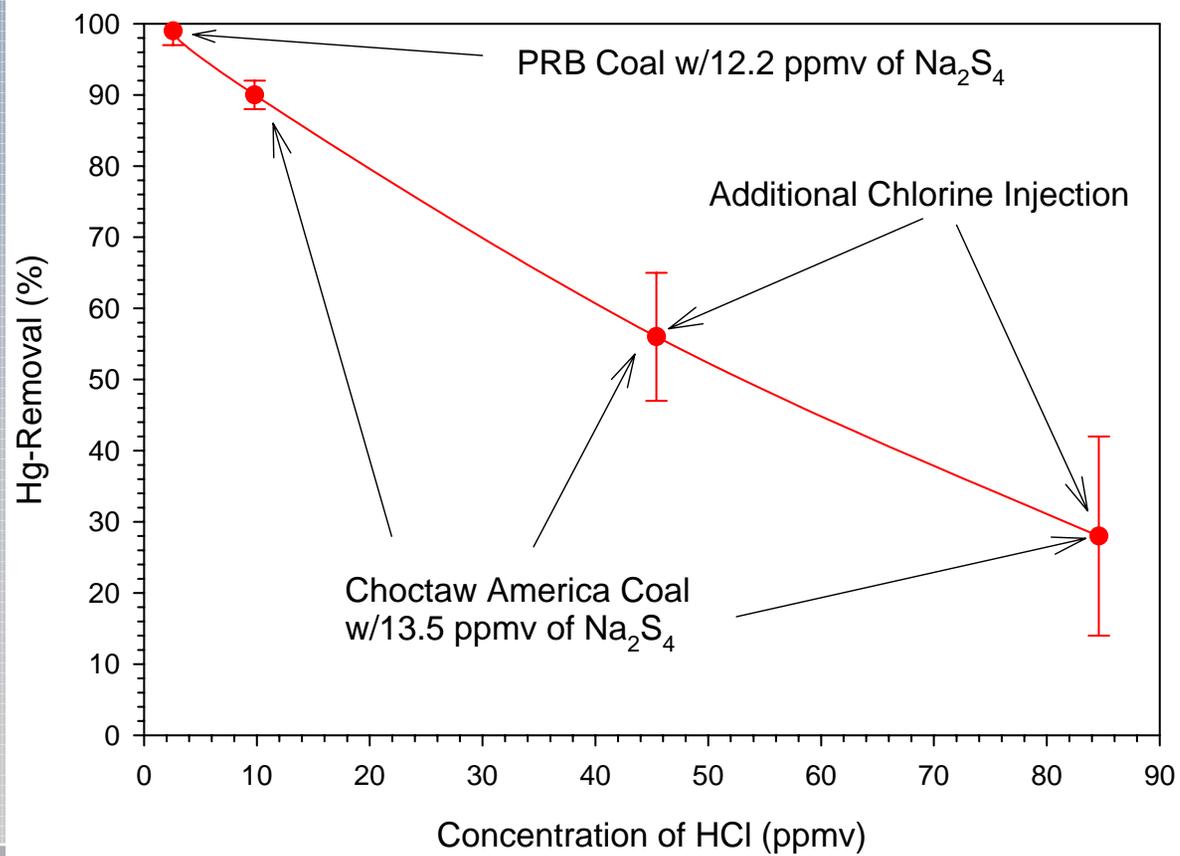
BAGHOUSE Test-Injection Location



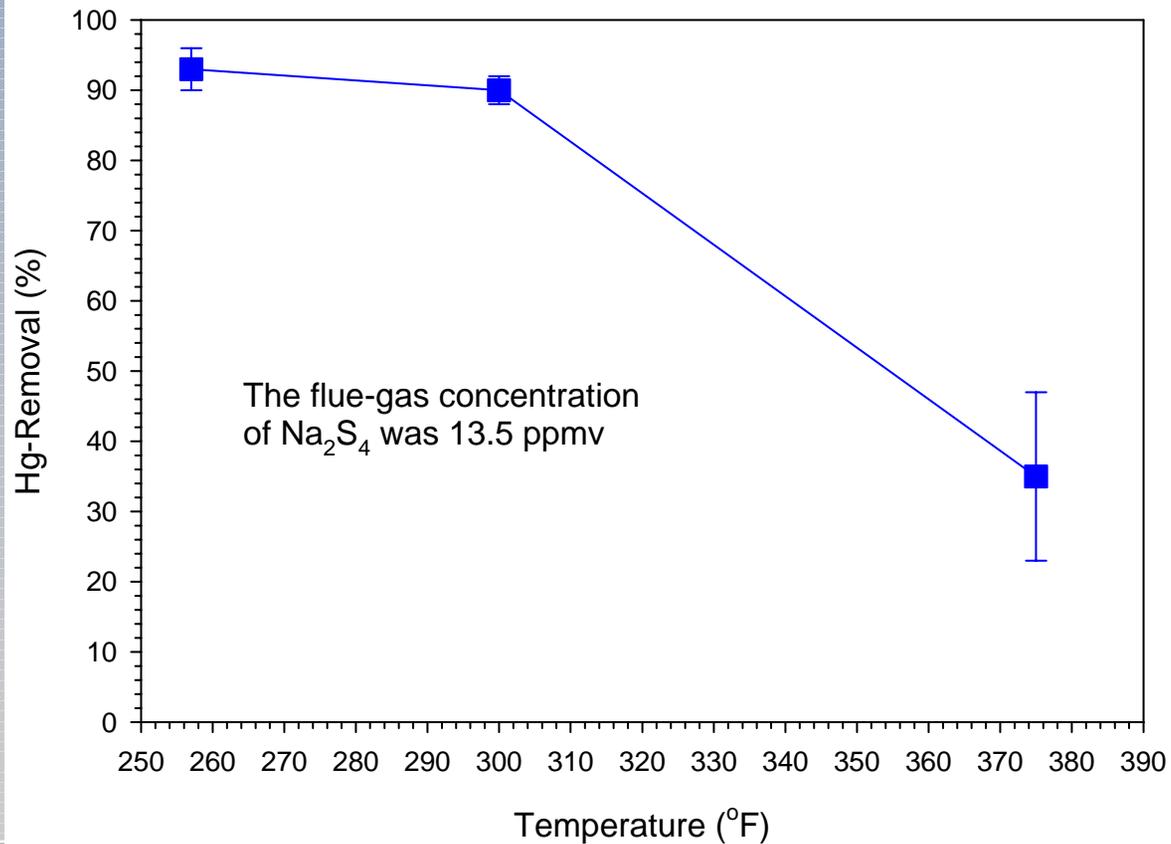
Gas-Phase Hg-Removal by Na_2S_4 -Injection



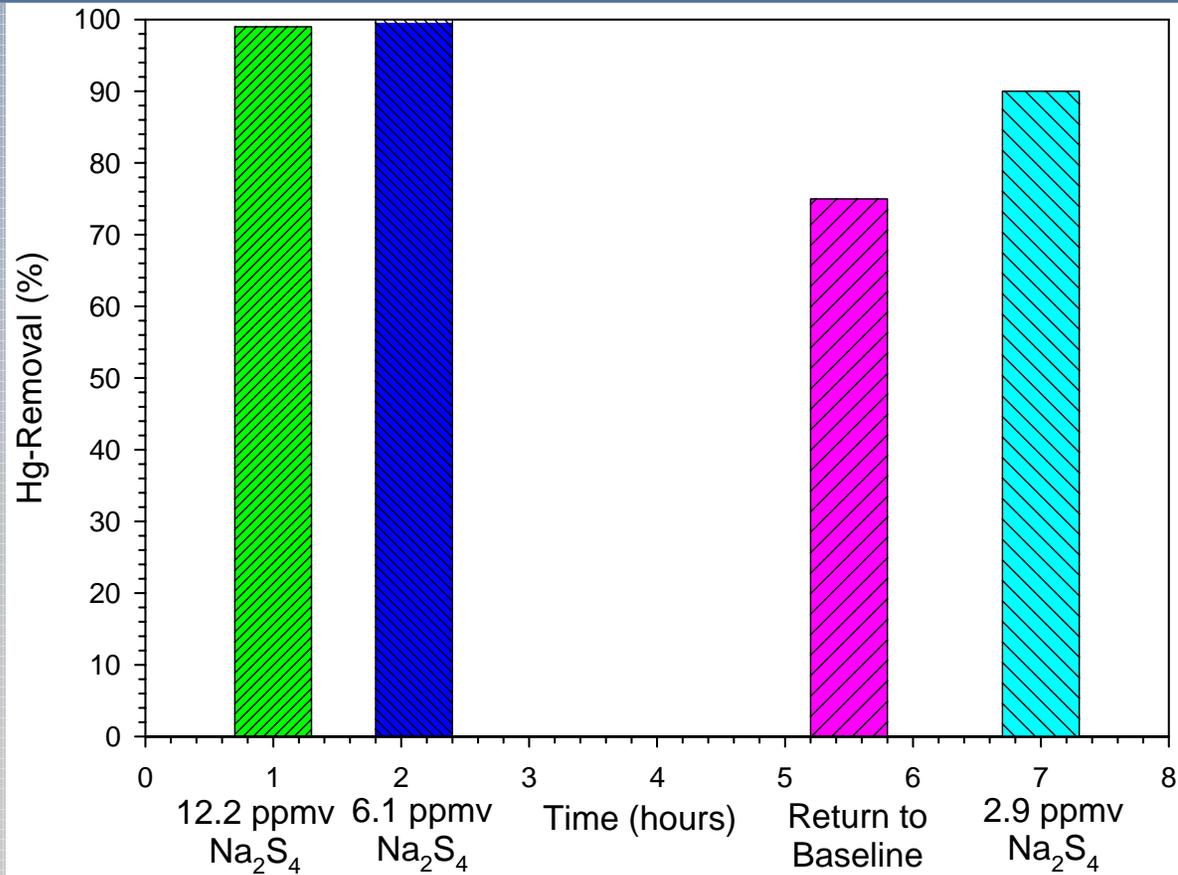
Effect of Chlorine



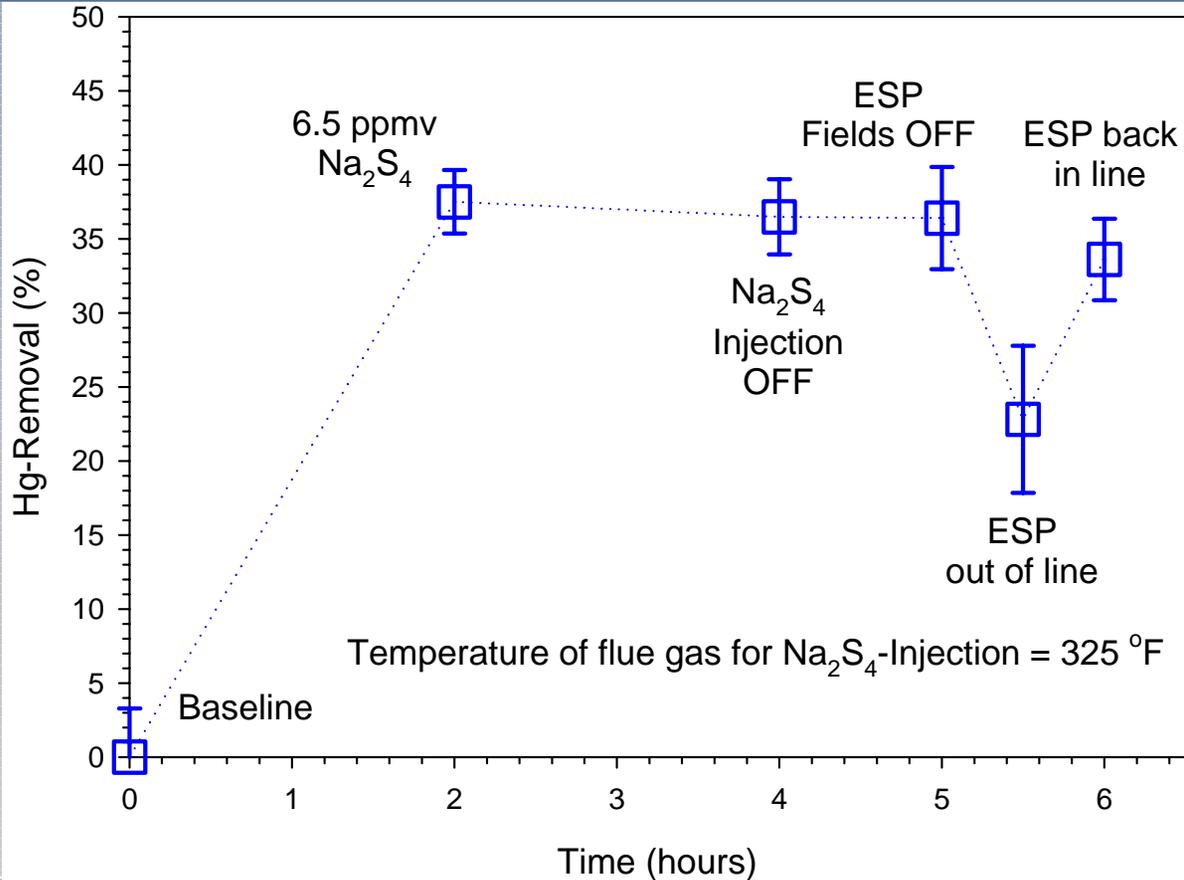
Temperature Effect on Na_2S_4 -Injection



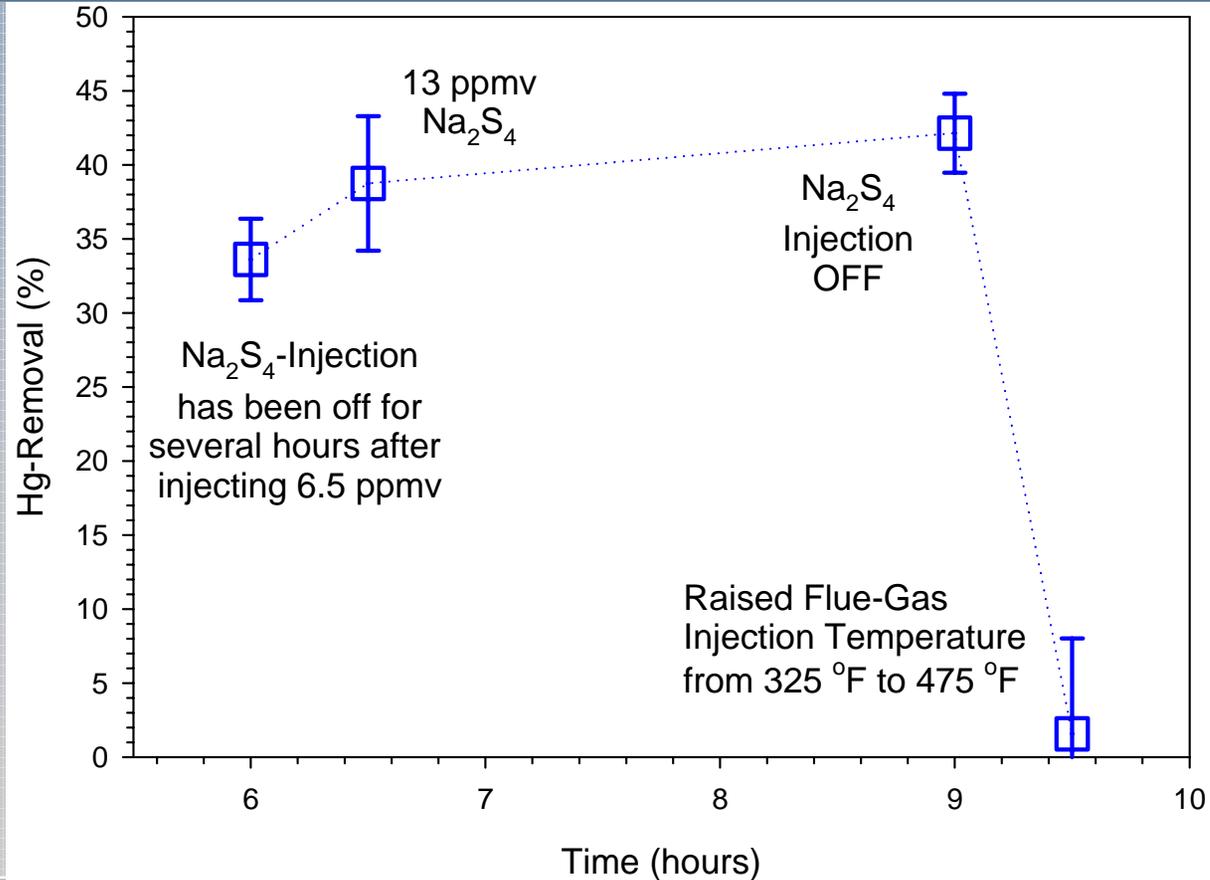
Residual Effect of Na_2S_4 -Injection



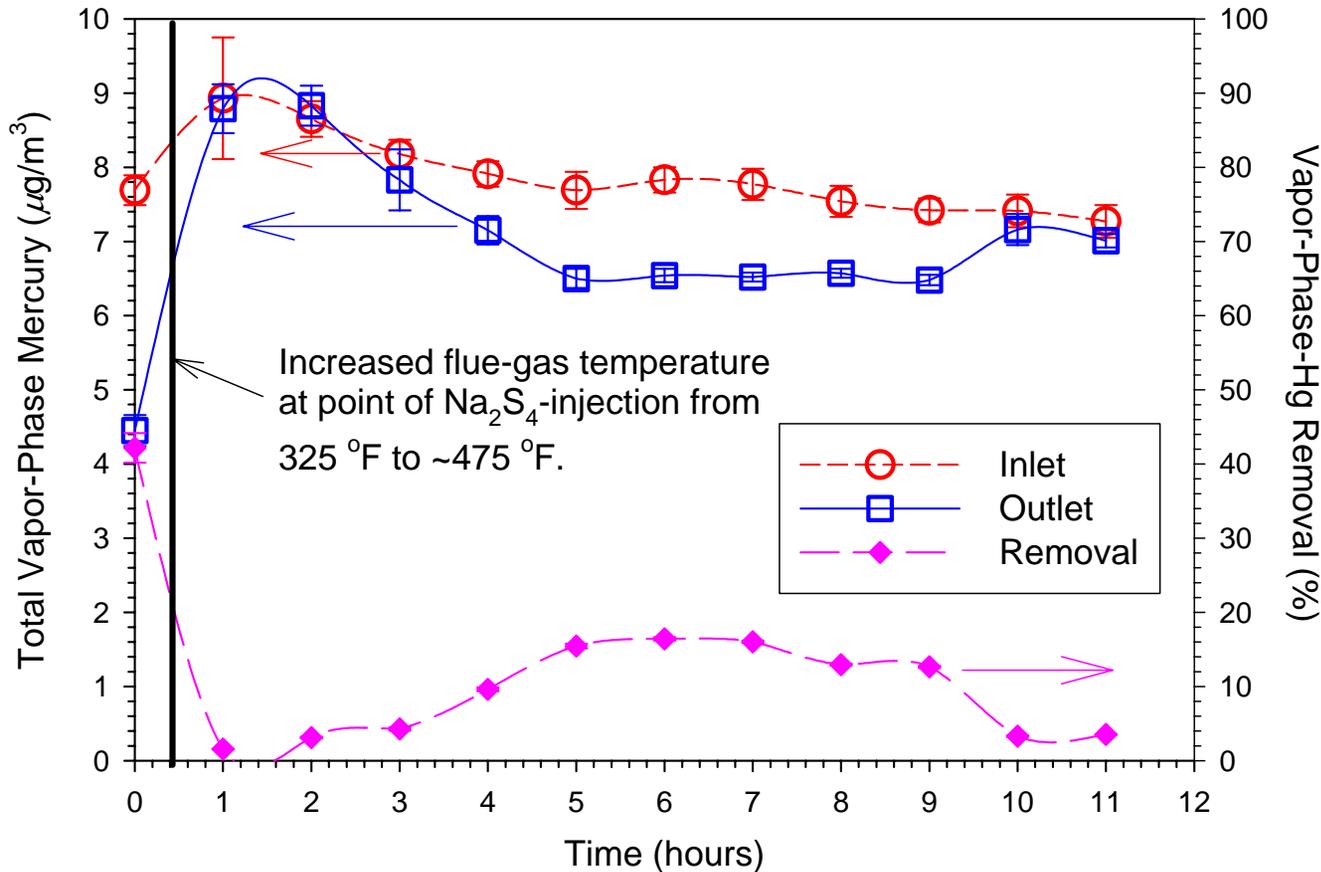
Na_2S_4 Injection in Front of ESP at 325 °F



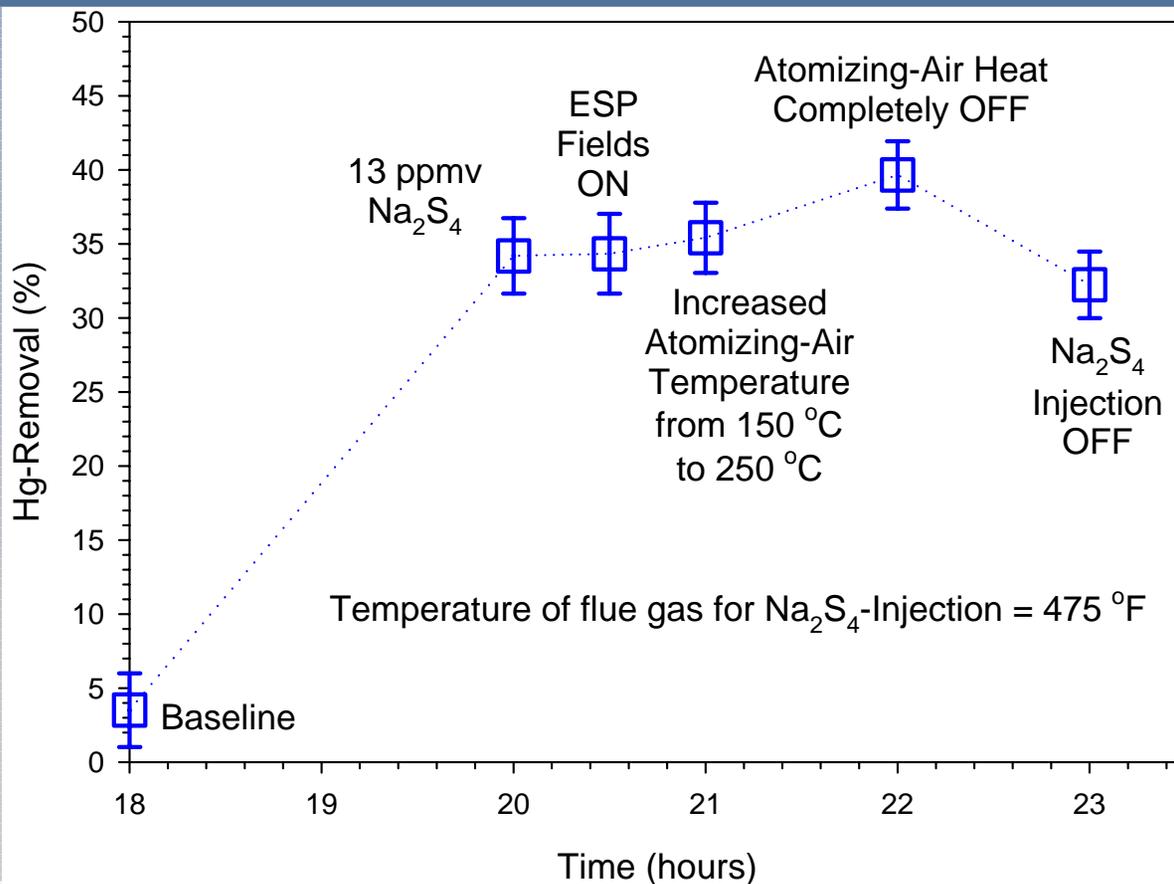
Effect of Doubling Na_2S_4 Injection Rate at 325 °F



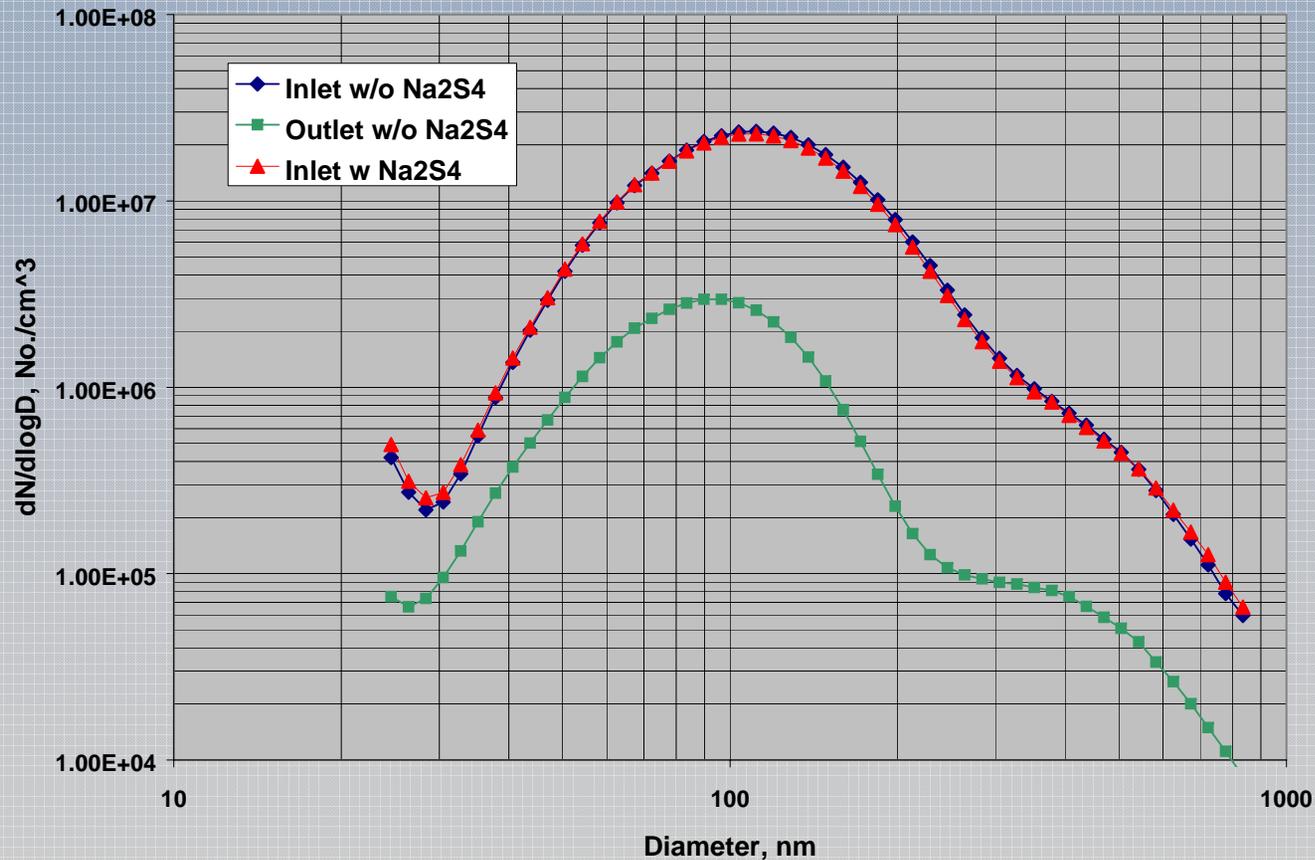
Effect of Increasing Na_2S_4 -Injection Temperature from 325 °F to 475 °F



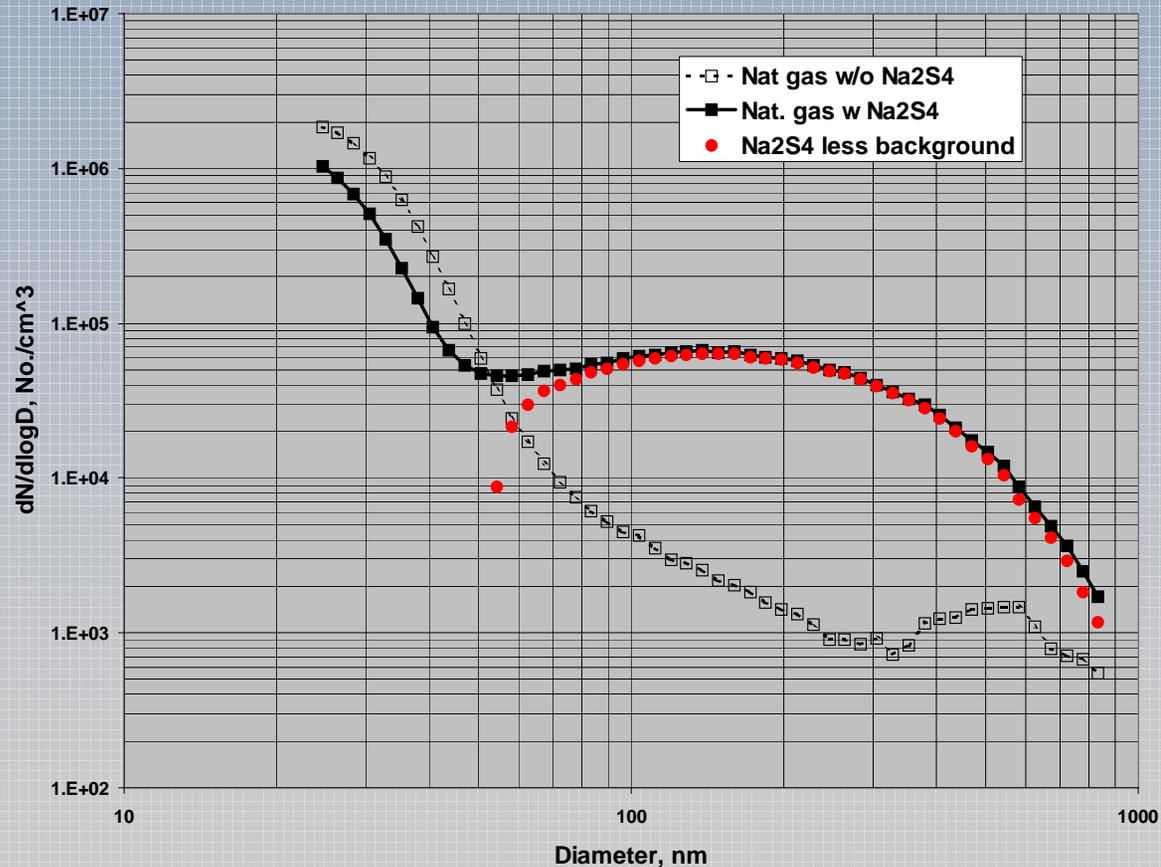
Na_2S_4 Injection in Front of ESP at 475 °F



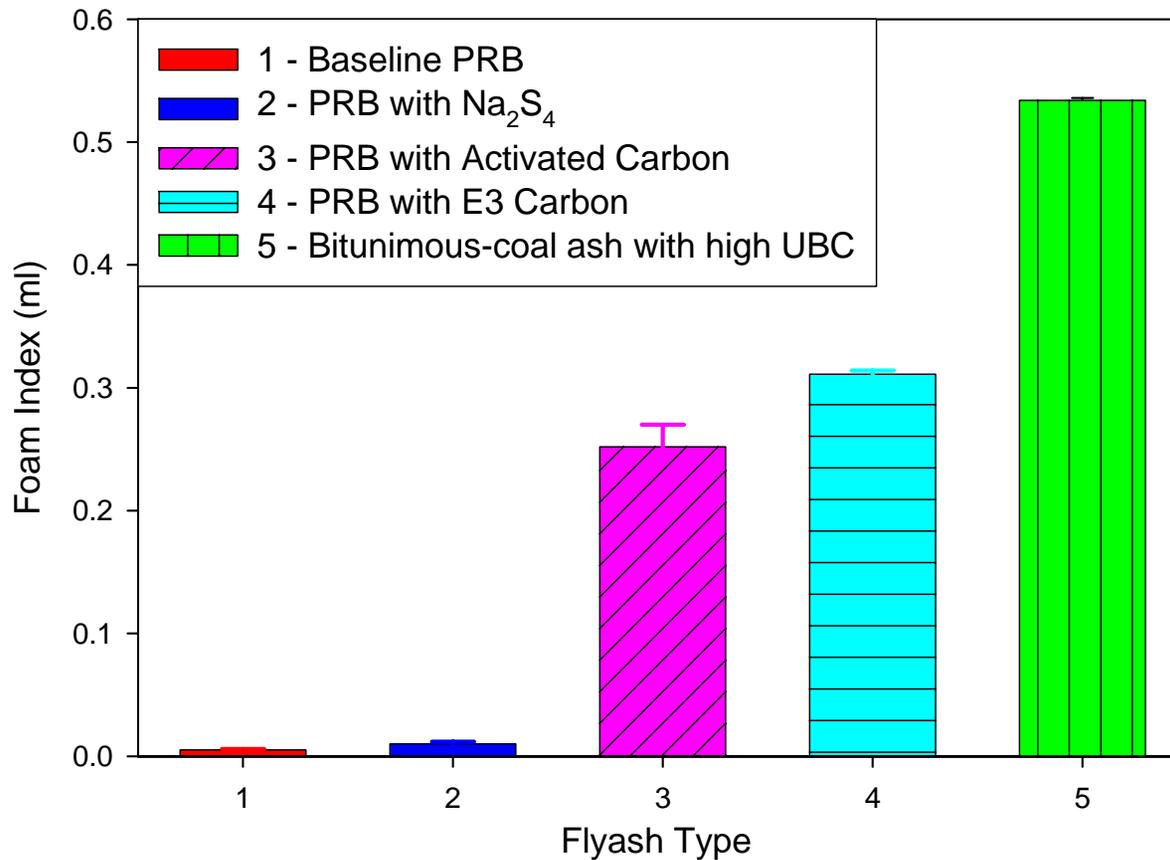
SMPS Measurement of Sub-Micron PSD in Coal-Derived Flue Gas



SMPS Measurement of Sub-Micron PSD in Nat. Gas-Derived Flue Gas

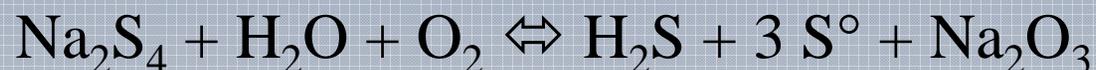


Foam Index of Different Flyash and with Additives

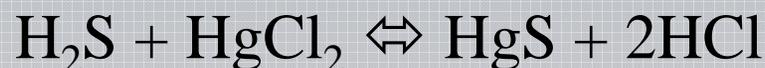
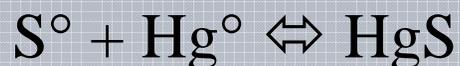


Reaction Pathways

Decomposition Reactions:



Hg-Capture Reactions:



Hydrochloric-Acid Hg-Re-Emission Reaction:

