Advantages of Using a Process Hg CEMS

An introduction to Hg Process Monitoring and Feedback Control
McIlvaine Mercury Measurement and Capture
Developed jointly by ADA-ES and Thermo Fisher

Presented by Jeremy Whorton on February 26, 2015
Background Info

► What are you doing for MATS Compliance (Traps, CEMS)?
► How are you controlling Hg (ACI, CHI)?
► What emission rate will you be controlling to?
► How are you going to handle non-compliance periods?
The Challenge Facing Power Plants

Factors Affecting Hg Emissions

► Coal Hg - Can vary by 5 lb/MBtu across a seam
► Coal Halogen Concentration
► Burner Performance (unburned carbon-LOI)
► SCR Operations - Excess SO$_3$ and NH$_3$
► Wet Scrubber Chemistry - Hg Re-emissions
► Boiler Load (temperature and gas flow)
► Add Rate of Mercury Control Agent (PAC, CHI)
► SO$_3$ Conditioning for ESPs
► Gas Temperature

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CoalQUAL Hg Data

- In General, Coal Hg can vary by 5 lb/TBtu across the same seam.
- If you don’t have a continuous Hg reading, you have to assume the highest possible Hg value.
Typical Range of ACI Performance
Systems that can Benefit from Feedback Control

► Activated Carbon Injection (ACI) Systems
► Coal Additive Systems
► Scrubber Additive Systems
Plants Using ACI

Assumptions:

- Typical 500 MW as per B&W’s 40th Edition of “Steam”.
- PAC cost of $1.00/lb.
- Boiler availability = 70%.
- No significant native Hg capture
Possible ROI for ACI Systems

An ACI reduction of 0.25 lb/MMacf saves $140,000/yr.
What is a Process Hg CEMS?

A Process Hg CEMS is any Hg CEMS in which the mercury measurement is used in a feedback loop to control a mercury reduction process such as Activated Carbon Injection (ACI), Coal Halogen Injection (CHI), etc.

It can be a compliance system or a CEMS specially designed for process control.

CEMS designed only for process control tend to be simplified versions of compliance systems because they do not have to meet the strict QA/QC requirements.
What is a ProRak™

The ProRak™ is a continuous process mercury analyzer developed jointly by ADA-ES and Thermo Fisher. It is built from genuine Thermo Scientific components in a transportable, climate controlled enclosure.

Why use it?
- Lowers O&M costs of Hg control systems
- Keeps you in MATS compliance
- Compliments sorbent trap monitoring
- Controls Hg Reduction Processes

Features?
- Simple to operate and maintain
- Short Return on Investment
- Installs anywhere in a few hours
- Uses CVAF to eliminate SO₂ Bias vs. AA

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ProRak™ Components

► ADA® ProRak™ Mercury Analyzer

► Consists of Thermo Fisher Components

• 80i Analyzer

• 82i Probe Controller

• 83i Fast Loop Probe (simplified)

• 84i Hg Permeation Source
Ancillary ProRak™ Equipment

► Air Cleaning System – Portable/Modular
  ➢ *Removes particulates, oil, moisture*
  ➢ *Boosts pressure to 90 psi (if needed)*
  ➢ *Produces a nitrogen stream for calibration and dilution*

► Heated Umbilical – 50 feet included
ProRak vs. Compliance CEMS

**ProRak**

1. Measures Hg Total (HgT) Only → Speciates Hg (HgT + Hg0)
2. Not designed for MATS QA/QC → Meets all MATS Criteria
   - Only needs to pass Daily Cals
3. Calibrates with 84i → Calibrates with 81i and 84i
4. Simplified 83i Probe → Regular 83i Probe
   - No Oxidizer
   - Less solenoid valves
   - Less tubing
   - Hg Total stream only
5. Installs anywhere in 2-days → Requires costly CEMS Shack
6. Mobility (anywhere in plant) → Stack or CEMS Shack
7. Less Maintenance/Training → More Maintenance/Training
8. Costs Less (~$150,000) → Costs More

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Summary of Process Hg CEMS Advantages

- Lower Cost than a Compliance System
- FAST Continuous Readout
- Feedback Control
- Less QA/QC
- Lower O&M
- Short Return on Investment
- Commonality of components for Thermo Scientific Freedom Hg CEMS for MATS Compliance
Questions??

Jerry Amrhein- ADA-ES
Product Line Manager- CEMS Services
jerry.amrhein@adaes.com
(303) 339-8840

Jeremy Whorton- Thermo Fisher Scientific
CEMS Applications Engineer
Jeremy.whorton@thermofisher.com
(508)269-9965