SBS Injection™ Technology and Benefits

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McIlvaine Hot Topic – Direct Sorbent Injection
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Technology Overview

– Injection of “Sodium-Based Solution”
– Produces very small reactive sorbent particulate
– Achieves uniform dispersion and mixing of sorbent
– Captures nearly all SO$_3$ prior to APH
– Allows operation of APH at lower temperatures
– Improves unit efficiency and reduces fuel costs
– Captures HCl and Se to lesser extent
Heat Rate Benefit

- **500 MW**
- **10,000 Btu/kW-hr**
- **80% Capacity Factor**
- **$2.25/MMBtu Fuel**

**Annual Fuel Savings ($/M/Yr)**

- **$0.0**
- **$0.5**
- **$1.0**
- **$1.5**
- **$2.0**
- **$2.5**

**APH Outlet Temperature (F)**

- **350**
- **315**
- **280**
- **245**

- **$0.8**
- **$1.6**
- **$2.4**
Other Co-Benefits

– Reduced CO$_2$ Emissions
  • higher unit energy efficiency

– Enhanced Mercury Capture
  • greater carbon absorption capacity
  • less SO$_3$ interference

– Enhanced ESP Performance
  • lower gas volumetric flow (higher SCA)
  • lower ash resistivity (temp and SO$_3$ effect)

– Reduced Fan Aux Power Consumption
  • reduced gas flow and gas path pressure drop

– Reduced WFGD Water Consumption
  • cooler inlet flue gas temp

– Reduced Unit Derates
  • higher PA temp and greater fan margin
Midwestern Power Plant

- 500 MW
- SCR-APH-ESP-WFGD
- Illinois Basin Fuel
- 5 lb SO$_2$ Fuel
- 40-70 ppm SO$_3$
- SBS Injection (2012)
- APH Upgrade (2014)
Relative $\text{SO}_3$ Levels Thru Gas Path

- w/o SBS ~ 70 ppm
- w/ SBS < 5 ppm
- w/ SBS ~ 1 ppm
- w/ SBS ~ 1 ppm
- w/ SBS ~ 0.5 ppm
APH Configuration and Operation

Pri Air 1 Wall Coils 2 PA Fan 3 Duct Coils 4 APH

Sec Air 5 FD Fan 6 Gas

ESP 7 8
APH Upgrade Modifications

**Old Configuration**

- Total heat transfer surface depth 48”

**New Configuration**

- Total heat transfer surface depth 63.5”
APH Temperature Changes

SO₃ Mitigation Allows Lower APH Op Temps
APH Upgrade Operating History

No APH dP Increase Over 8 Months Operation
Impact on Mercury Capture

Source: EPRI, Chang (2013)

Lower APH Exit Temp = Lower Mercury Emissions
Long-Term APH Demonstration

– Utility Drivers / Benefits
  • Heat Rate Improvement (O&M Savings)
  • CO₂ Reduction (Clean Power Plan)
  • Enhanced Mercury Capture (MATS)
  • Consider More Efficient APH Upgrade on 2nd Unit

– Approach
  • Conduct During Winter (lower ambient temp)
  • Reduce Fan/SAH Inlet Air Temp
  • Lower APH Gas Exit Temp Incrementally
    o From 285°F to ~ 250°F
  • Monitor Plant Operation & Performance
    o APH dp, Heat rate, Aux power, Opacity, Stack Hg

Anticipate Reporting Results in Summer 2015
Thank You

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