

# ***Reinhold Environmental Ltd.***

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***2007 APC Round Table & Expo  
Presentation***

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# Design Considerations for Baghouses Treating Flue Gas from High Sulfur Coal Combustion

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New Generation Design &  
Engineering



# AEP's Existing Baghouse Fleet



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# Presentation Agenda

- Background and Triggers
- Fuel Characteristics
- Design Considerations
  - Materials of Construction
- Operating Considerations
  - Air Heater Outlet Temp
  - Startup / Shutdown
  - Maintenance & Inspections
- Discussion / Q & A

# Background

- Environmental Regulations are Steering the Industry
  - New Source Performance Standards (NSPS), by which new sources are governed.
  - NO<sub>x</sub> Reduction (SCR, SNCR)
  - SO<sub>x</sub> Reduction (FGDS)
  - Mercury Reduction (CAMR) (Activated Carbon, Fabric Filters)

# Background

- Cascading effects
  - Highly efficient FGD systems allow units greater fuel flexibility.
  - SCRs reduce  $\text{NO}_x$  but oxidize Mercury (fuel dependent) and  $\text{SO}_2$  to  $\text{SO}_3$
  - Increased levels of  $\text{SO}_3$  heighten potential for formation of  $\text{H}_2\text{SO}_4$  under the right conditions.
  - Baghouses are very effective in collecting oxidized mercury but extremely susceptible to acid attack.



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# Design Considerations

- SO<sub>3</sub> Mitigation
- Air Heater Outlet Temperature (New Unit)
- Insulation
- Filter Bags
- Bag Cages
- Tubesheet
- Casing and Hoppers
- Hopper Heaters

# Operating Considerations

- Air Heater Outlet Temperature
- Startups & Shutdowns
  - Alkali coating of bags and surfaces
- Normal Operations and Maintenance
  - Temperatures
  - Pressure Drop
  - FARS
  - Hopper Heating
  - Internal Inspections
  - Online Inspection (IR or Ultrasonic devices)

## What to Do?

- No absolute right answer
  - Benefits and drawbacks to each option
  - Performance vs. Economics
  - Capital Cost vs. O&M Costs



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## Discussion / Q&A

# Design Considerations for Flyash Removal Systems Transporting PRB Fly Ash and Dry FGD Waste

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# Presentation Agenda

- Fuel Characteristics
- Design Considerations
  - Wet Vs. Dry System
  - Vacuum Vs. Pressure Transfer
  - Minimizing Pluggage
  - Materials of Construction
- Operating Considerations
  - Normal Operation
  - Startup / Shutdown
  - Maintenance & Inspections
- Discussion / Q & A



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# Fuel Characteristics

- Powder River Basin Coal (Sub-bituminous)
  - Lower Heating Value (8000 – 9000 BTU/lb)
  - Lower Ash Content (5 – 7%)
  - High calcium content (20-30% CaO)
  - Higher concentration of fines (80% sub-45 micron)
  - Fair fluidization
  - Pickup Velocity 2800 – 3800 fpm
- Eastern Bituminous Coal
  - High Heating Value (10,000 – 12,000 BTU/lb)
  - Higher Ash Content ( >7%)
  - Low calcium content (2-5% CaO)
  - Lower concentration of fines (80% > 45 micron)
  - Excellent Fluidization
  - Pickup Velocity 3800 – 4400 fpm

# Design Considerations

- Wet Vs. Dry Transport
  - High Calcium content results in increased pluggage potential downstream of the water exhauster.
    - CaO (lime) and water mix well in scrubbers but not in FARS.
    - Short term - material solutions (liners, coatings), piping changes (reduce bends)
    - Long term – switch to dry conveying system

# Design Considerations

- Vacuum Vs. Pressure
  - Retrofits largely dependent on existing ESP/Baghouse Design.
  - Vacuum Systems
    - Heated Transport Air EXTREMELY IMPORTANT
  - Pressure Systems
    - Heat of Compression aids ash transfer.

# Design Considerations

- **Preventing Pluggage**
  - **Temperature**
    - Heated transport air
    - Hopper heating
    - Hopper enclosure
  - **Materials of Construction**
    - Long radius elbows
    - Rubber Elbows

# Operating Considerations

- Continuous Operation
  - Keeps hopper ash levels low and insures high temps.
- Startups & Shutdowns
  - Pre-heating hopper surfaces and ash conveying lines
- Normal Operations and Maintenance
  - Closely monitor temperatures
    - Hopper heaters
    - Conveying air heaters
    - Address pluggage quickly (monitor hopper levels)

# Conclusions

- Fuel and Dry FGD waste characteristics change the way the system is designed and operated.
- Concern shifts from erosion to pluggage
  - Temperature is very important.
- Operational differences
  - Continuous operation
  - Close monitoring of temperatures and keeping system warm.



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## Discussion / Q&A