Reinhold Environmental Ltd.

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Process Problems – Identify and Correct

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2007 APC/PCUG Conference

Pre-Conference Scrubber O&M Workshop

Special FGD Operating Problems

Learning Objectives

- Identify areas of operation that have historically been problems in FGD system
- Identify causes and corrective actions for these problems

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Historical Problem Areas In FGD Operation

- Scaling and solids buildup
- Poor SO_2 removal
- Poor reagent utilization
- Poor gypsum byproduct quality
- Excessive water consumption
- Mist eliminator pluggage

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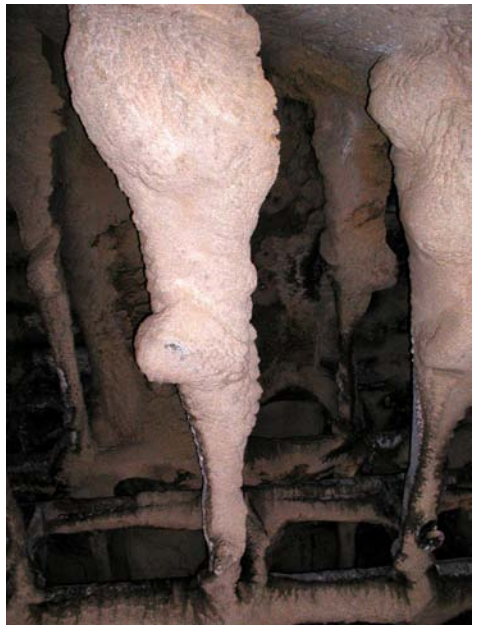
Scaling and Solids Buildup

Common areas where can occur

- Scrubber inlet
- Absorber internal walls and support structure
- Absorber spray headers
- Inside spray piping
- Trays
- Reaction tank walls



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Scaling and Solids Buildup (cont.)

Causes:

- Chemical (high gypsum relative saturation)
  - Oxidation
  - Insufficient seed solids
  - Solid residence time that is too short
  - Poor wash water quality
- Wet-dry interface and recirculation of slurry
- Poor reagent utilization

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Scaling and Solids Buildup (cont.)

Steps to correct:

- Control process chemistry within design limits
- Ensure that inlet flue gas is quickly and completely quenched
- Modify absorber inlet design to eliminate flow disturbances and gas recirculation
- Maintain reagent utilization within design range

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Poor SO_2 Removal as Result of Chemical Problem

Cause	*Analytical Indication*	*Corrective Action*
Insufficient Limestone In Scrubber	Low carbonate measured in scrubber solids	Increase pH set-point
Malfunctioning pH Monitor	Poor agreement during pH calibration check	Make repairs to pH monitor system
Sulfite Blinding	Poor reagent utilization along with elevated levels of soluble sulfite	Verify operation of oxidation air system. Correct as required
Aluminum Fluoride Blinding	Poor reagent utilization along with elevated levels of aluminum and fluoride	Improve particulate removal upstream of scrubber
Poor Limestone Quality or Off-Spec Grind Size	Sieve analysis, composition analysis	Modify grind circuit and/or obtain better limestone

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Poor SO_2 Removal as Result of Mechanical Problem

Cause	*Indication*	*Corrective Action*
Plugged Spray Header(s) or Spray Nozzle(s)	Low recycle flow As indicated by flow meter or motor amps	Clean during outage
Broken Spray Header	Indication from flow meter or motor amps. observed during inspection	Repair during outage
Loss of Recycle Pump Capacity	Low recycle flow as indicated by flow meter or motor amps	Repair during outage

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Poor Reagent Utilization

Cause	*Analytical Indication*	*Corrective Action*
Malfunctioning pH Monitor	Poor agreement during pH calibration check	Make repairs to pH monitor system
Sulfite Blinding	Poor reagent utilization along with elevated levels of soluble sulfite	Verify operation of oxidation air system. Correct as required
Aluminum Fluoride Blinding	Poor reagent utilization along with elevated levels of aluminum and fluoride	Improve particulate removal upstream of scrubber
Poor Limestone Quality or Off-Spec Grind Size	Sieve analysis, composition analysis	Modify grind circuit and/or obtain better limestone

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Poor Gypsum Byproduct Quality

- High acid insoluble (inerts) fraction
  - Verify operation of particulate control device upstream of scrubber
  - Optimize operation of process hydroclones to maximize concentration of A.I. In overflow
  - Increase liquid purge rate
- Poor reagent utilization
- Low sulfite oxidation
  - Verify operation of oxidation air system

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Poor Gypsum Byproduct Quality (cont.)

- High moisture
  - Verify operation of primary and secondary dewatering system
  - Check filter cloth for blinding. Clean or replace as required
  - Increase temperature of filtercake wash water
  - Verify system chemistry
    - High level of limestone
    - High level of acid insolubles
    - Presence of crystal modifier

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Excessive Water Consumption

- Common causes
  - Broken or leaking ME wash headers or spray nozzles
  - Failure of ME wash valve or flush valve to close
  - Poor condition of packed-gland seals
  - Excessive flow for seal water or filtercake wash systems
- Indications of problem
  - Higher than normal water consumption
  - Flow meters do not zero
  - Observed during routine inspections

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Mist Eliminator Pluggage

- Chemical causes
  - Poor reagent utilization
  - Poor quality wash water
- Mechanical causes
  - Poor design of wash system
  - Broken or plugged wash system
  - Non-uniform gas flow and liquid loading distribution

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Mist Eliminator Pluggage

- Indication
  - Increase in pressure drop
  - Visual observation during inspection
- ME pluggage can:
  - Result in increased gas velocity through ME and liquid carryover into outlet duct
  - Cause stack rainout and particulate emissions
  - Damage ME due to weight of solids

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Considerations For ME Wash System

- ME faces to wash
- Wash coverage (150 to 200%)
- Wash intensity and pressure (1.5 gpm/sq ft, 30 to 50 psi)
- Wash duration and frequency
- Recommended wash nozzles

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Questions?