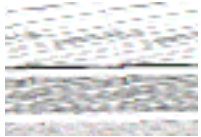


# *Controlling Acid Gas Emissions from Industrial Boilers*

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## Overview of Talk

- Acid gas limits in vacated MACT rule and NACAA guidance for industrial boilers
- Technologies for acid gas controls to meet limits
  - Trade-offs among technology choices
- Possible affect of recent changes in alkali markets on technology choices

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## Acid Gas Control for Industrial Boilers

- HCl only acid gas in vacated MACT rule and NACAA guidance
- HCl limits for coal
  - Vacated MACT: 0.09 lbs/MM Btu
  - NACAA: 0.015-0.03 lbs/MM Btu
- Uncontrolled HCl emissions from coal
  - 0.03-0.15 wt.% Cl in coal
  - 0.024-0.125 lbs/MM Btu
- ~38-88% HCl removal required

## HCl Control Technologies

- Pulverized or stoker coal combustion
  - Mostly same as for SO<sub>2</sub> (FGD)
  - Wet FGD following particulate control
    - Extensive experience in electric generating plants
    - >98% SO<sub>2</sub> removal
    - >99% HCl removal but infrequently measured
    - Lime/limestone [CaO/Ca(OH)<sub>2</sub>/CaCO<sub>3</sub>]
    - Wastewater and/or solids byproducts
  - Wet FGD in refineries
    - Caustic (NaOH)
    - Very high reliability

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## HCl Control Technologies

- Pulverized or stoker coal combustion
  - Dry FGD ahead of particulate control
    - Extensive experience in electric generating waste-to-energy industries
    - Up to 94% SO<sub>2</sub> removal in electric generation
    - >95% HCl removal in waste-to-energy
    - Lime [CaO/Ca(OH)<sub>2</sub>]
    - Solids byproducts to disposal
    - Spray-dryer type
    - Circulating-fluid-bed type

## HCl Control Technologies

- Pulverized or stoker coal combustion
  - Furnace sorbent injection
    - Lime/limestone or sodium-based
  - Sorbent injection ahead of baghouse
    - Lime or sodium-based
  - Wet scrubber with water
    - Recovers HCl or  $\text{CaCl}_2$  solution as byproduct
    - > 90% HCl removal
  - Dry FGD/baghouse after existing ESP
    - Solid byproduct separate from flyash

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## HCl Control Technologies

- Circulating fluid bed boiler
  - Limestone or dolomite addition for SO<sub>2</sub> control
  - Dry FGD or sorbent injection ahead of baghouse for additional SO<sub>2</sub> control and HCl control
- Regenerable processes for SO<sub>2</sub> control
  - Not applicable for HCl control

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## HCl Control Technologies

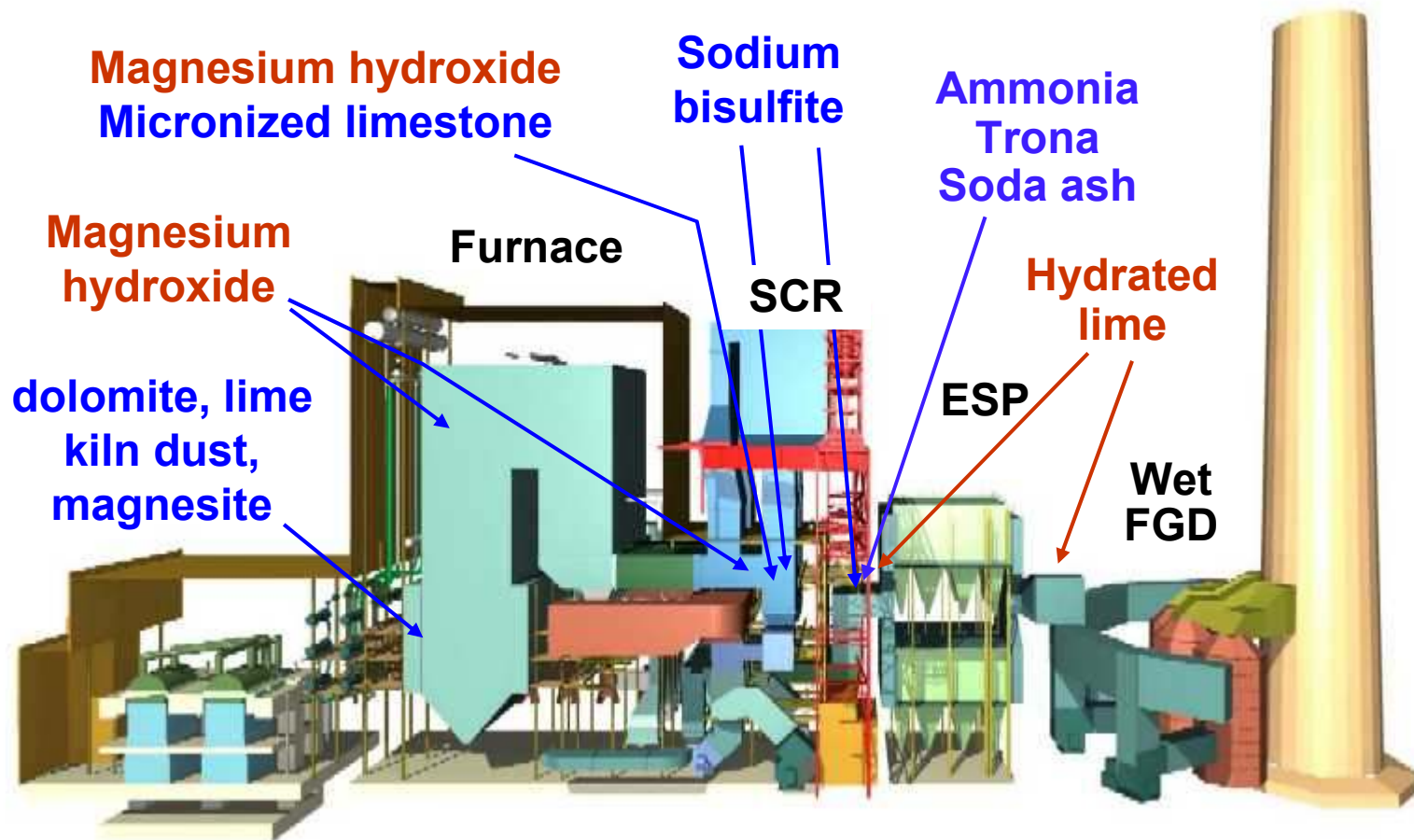
- Effect of alkali cost on technology choices
  - Wet FGD
    - Lime/limestone used in largest FGD units
      - 800 MW electric generating plant
    - Lime used in medium and large FGD units
      - Waste-to-energy plant
    - Caustic used in small units
      - Refinery cat cracker unit
  - Relative costs of limestone/lime/caustic:
    - 2 years ago: 1/3/15
    - Now: 1/3/25
  - Shift smaller units to dual-alkali wet FGD or dry FGD

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## Summary of Talk

- Effect of proposed limits for HCl emissions from industrial boilers on technology choices
- Technology choices based on experience with SO<sub>2</sub> controls in electric generation and HCl controls in waste-to-energy
- Impact of relative alkali costs on technology choices

# Compounds for SO<sub>3</sub> Control in Coal-fired Plants



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## HCl Control Technologies

- Other Factors in technology choice
  - Wet FGD produces
    - Lime/limestone used in largest FGD units
      - 800 MW electric generating plant
    - Lime used in medium and large FGD units
      - Waste-to-energy plant
    - Caustic used in small units
      - Refinery cat cracker unit