Reinhold Environmental Ltd.

2008 APC Round Table & Expo Presentation

July 13-15, 2008, in Savannah, GA

2008 ESP_FF Conference

INTEGRATED CONDENSABLES MANAGEMENT

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Background to ICM

There is no straight path to correct gas chemistry,

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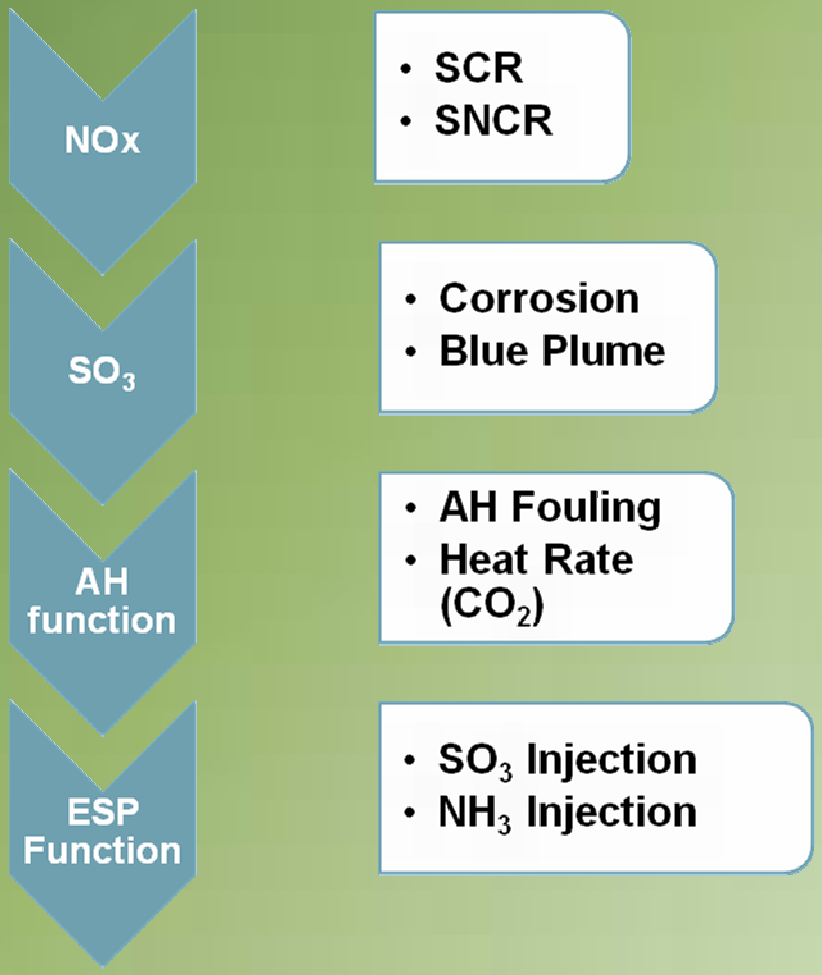
Plant Issues that need Solutions



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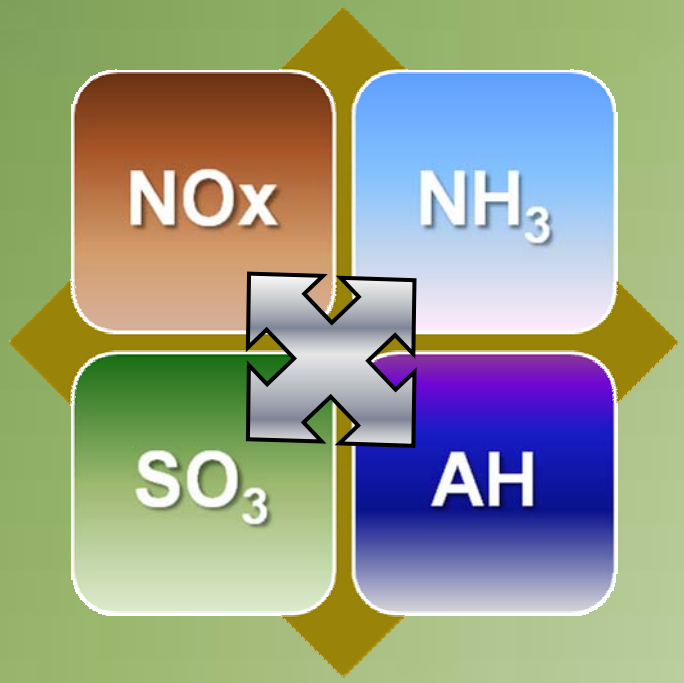
But the pieces are inter-related



You cannot address each issue separately

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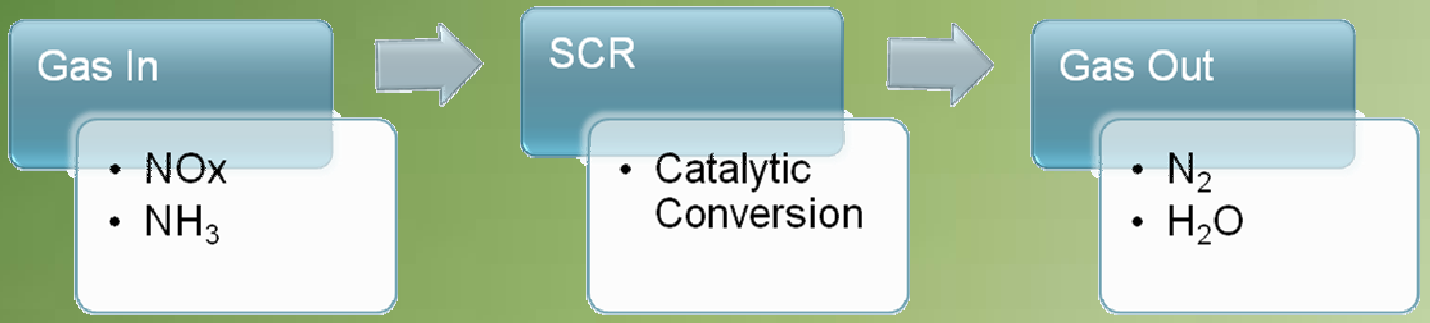
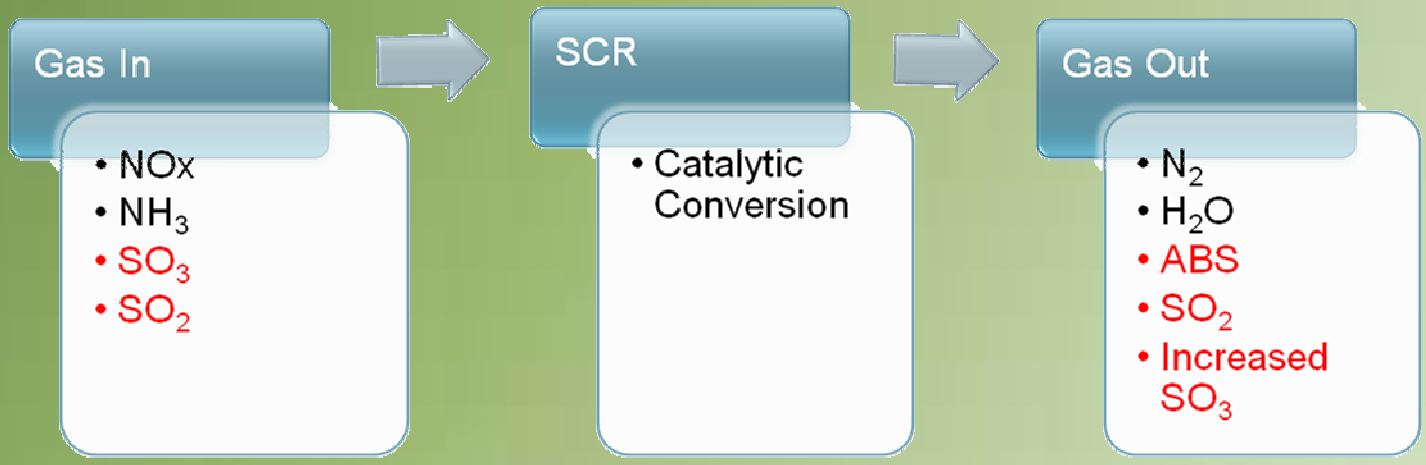
SCR Theory vs. Reality





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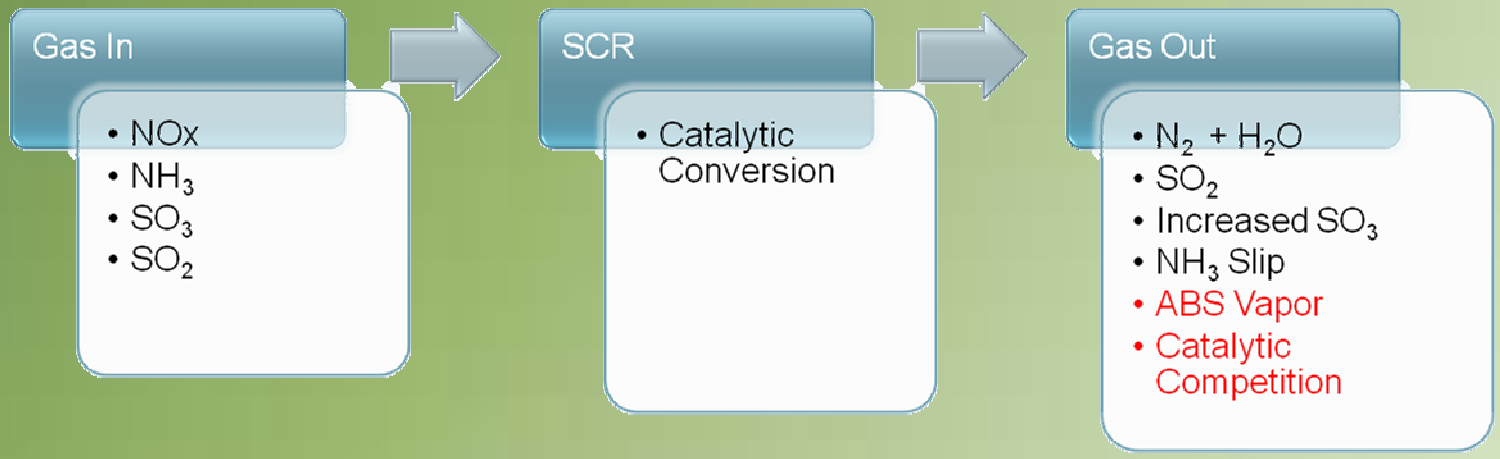
NH_3 Slip Theory vs. Reality



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AH Theory vs. Reality

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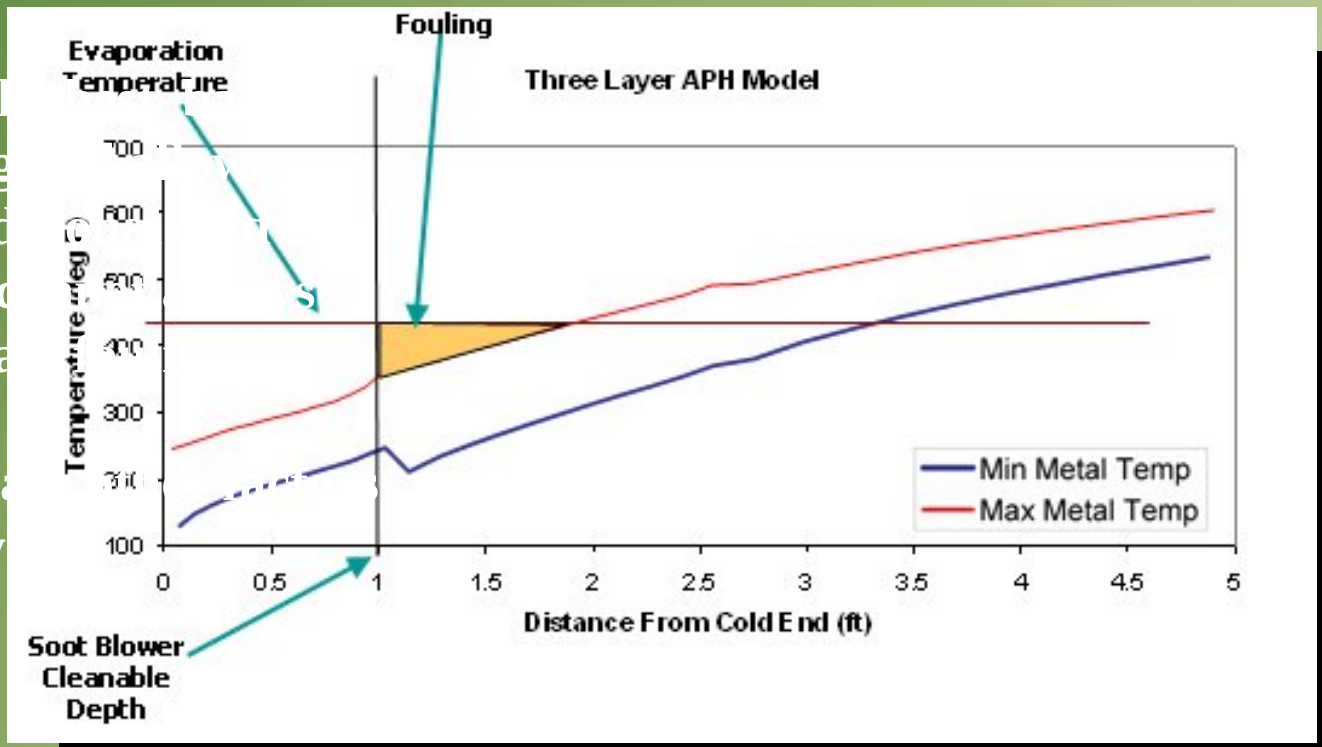

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Condensables Measurement System

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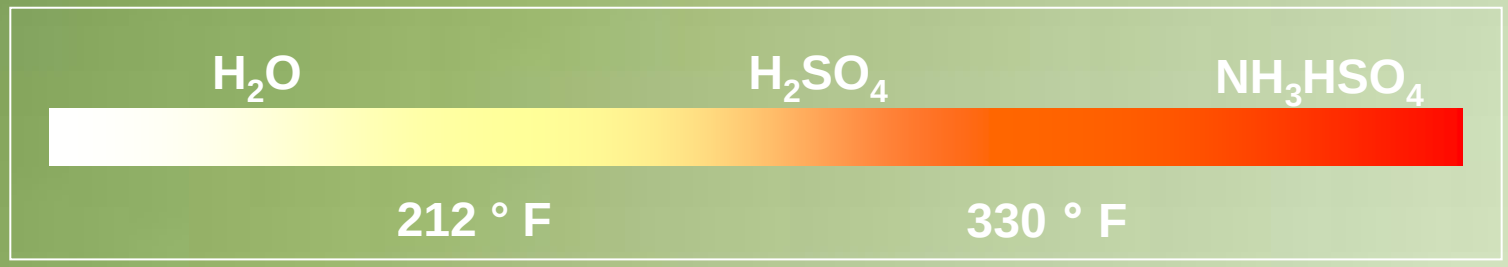
AbSensor – AbS/SO3
What is it? What does it do?

- In-Situ, Continuous measurement
- Temp at which material condenses out from flue gas

This material could be:

- Moisture (H_2O),
- Sulfuric Acid (H_2SO_4) ($H_2O + SO_3$)
- Ammonium Bisulfate (NH_3HSO_4) ($NH_3 + H_2O + SO_3$)



The same device measures condensables across the spectrum!

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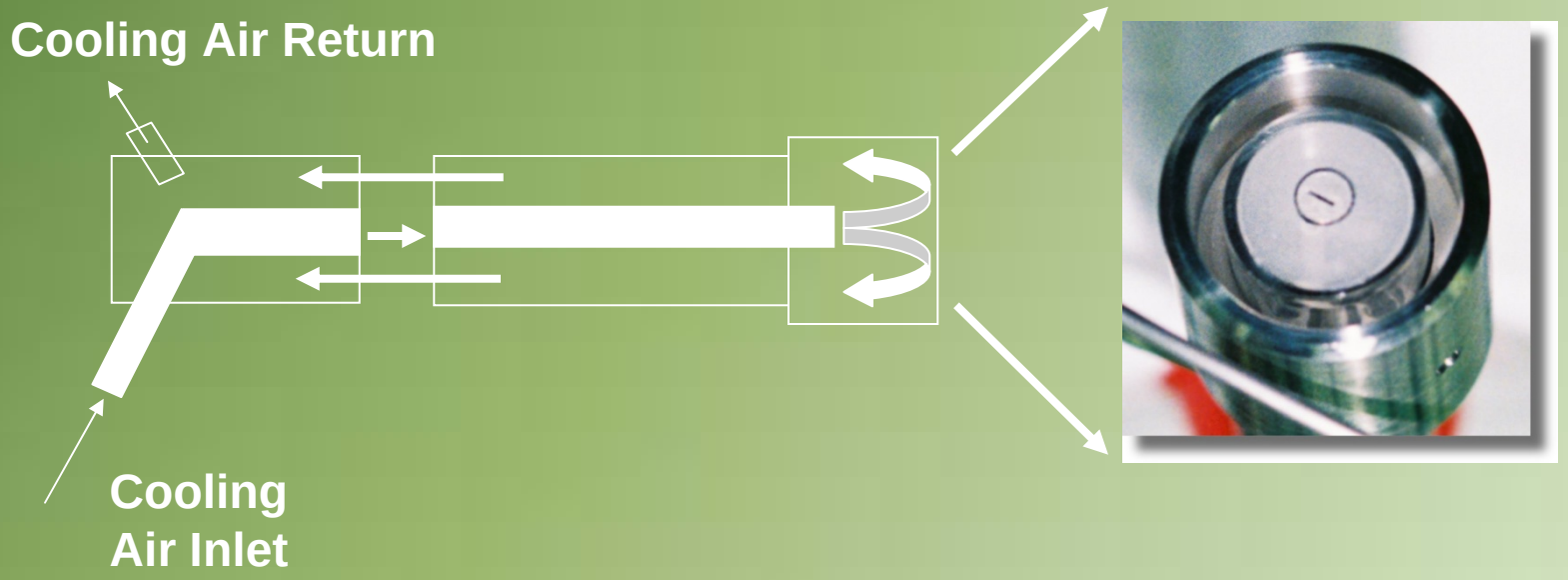
How does it work? - I



Cooling air flow to the probe tip is precisely controlled to induce condensation on the probe surface

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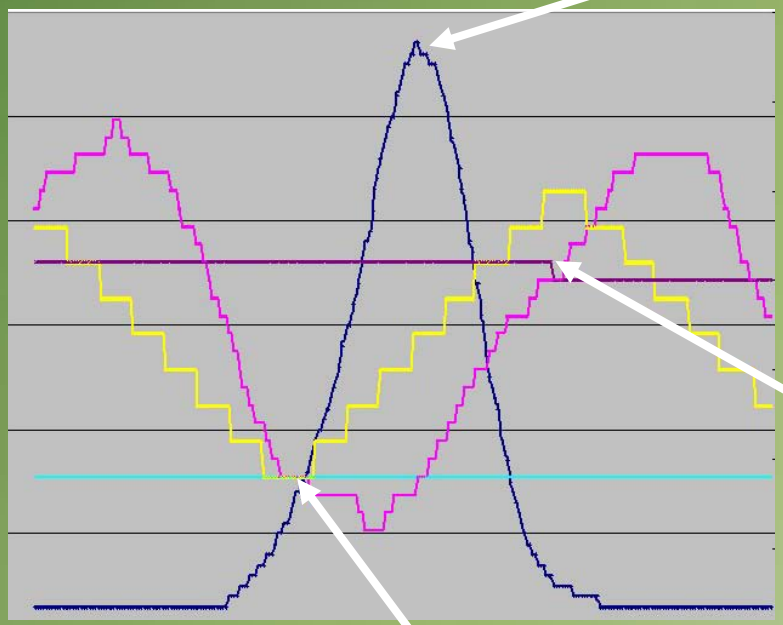
How does it work? - II



Condensation = Evaporation

Equilibrium Dewpoint

The probe is allowed to heat in the Flue Gas until the current goes below a threshold (Evaporation Point).

Evaporation > Condensation

A hot probe is precisely cooled until condensation current is detected. (Formation Point).

Condensation > Evaporation

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AbSensor – AbS/SO3 System

- 4” 150 lb 8-bolt flanged port
- 50 psi service air
- 12 cfm air consumption
- 110 VAC power supply

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SO_3 Mitigation

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Primary Materials Available

- Magnesium
  - MgO
  - MgOH
- Sodium
  - Sodium Carbonates (wet)
  - Sodium Carbonates (dry) “Trona”
- Calcium
  - Hydrated Lime
  - Pulverized/Micro-pulverized Limestone
- Ammonia

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Primary Injection Locations

- In-Furnace
  - Mg products
- Pre-SCR
  - Sodium Products
  - Micro-pulverized Limestone
- Pre-Air Heater
  - Sodium Products
  - Micro-pulverized Limestone
- Pre-ESP/FF
  - Trona
  - Calcium Products

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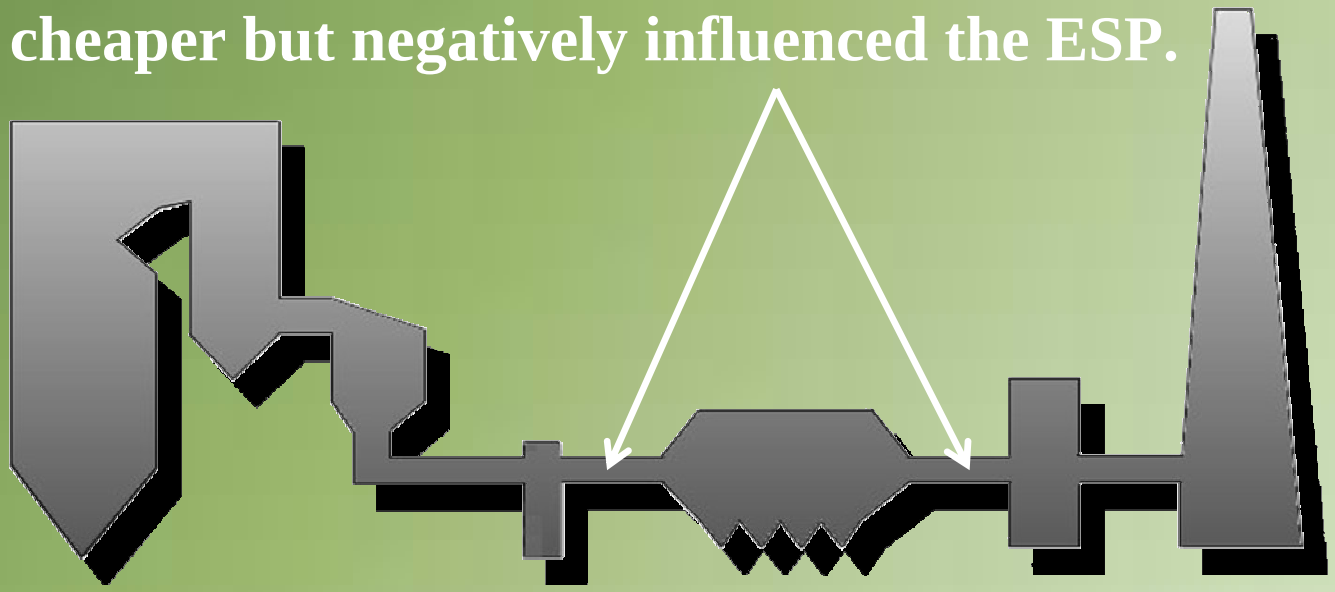
Principal Vendors

- Mg
  - Fuel Chem/EES/GE
- Na
  - URS/O&G/B&W
- Ca
  - BCSI/Marsulex/Fuel Chem
- NH3
  - Generic

Not One-size-fits-all

The Initial work was generally done here, and included Trona, SBS and hydrated lime. Sodium products provided ESP performance support, but affected fly ash salability. Hydrated lime was cheaper but negatively influenced the ESP.



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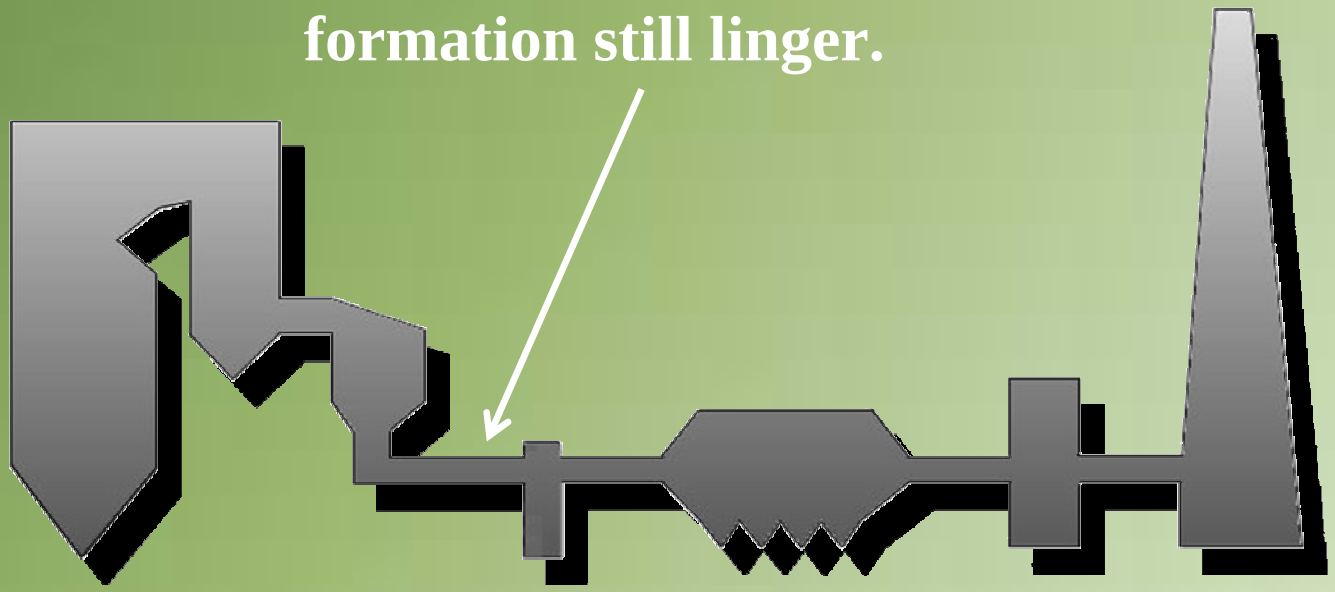
Not One-size-fits-all

When the negative effects of SO3 on Mercury capture and air heater fouling/corrosion were considered, more effort was placed on mitigation here. Issues with air heater pluggage from SBS formation still linger.



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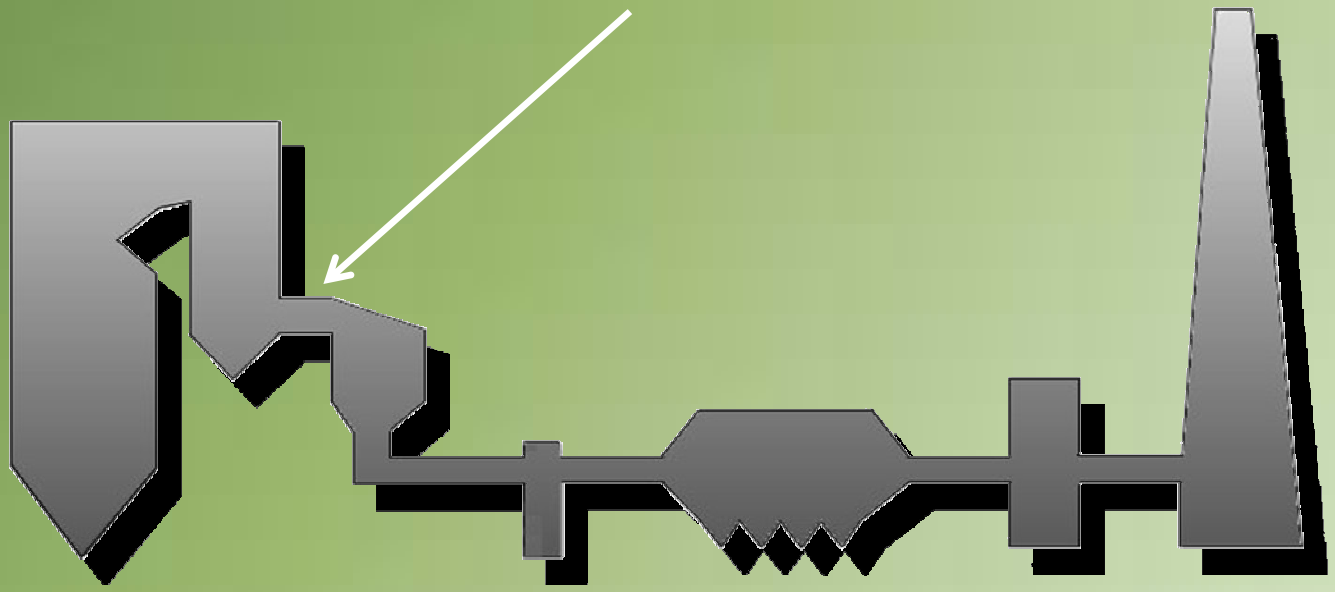
Not One-size-fits-all

Efforts to reduce the minimum operating temperature of the SCR have pushed mitigation technology to here. Concerns with Na effects on catalyst life still linger as well.



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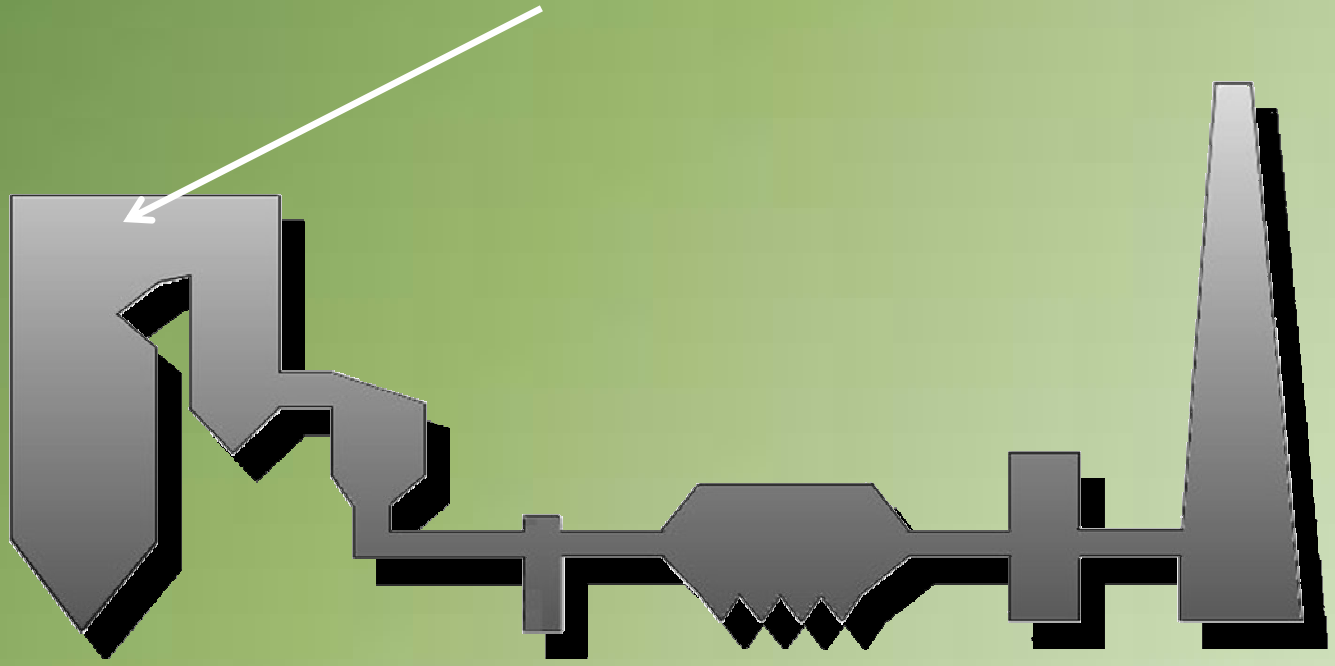
Not One-size-fits-all

Historical processes to improve ash friability using Mg products have a side benefit of SO_3 capture as well.



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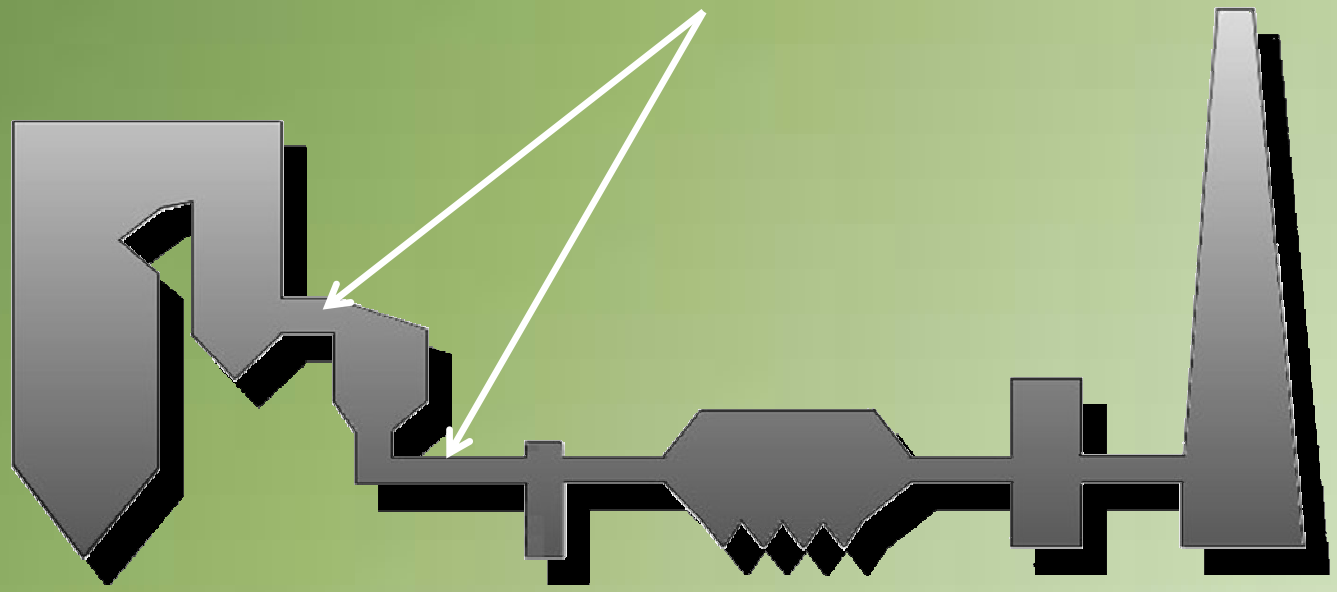
Not One-size-fits-all

However, SO_3 removal ahead of the SCR has diminished effect on reduction of SCR created SO_3. More and more effort is being directed toward dual conditioning ahead of, and behind, the SCR.



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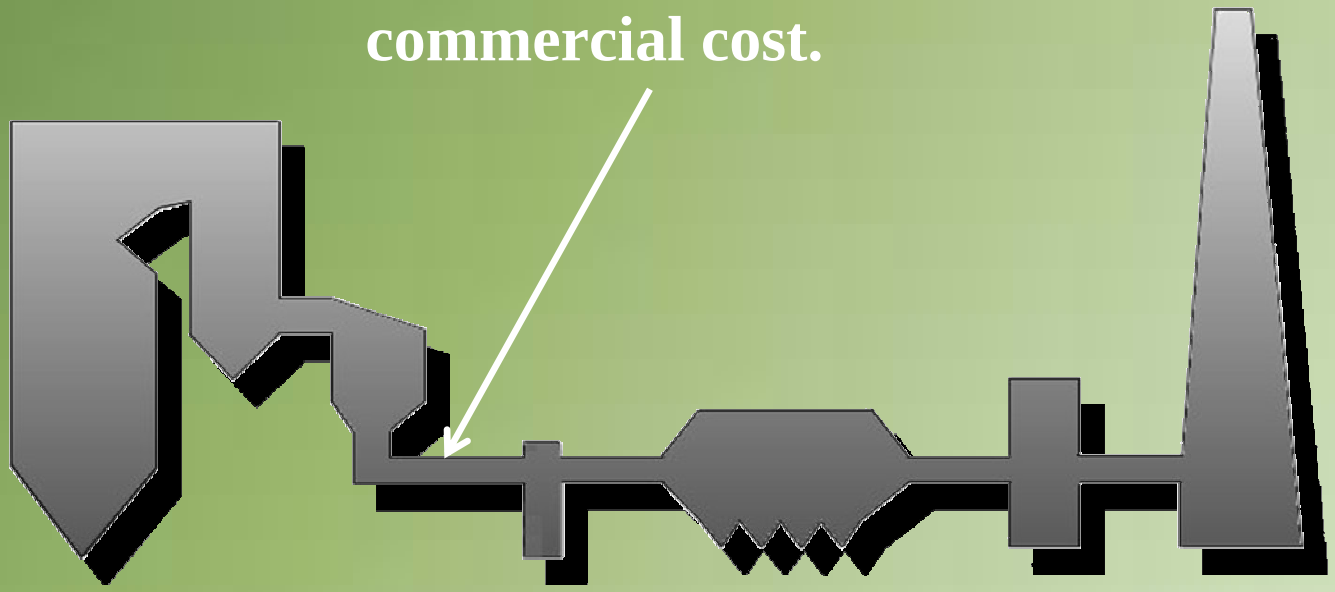
Not One-size-fits-all

Adding complexity is the sensitivity of Na products to sodium bisulfate formation if the molar Na/SO3 ratio is not maintained. To combat this, injection levels are often kept artificially high, but at a commercial cost.



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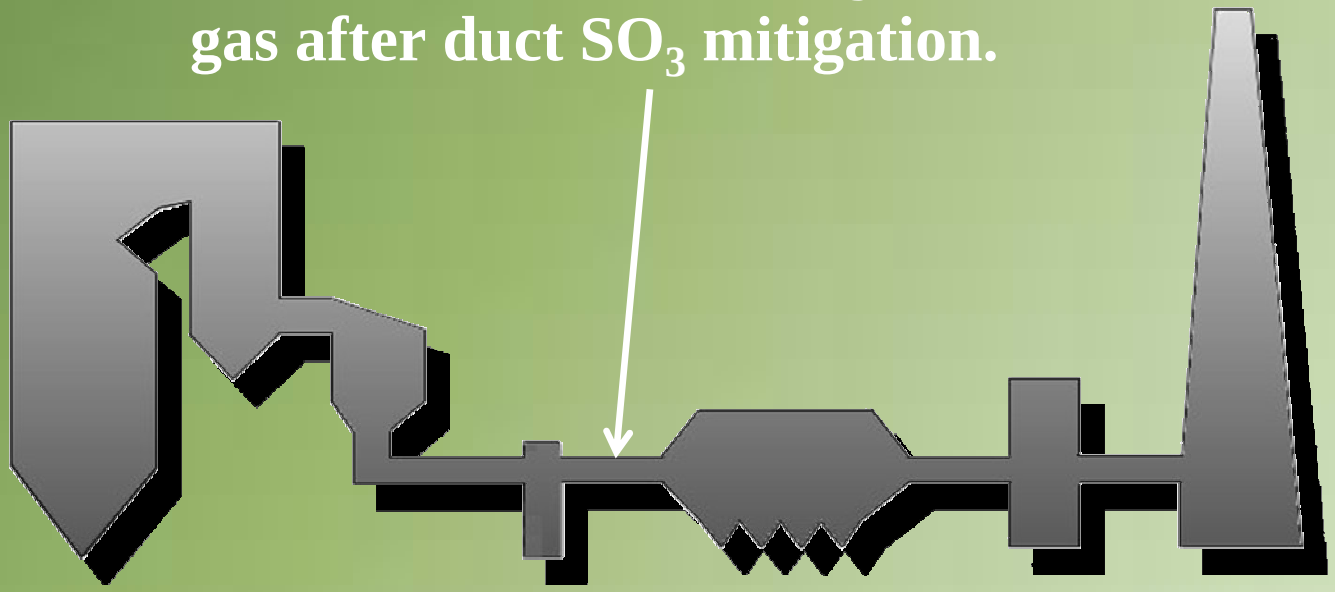
Not One-size-fits-all

In all cases, highly effective removal of SO_3 ahead of the ESP can lead to unwanted particulate collection issues and potential opacity derates. As silly as it sounds, some plants are adding SO_3 to the ESP flue gas after duct SO_3 mitigation.



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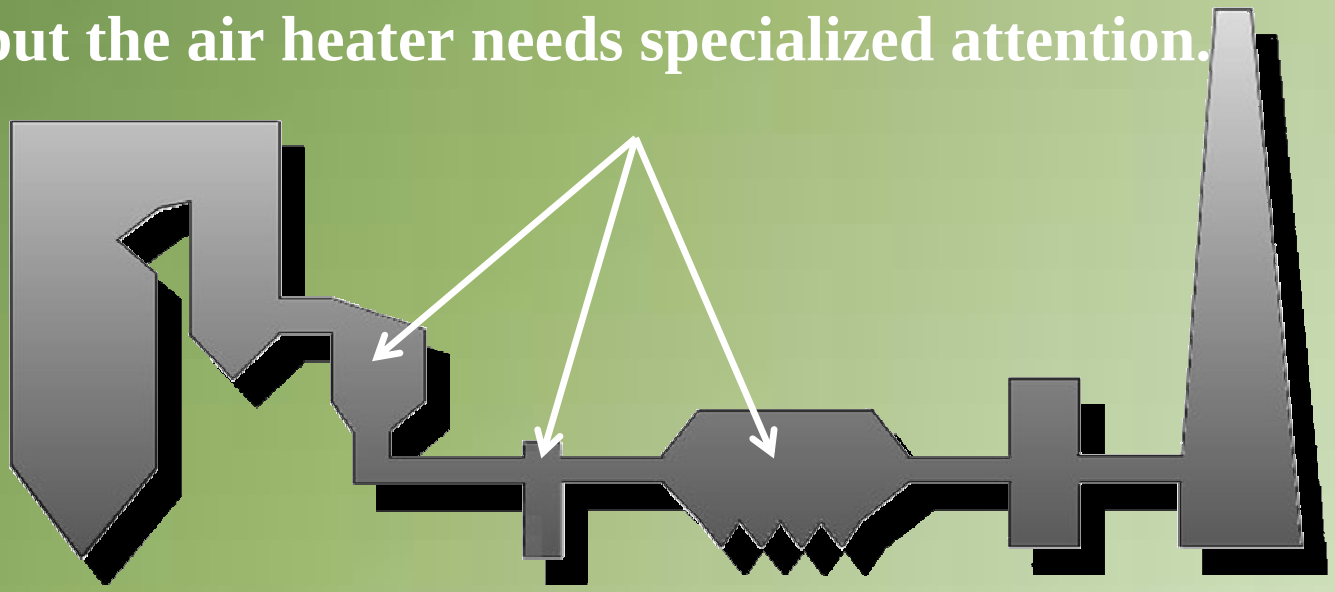
Not One-size-fits-all

One utility we know of is highly aggressive with NH3 injection at the SCR inlet. This has effectively removed the free SO3 and bound it up in ABS. NOx reduction is excellent, ESP performance is excellent, but the air heater needs specialized attention.



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