REINHOLD ENVIRONMENTAL Ltd.

2012 NOx-Combustion Round Table & Expo Presentation

February 13-14, 2012, in Columbus, OH / Hosted by AEP

PANEL DISCUSSION: CATALYST STRATEGY IN REGARD TO SO3 FORMATION

Panel Chairman: Mark Thomas

Panel Members

Michael O'Connor - Duke Energy

Chao Lin – American Electric Power

Cindy Khalaf – Johnson Matthey Catalysts LLC

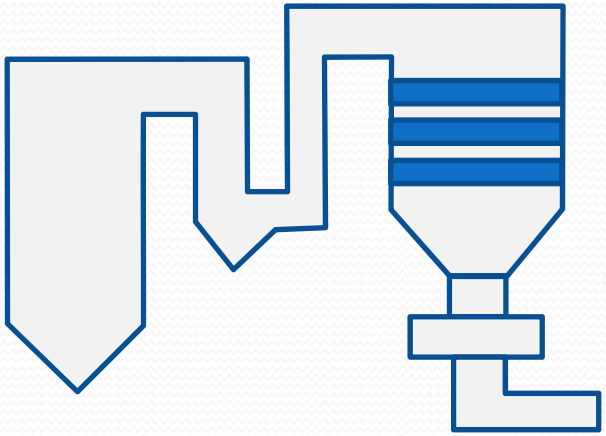
Kyle Neidig - Hitachi

CATALYST STRATEGY IN REGARD TO SO3 FORMATION

- Catalyst Management Fundamentals
- SO_3 Formation & Issues
- Q & A For Panelists
- Q & A From Audience
  - No question is a dumb question

CATALYST STRATEGY IN REGARD TO SO_3 FORMATION

- CMP requires Catalyst "EVENTS" to meet long term compliance objectives.
  - NO_x Removal
  - Hg Oxidation



- Catalyst EVENTS include
  - Cleaning
  - Regeneration/ Rejuvenation
  - Replacement (new or used)

- CMP Outlines:
  - When to replace Catalyst (Outage Timing)
  - Where to install Catalyst (Station, Unit, Layer)
  - What type of Catalyst
    - Physical Properties (Type, Pitch, etc)
    - Chemical Properties
      - Activity (K_{NOx})
      - **SO_2 Oxidation (K_{SOX})**
      - Hg Oxidation

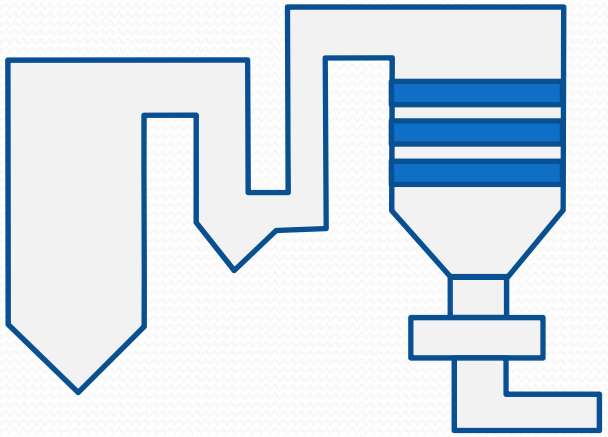
BOP SO_3 Impacts

NEGATIVE

- Plume Opacity
- Air Heater Pluggage
- Duct & Fan Corrosion
- Reduced Hg Capture
- Catalyst ABS
- SCR AIG Pluggage
- FFDC Bag Corrosion & Blinding
- Reduced HCl Capture when using DSI

POSITIVE

- ESP Conditioning



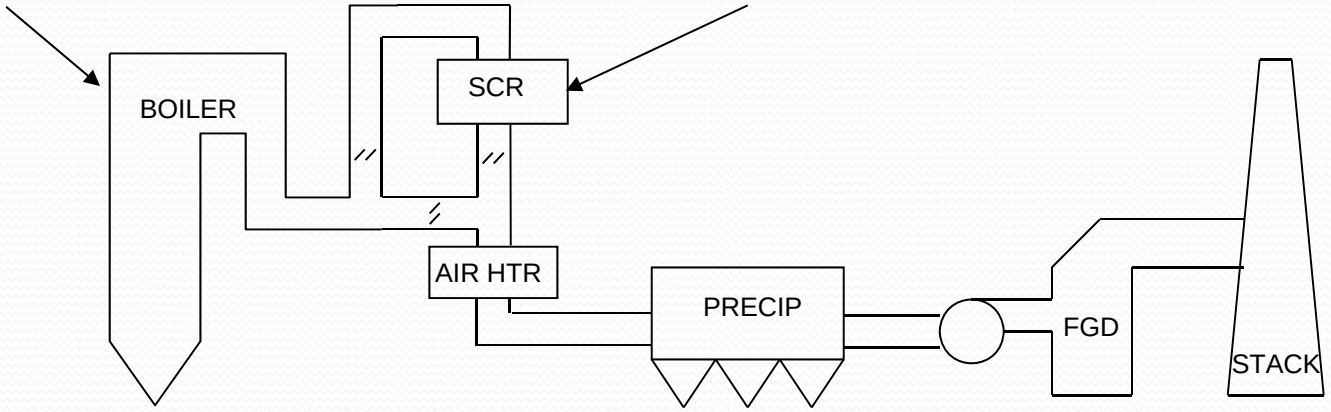
SO3 impacts should be weighed along with other factors when developing a CMP.

Q: How

How SO_3 is Formed

In Boiler 0.25% to 1.5% of SO_2 oxidizes to form SO_3

In SCR added 0.75% -to-1.5% of SO_2 oxidizes to form $S0_3$. Vanadium in SCR serves as catalyst for this reaction.



Physical Forms of SO_3

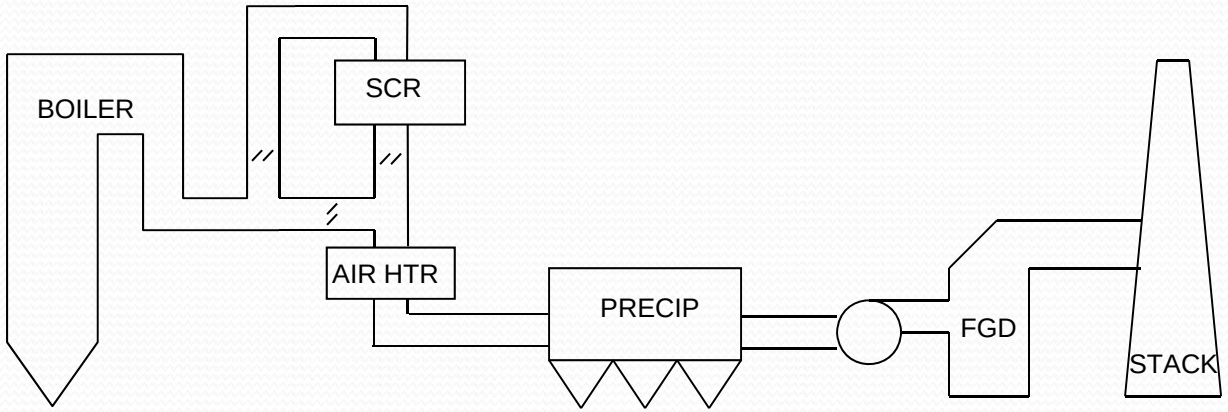
Vaporous SO_3 Converts to Vaporous Sulfuric Acid (H_2SO_4) $SO_{3Vap} + H_2O_{Vap} = H_2SO_{4Vap}$

Vaporous and Condensed Acid @ Temps Below Acid Dew Point

Sulfuric Acid Mist (Aerosol) H_2SO_4

QUESTION #1 FOR PANELISTS

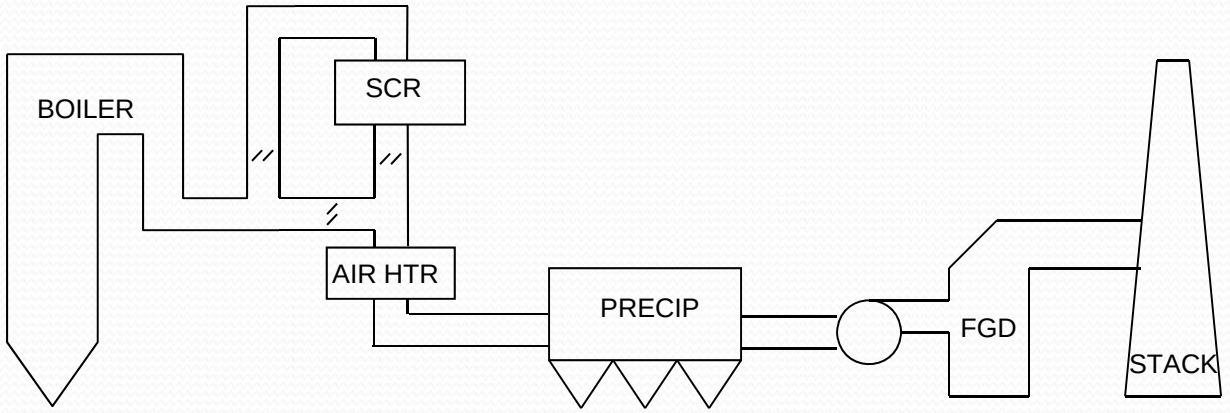
What are your primary concerns with SO_3 as it relates to Catalyst planning?



CATALYST STRATEGY IN REGARD TO SO_3 FORMATION

QUESTION #2 FOR PANELISTS

How do you weigh catalyst SO_2 oxidation against other catalyst properties (K, deactivation, Hg ox, etc.)?



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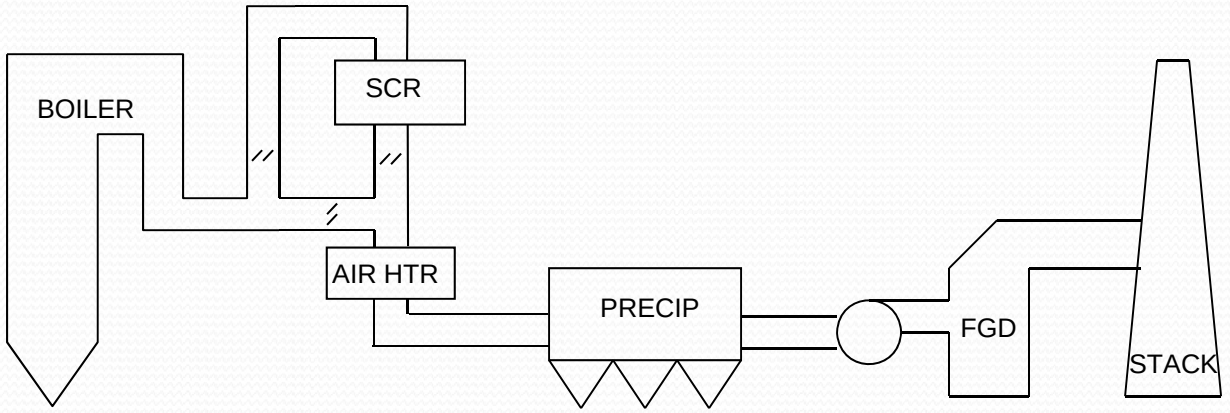
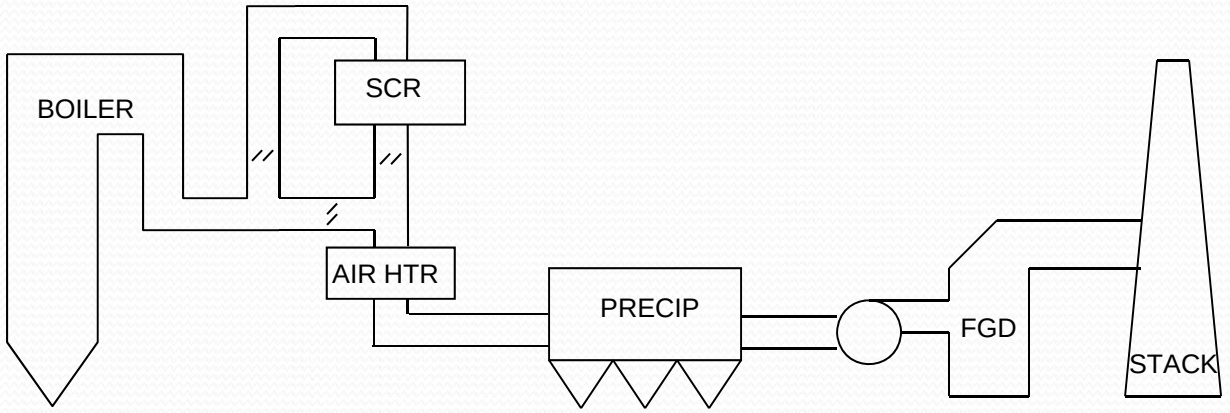
QUESTION #3 FOR PANELISTS

Will you need to weigh SO_2 oxidation differently under MATS & CSAPR? If so how?



QUESTION #4 FOR PANELISTS

Are there other aspects of Catalyst SO_2 oxidation you see as pertinent that we haven't discussed?



Q & A FOR AUDIENCE