

REINHOLD ENVIRONMENTAL Ltd.



2016 NO_x-Combustion-CCR Round Table Presentation

February 1 & 2, 2016, in Orlando, FL / Hosted by OUC

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DSI Can be Good for Your Plant



Reinhold NOx Combustion Mtg
February 2, 2016



“You Can’t Always Get What You Want”

The Rolling Stones

***“You can't always get what you want
You can't always get what you want
You can't always get what you want
But if you try sometimes you might find
You get what you need”***





DSI – Background

- Late 60's – TVA experimented with limestone boiler injection
- 1970's and 1980's – Nahcolite and trona injection
- 1984 – 1991 LIMB Project sponsored by EPA & DOE

Basically no DSI Activity

- 2003 – The need for SO_3 control revived interest in duct injection
- MATS has resulted in need for HCl and Hg control data
- Various consent decrees have renewed interest in SO_2 control
- Somewhere around 100 DSI systems installed and operating in the US today





WHY Have DSI Upstream of Your Air Heater?

- Corrosion control
- Added residence time for reactions
- Enhanced Mercury removal
- Reduced air heater downtime
- Heat rate improvements



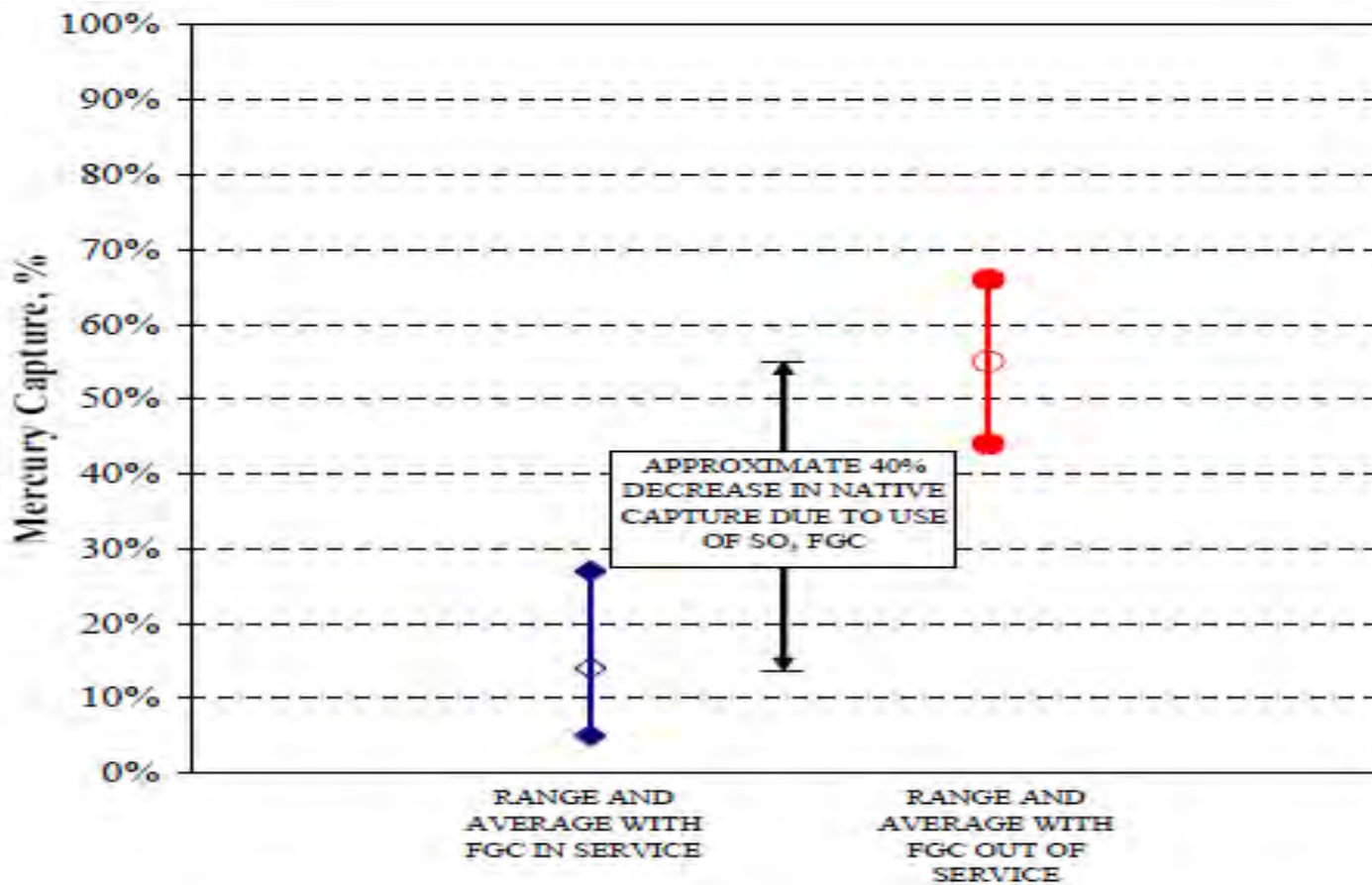


Improved Mercury Removal Performance

- Data show that small amounts of SO_3 (3 – 5 ppm) greatly impact the performance of ACI Mercury Control Systems
- When SO_3 is removed upstream of ACI injection – the Mercury removal performance is improved by 40+%



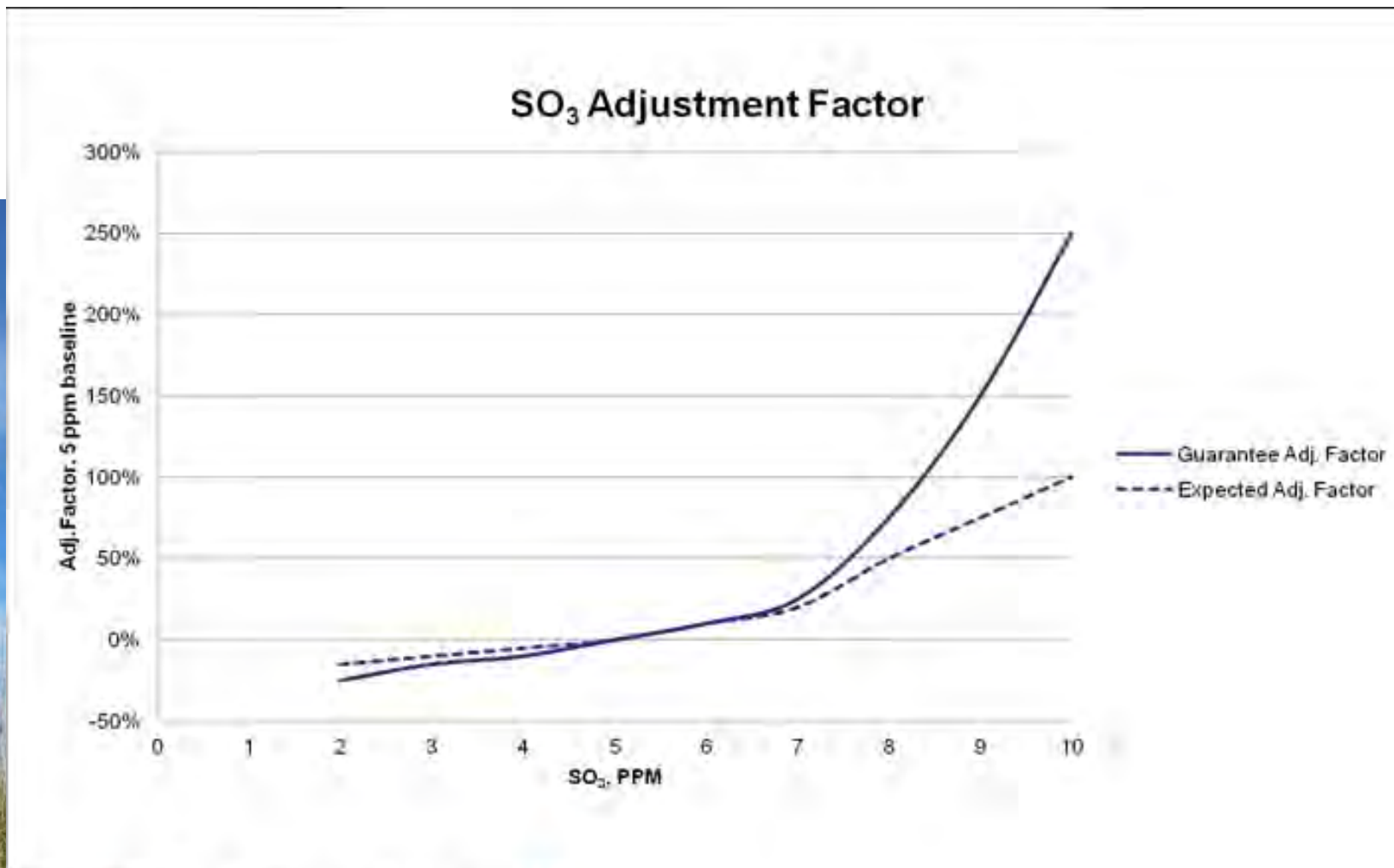
Impact on Native Hg Capture with 6 ppm SO₃



Data Courtesy of Southern Company



Improving ACI Effectiveness





Improved Air Heater Performance

- Both SCR and SNCR systems have some NH_3 slip
- SO_3 can react with NH_3 to form Ammonia bisulfate (ABS)
- ABS can attach to air heater surfaces, it will build up and increase the ΔP requiring downtime for air heater cleaning
- Removing SO_3 prevents ABS from forming, plus it allows better performance of SCR & SNCR by allowing larger amounts of NH_3 slip





Case Study – 550 MW Boiler moved DSI injection location upstream of air heater

- Plant configuration
 - ✓ Boiler – SCR - air heater – ESP – Wet Scrubber
- Original DSI design was to inject downstream of the air heater
 - ✓ Boiler was down every 6 weeks or so for air heater cleaning
- Moved injection to upstream of air heater over 1 year ago
 - ✓ Have gone for many months (6+) without the need to have outage for cleaning
 - ✓ Have been able to wash air heater during downtimes for other issues
 - ✓ No indication of hydrate build up on air heater surfaces



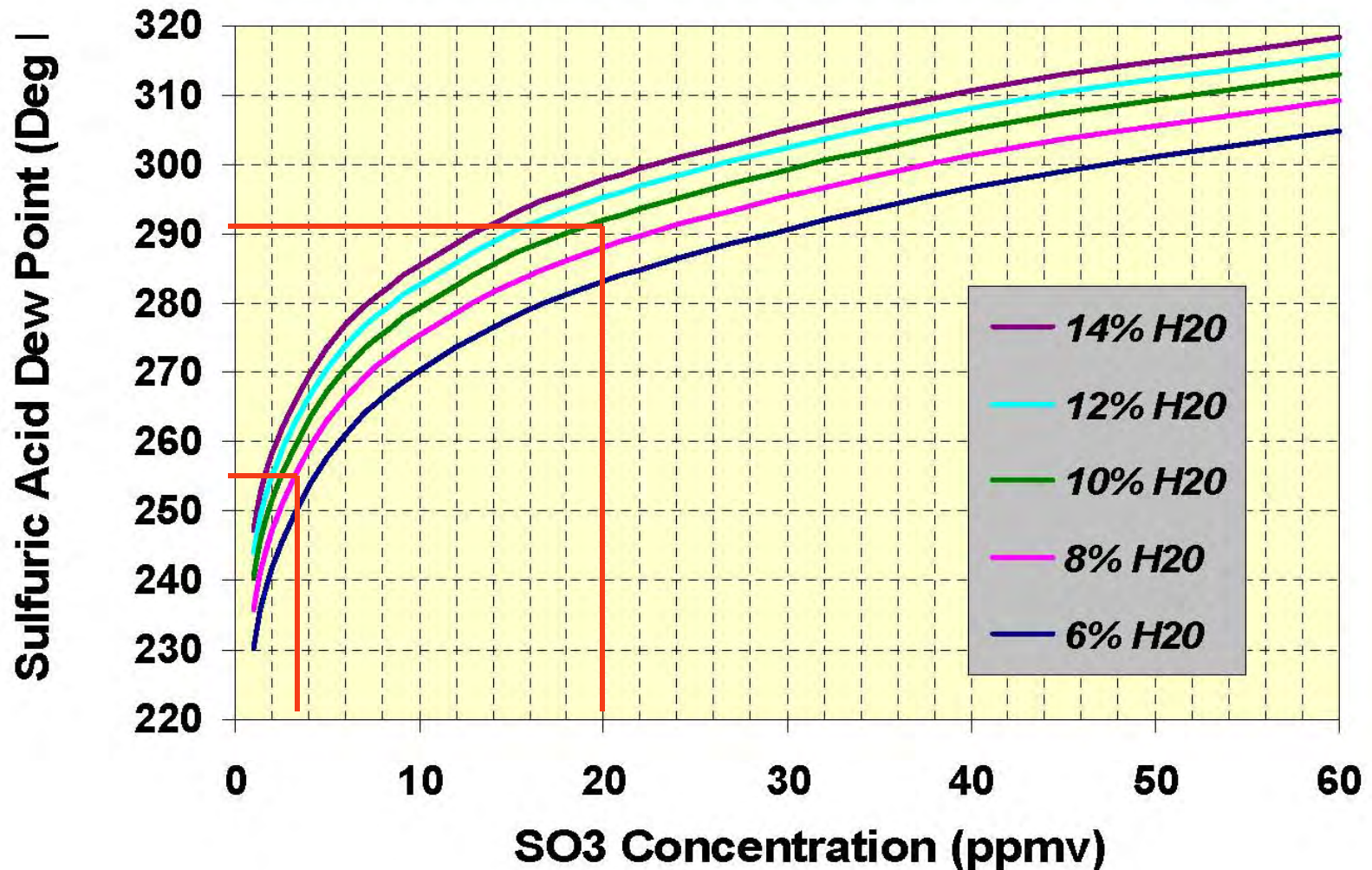


Improved Heat Rate

- Air heater outlet T set to maintain flue gas above dew point to prevent/reduce downstream corrosion
- Reducing SO_3 lowers dew point T to allow the air heater to operate at a lower outlet temperature
- Equipment modifications may be required to actually capture this benefit



Acid Dew Point as a Function of SO₃ Concentration





Impact of Decreased Air Heater Temperature

- Calculation Basis

- ✓ 500 MW boiler
- ✓ 10,000 BTU/kw-hr heat rate
- ✓ 8600 BTU/lb coal
- ✓ 0.5% S
- ✓ 100% capacity factor
- ✓ Coal price = \$50/ton delivered
 - (\$2.90/MM Btu)

- A 10°F temperature reduction improves the heat rate to 9,975 BTU/kw-hr
(assumes a 0.25% improvement for 10°F)

- Calculation Results

Base amount of coal –

- ✓ 2,546,512 tons/yr

Coal use at improved heat rate

- ✓ 2,540,145 tons/yr

Annual coal reduction

- ✓ 6,367 tons

Annual savings = ~\$300,000





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Cost Impact of 10°F Decreased Air Heater Temperature

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