

REINHOLD ENVIRONMENTAL Ltd.



2012 NO_x-Combustion Round Table & Expo Presentation

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

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Michael Thiel
Michael Thiel

Controlling HCl Emissions for MATS using DSI

Reinhold NO_x – February 14, 2012

Agenda

-  DSI Dry Sorbent Injection (DSI) Overview
-  APP Applying DSI for HCl
-  DATA Field Trial (November 2011)



Controlling HCl Emissions for MATS

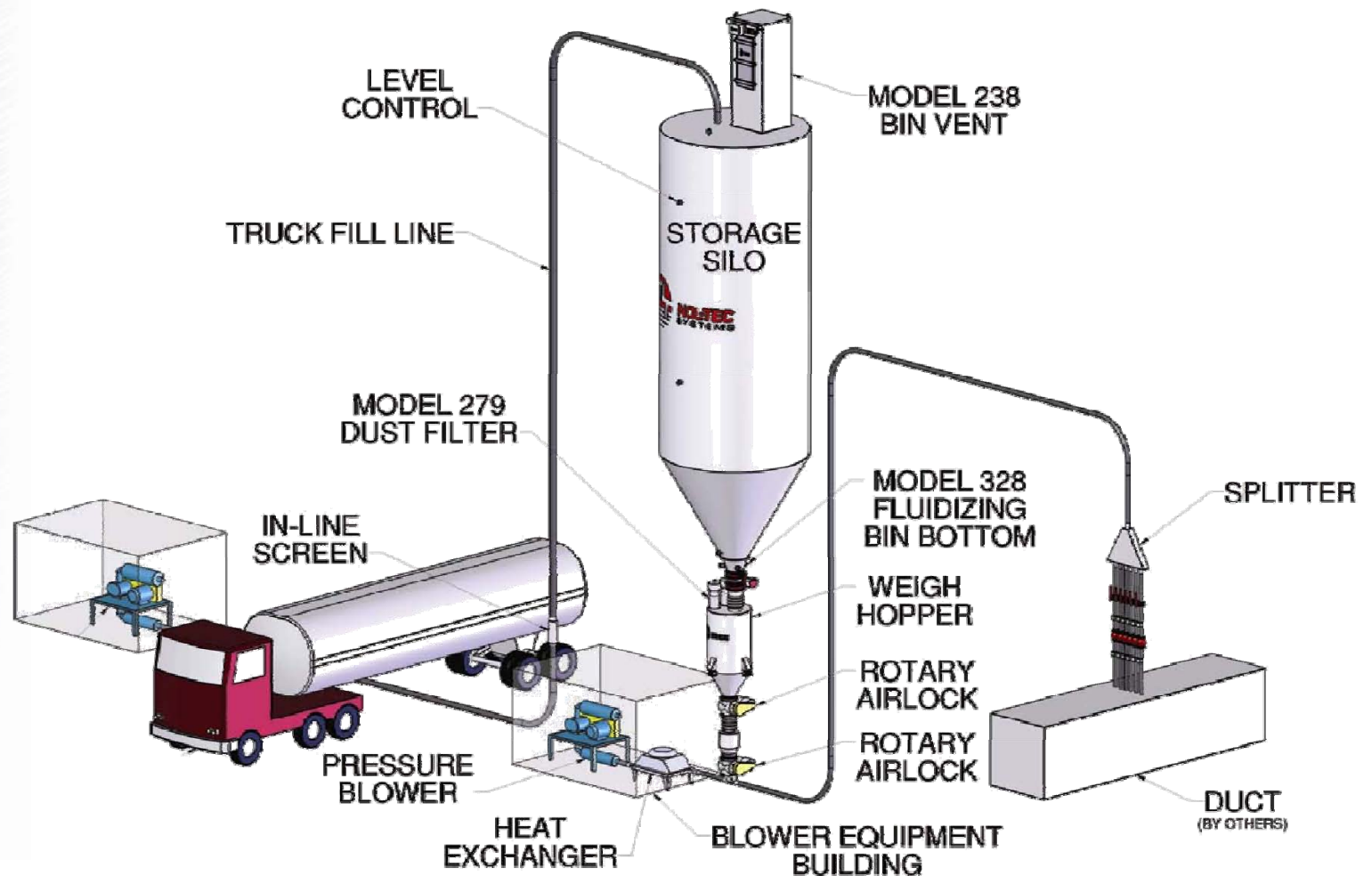
DSI

APP

DATA

DSI System – No Mill

- DSI – No Mill
- DSI – Pin Mill
- DSI – ACM
- Portable
- Permanent
- Turn Key





Controlling HCl Emissions for MATS

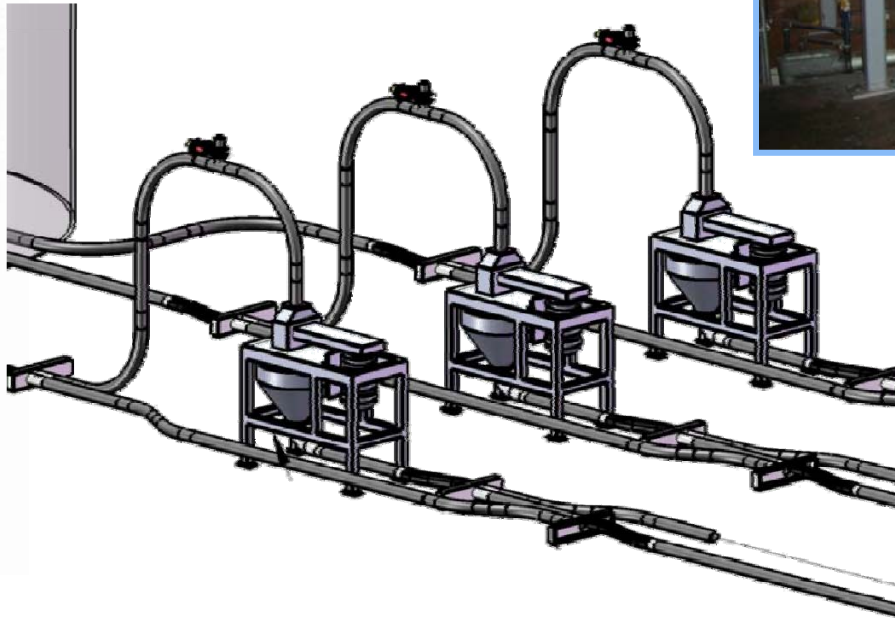
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Air Classify Milling

- Used for Sodium Bicarbonate
- Vendors: Sturtevant, CMS, GTS, Fitzpatrick, Hosokawa
- Market: Used for SO₂ and HCl Applications with SBC
- Single pass through cut; no pre-milling
- Fine cut SBC

$d_{50} \sim 140 \mu\text{m} \rightarrow d_{50} \sim 15 \mu\text{m}$

$d_{90} \sim 25 \mu\text{m}$



Controlling HCl Emissions for MATS

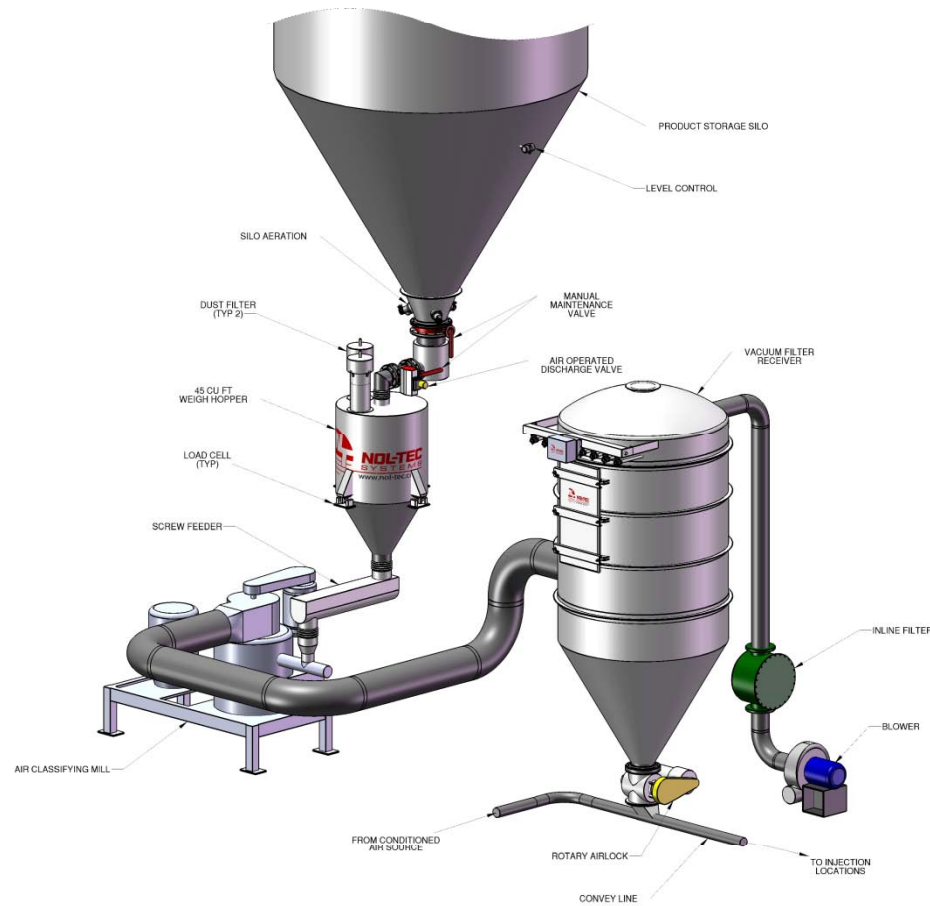
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Technology



Controlling HCl Emissions for MATS

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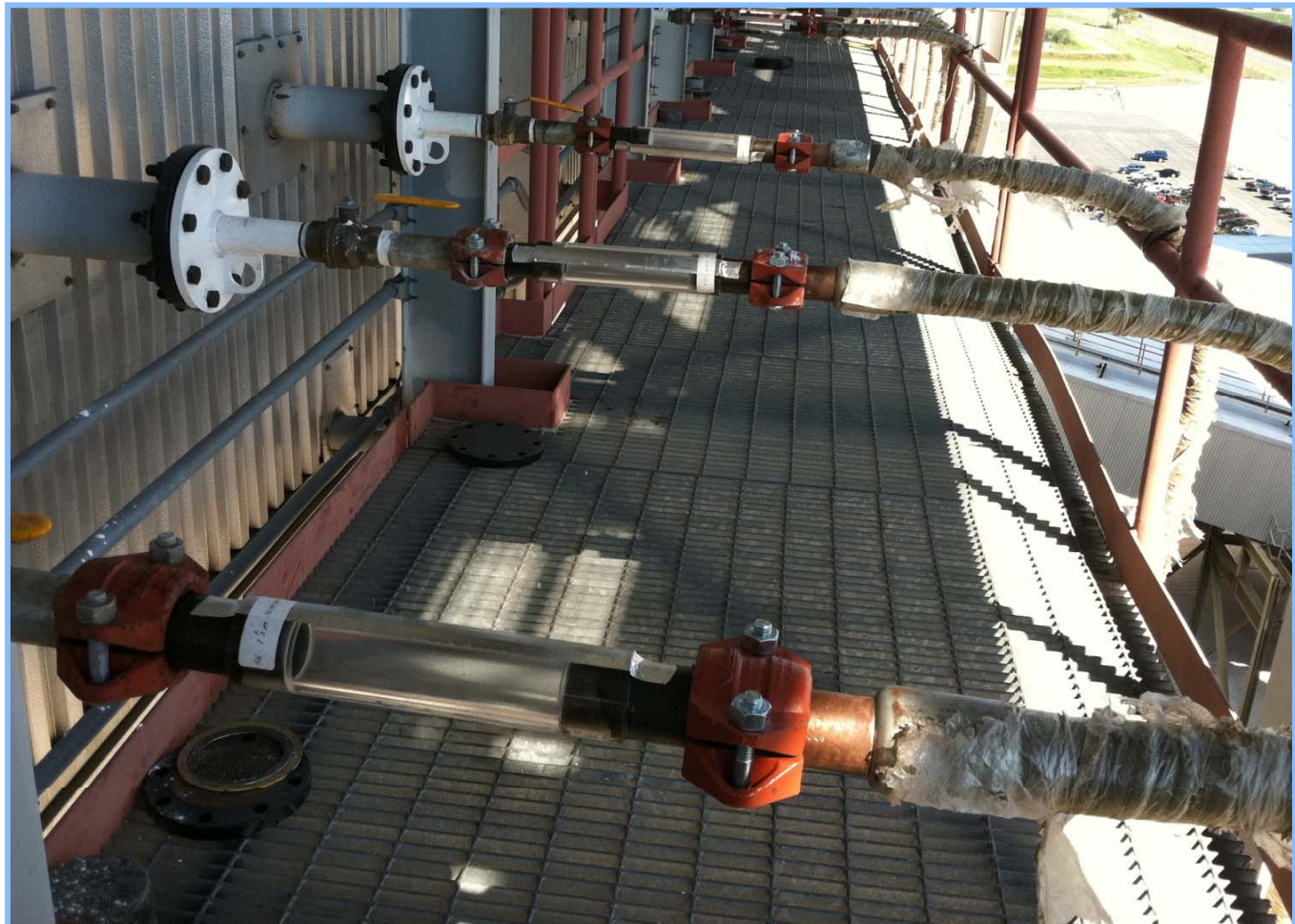
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Controlling HCl Emissions for MATS

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Permanent System

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Controlling HCl Emissions for MATS

DSI

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Permanent System

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Controlling HCl Emissions for MATS

DSI

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Turn Key

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Controlling HCl Emissions for MATS

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Controlling HCl Emissions for MATS

DSI

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Applying DSI for HCl

- Situation: MATS
- Various Contexts
- Applying DSI
- The Net

Situation: MATS

- Final Rule signed by Lisa P. Jackson on Dec. 16, 2011
- Final Rule published Dec. 21, 2011
- Timeline: three years to comply with the final standards
- Potential: one year extension for installation
- Existing Coal EGU HCl Limit: 0.0020 lbs/MMBtu
- Alternative Compliance: SO_2 Limit 0.20 lbs/MMBtu



Controlling HCl Emissions for MATS

DSI

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Applying DSI for HCl

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Each Unit is Different

- Existing SO₂ Wet Scrubber
 - ✓ May or may not suffice for 99+% HCl removal
- Sulfur Content in Coal and Boiler Size
 - ✓ Amount of sulfur in coal impacts SO₂ levels
 - ✓ SO₂ levels impact HCl removal with sodium sorbents
- Residence Time
 - ✓ Dependent on flow rate and duct configuration
 - ✓ More time increases probability of reaction
- Operations / Economics / Life Cycle
 - ✓ Peak load unit or base load unit



Controlling HCl Emissions for MATS

DSI

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Applying DSI for HCl

- Situation: MATS
- Various Contexts
- Good Candidates
- The Net

“Good” Candidates for DSI

- “Smaller” coal-fired units
- Lower sulfur coal
- Units with PJFF
- Units that need a little extra to help the wFGD

Only one way to find out if you meet the limit... Test!



Controlling HCl Emissions for MATS

DSI

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Applying DSI for HCl

- Situation: MATS
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Why DSI for HCl

- Low capital cost solution
- Effective for HCl removal
- Quick installation and start up

The Net: Dry Sorbent Injection...

- ...is not the perfect solution for every application.
- ...will be used by many to achieve HCl emission limits.
- ...should be tested at your facility.



Controlling HCl Emissions for MATS

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Field Trial (November 2011)

- Overview
- Test Protocol
- Results
- Conclusions

Dry Sorbent Injection Test Overview

- Type: bituminous coal-fired unit
- Boiler: <150MW
- Sulfur in Coal: ~1.2%
- PCD: ESP
- Residence Time: <1 sec
- Injection Location: Economizer Outlet (600°F-700°F)
- Primary Objective: Determine achievability of HCl Limit



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Test Protocol

- SBC Injection (Monday and Tuesday)
- Trona Injection (Wednesday and Thursday)
- PAC Injection for Hg Removal
- Testing: HCl (M26), Hg (M30B), PM (M5), SO₂ (CEMS)
- Primary Objective: HCl Removal for MATS



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Field Trial (November 2011)

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Results

- Start: Chlorine in coal: ~0.16%
- Finish: HCl Removal: >98%
- Start: SO₂ in coal: 2.29 lbs/MMBtu
- Finish: SO₂ Removal: Up to 71%
- Trona and SBC proved to mitigate HCl to MATS limit (0.002)



- Overview
- Test Protocol
- Results**
- Conclusions

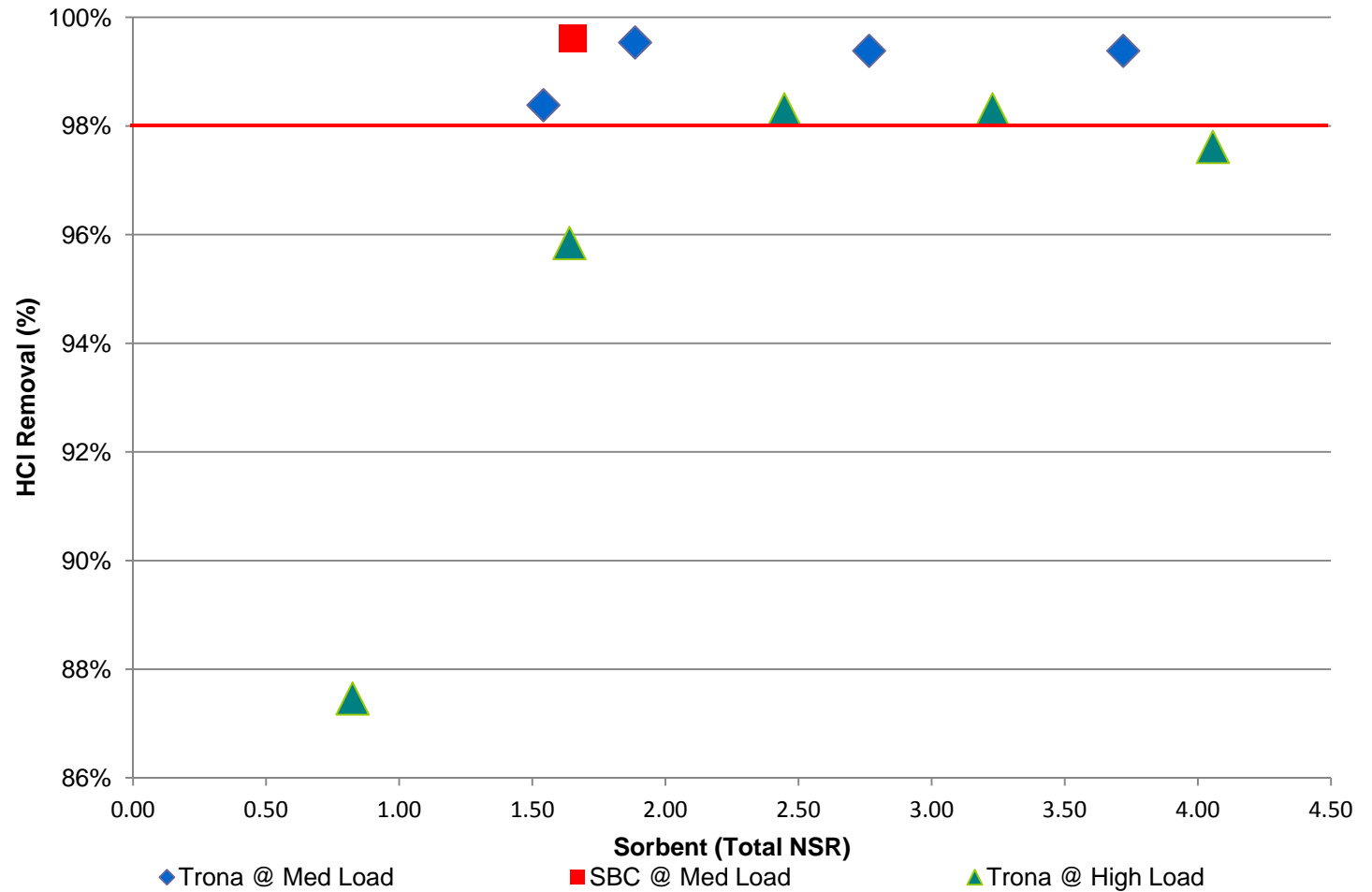
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Trona and SBC (Total NSR) vs HCl (% Re)





- Overview
- Test Protocol
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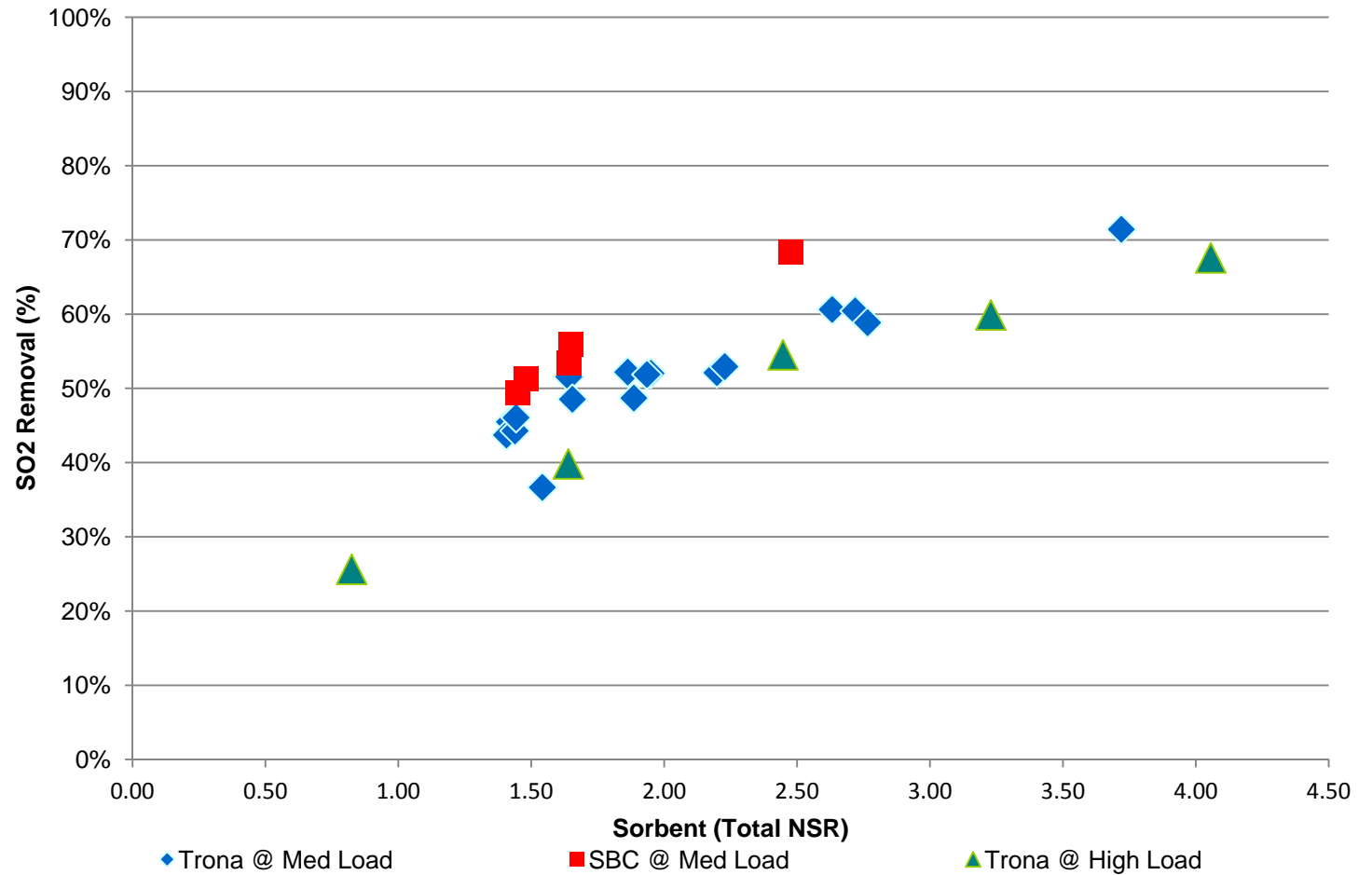
Controlling HCl Emissions for MATS

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DATA

Trona and SBC (Total NSR) vs SO₂ Removal (%)





Controlling HCl Emissions for MATS

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Hg & PAC

- Unit has ~10%-20% LOI
- Theory: Clean up acid gases and Hg drop
- Reality
 - ✓ High Trona NSR impacted Hg Removal
 - ✓ SBC had less of an impact on Hg Removal
 - ✓ Halogen's getting stripped?
 - ✓ Or, NO₂ formation?
- Plan forward: Balance Trona/SBC NSR with PAC Injection



Controlling HCl Emissions for MATS

DSI

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Field Trial (November 2011)

- Overview
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Conclusions

- Trona and SBC proved to mitigate HCl to MATS limit (0.002)
- ACI proved to mitigate Hg to MATS limit ($1.2 \text{ lbs}/_{\text{TBtu}}$)
- SO_2 % Re and Corresponding HCl % Re

<u>SO_2 (%Re)</u>	<u>HCl (%Re)</u>
10%	75%
30%	95%
40%	>95%



Thank You!

Jerry VanDerWerff

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A handwritten signature in black ink that reads 'Jerry VanDerWerff'.

Michael Thiel

Air Pollution Control
Technical Sales Manager
(612) 799-4573

A handwritten signature in black ink that reads 'Michael Thiel'.