Agenda

- Introduction SOLVAir Solutions
- Summary of HCl requirements
- EERC Pilot Test Results and Plant Experience
- SOLVAir Solutions
SOLVAir® Solutions - North America

- Chemical products for the air pollution control market
- Bring expertise to customers, engineering companies, and many others
- Consists of Sales, Marketing, and Technical support

SOLVAir® Global Mission Statement:
To offer and continuously develop competitive and sustainable environmental solutions used for air emissions control and associated waste, which includes a portfolio of products, services, technologies and treatment systems.
<table>
<thead>
<tr>
<th>Rule</th>
<th>Utility MATS</th>
<th>Industrial Boiler MACT</th>
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</thead>
<tbody>
<tr>
<td>HCl Limit</td>
<td>0.002 lbs/MMBTU</td>
<td>0.022 lbs/MMBTU</td>
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<tr>
<td>Effective Date</td>
<td>April 16, 2015 (one year extensions available)</td>
<td>January 31, 2016 (one year extensions available)</td>
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Solvay testing with EERC

- Coal contained .78 lb/MMBTU Sulfur and 954 to 970 ppm HCl
- Regents used
  - Standard trona (S200)
    - $d_{50}$: 30 µm
  - Milled Trona (labeled as S250)
    - $d_{50}$: 15 µm, $d_{90}$: 60 µm
    - equivalent to milling S200 with a pin mill
  - Milled Sodium Bicarbonate (S350)
    - $d_{50}$: 12 µm, $d_{90}$: 40 µm
    - commercially available, pin mills can approach this particle size
  - Finely Milled Sodium Bicarbonate (labeled as S450)
    - $d_{50}$: 7 µm, $d_{90}$: 17 µm
    - can be milled on site with a classifier mill
  - Standard Hydrated Lime
    - $d_{90}$: 45 µm, purity: 96.8%

Injected upstream of ESP
- 2.5 seconds residence time at 650°F

Injected upstream of Baghouse
- 1 second residence time at 325°F
HCl Removal with Sorbent Injected at ESP Inlet

- Utility MACT Limit: 0.002
- Boiler MACT Limit: 0.022
HCl Removal with Sorbent Injected at Baghouse Inlet

- **Utility MACT Limit**: 0.002
- **Boiler MACT Limit**: 0.022

[Graph showing HCl at Stack (lb/mmBtu) vs. Total NSR for different sorbents (S200, S250, S350, Hydrated Lime).]
HCl Removal vs. SO₂ Removal - ESP

SO₂ Removal Rate (%) vs. HCl Removal Rate (%)

Graph showing the removal rates of HCl and SO₂ for different substitutions (S200, S250, S350, S450).
HCl Removal vs. SO₂ Removal – Baghouse
**DTE St. Clair**

**Tested trona and pre-milled sodium bicarbonate**

- HCl removal to MATS standard (85% removal) at total acid gas NSR of less than 0.45 for both milled trona and pre-milled sodium bicarbonate with hot side addition.
  - Trona performed a bit better than expected from our data likely due to increased residence time and mixing through the air heater.
- At the NSR needed to remove the HCL to compliance levels trona also removed about 15% of the SO2 present while bicarbonate removed about 25% of the SO2 at those conditions
- Removal efficiency for HCl was about the same for trona and bicarbonate
- PAC addition does not affect HCl removal
- DSI for HCl can affect mercury removal in some cases especially when used in hot side applications.
  - some NO₂ generation was confirmed and was absorbed on carbon
  - less NO₂ generation occurred at lower temperature
  - HCl removal prior to the air heater could also impact mercury oxidation
- Trona injection cold side was less effective for HCl control
  - trona benefits from higher temperatures
  - shorter residence time and lack of mixing through the air heater work against better removal
DSI and Mercury Impacts

- SO$_3$ removal will improve mercury adsorption on fly ash and carbon
- HCl removal shifts the balance between oxidized and elemental mercury
  - Oxidized mercury is more easily captured
  - Sorbent injection hot side has a greater impact on this balance as mercury is oxidized across the air heater
  - Increased PAC injection or use of BPAC are options when mercury adsorption is affected by DSI
  - Sodium sorbents can react with halogen products that are added in the furnace and reduce their effectiveness to oxidize mercury
- NO$_2$ formation can impact carbon performance
  - NO$_2$ is adsorbed by carbon
  - DSI can convert some NO to NO$_2$ most evident on hot side additions where there is no NO$_x$ control
    - NO$_x$ reduction mitigates the impact of NO$_2$ formation
Summary

- Trona and sodium bicarbonate are cost effective options for HCl control.
- \( \text{SO}_2 \) control is achievable with the same system.
- Particle size is key for optimum results.
- HCl mitigation can impact mercury capture and it is important to consider where the sorbents are added.
- Additional information at [www.solvair.us](http://www.solvair.us)
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