A Fixed-Structure Approach to Mercury Control for Coal Fired Power Plants

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Paul Barilla
W.L. Gore & Associates, Inc.
Mcllvaine Hot Topic Hour
April 18, 2013
### Traditional Strategies for Mercury Control

<table>
<thead>
<tr>
<th>Sorbent Injection</th>
<th>Mercury oxidation chemistry → capture Hg in scrubber liquor</th>
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<tbody>
<tr>
<td>Fly ash contamination – Loss of sales/disposal costs</td>
<td>Additives (i.e., Br) can cause corrosion</td>
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<td>Additional PM burden on collector</td>
<td>Waste water treatment concerns (i.e., Br, Se)</td>
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<td>Sensitivity ($SO_3$, Hg species)</td>
<td>Potential Hg Re-emissions from scrubber</td>
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GORE™ Mercury Control System

Fixed Sorbent Mercury Control

No Injection of Sorbents or Chemicals

Simple Passive Operation

Robust Mercury Control
Material Innovation by Gore

Sorbent Polymer Composite (SPC)
- Novel fluoropolymer material
- Efficiently captures mercury
- High capacity for mercury storage (long lifetime)
- Does not require regeneration
- SO$_3$ does not inhibit Hg capture

Unique physical-chemical nature
- SO$_2$ and H$_2$O are converted into sulfuric acid (catalytic function)
- Liquid sulfuric acid is expelled from the highly hydrophobic structure
- SO$_2$ removal co-benefit
Discrete Modules

\[ h = \text{Efficiency} \]

Over 90% Mercury Removal Possible
Low Pressure Drop

Hg bound to SPC

Low pressure drop
Pressure Drop

Pressure Drop (inwg)

Air Flow (fps)

1/8th - 1/3rd inch H₂O per module
Scalable Mercury Control

Coal Creek Pilot after 220 days
Modules in Operation (Coal Creek Pilot)

Top View of Module Removed for inspection

Leading Edge of Modules in operation after ~200 days
Variable Mercury Emissions – No Adjustments

Hg Concentration
µg/Nm³

- Hg Inlet Concentration
- Hg Outlet Concentration

Time (Hours)

0 5 10 15 20

0 20 40 60 80 100 120

Hg Inlet Concentration
Hg Outlet Concentration
Simple Solution for Scrubber Re-emissions

Hg Emissions (lb/TBtu)

GORE™ Mercury Control System

0 2 4 6 8

URS
Installation without Scrubber

Baghouse or ESP

Evaporative Cooler

Mercury Control Modules
500 MW<sub>e</sub> Operating Cost Comparison

- **SDI Lime**
- **Electricity**
- **GMCS**
- **Bromine license fee**
- **CaBr2**
- **Activated Carbon**
- **Fly Ash Sales / Disposal**

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<tr>
<th>Operating Cost, $</th>
<th>Baseline Operation</th>
<th>ACI</th>
<th>ACI / DSI</th>
<th>ACI / Bromide</th>
<th>Bromide</th>
<th>SCR / Bromide</th>
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**5 lb/Macf**
- 5:1
- 100 ppm

**2 lb/Macf**
- 300 ppm

**1 lb/Macf**
- 25 ppm
GORE™ Mercury Control System

- No Carbon Injection
- No Fly Ash Contamination
- No Additional PM
- No Bromine Injection
- No Corrosion Concerns
- No Wastewater Treatment System Impact

Low Impact
MATS Compliance
GORE™ Mercury Control System

- No Moving Parts
- No Adjustments In Use
- No Regeneration Required

- Low Impact
- Low Maintenance
- MATS Compliance
GORE™ Mercury Control System

- Insensitive to SO$_3$
- Insensitive to Hg Species (Hg$^0$, Hg$^{2+}$)
- Fuel Flexibility
- Re-emissions Barrier

Key Features:
- Low Impact
- Low Maintenance
- MATS Compliance
- Robust
GORE™ Mercury Control System

- Long Module Lifetime
- Low Operating Cost
- Zero Footprint
- SO₂ Removal Co-benefit

**Key Features:**
- Low Impact
- Low Maintenance
- MATS Compliance
- Cost Effective
- Robust
GORE™ Mercury Control System

“Tailpipe” solution

Commitment to Fitness-for-Use

Low Impact

Mercury Removal Guaranteed

MATS Compliance

Cost Effective

Low Maintenance

Robust
Planned Activities Next 12 months

- PILOT TEST #5
- PILOT TEST #6
- PILOT TEST #7
- PILOT TEST #8
- PILOT TEST #9

2013

2014

Full-scale Installation (~200 MW)

High Volume Module Production

Low Volume Module Production

Full-scale Installation (~400 MW)

Commercial Full-scale Installation (~300 MW)

Full-scale Installation (~100MW)
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