Industrial Accessories Company
4800 Lamar Ave
Mission, Kansas 66202

PAC Injection for Mercury Control

www.iac-intl.com
## Hg Removal with Existing Equipment

<table>
<thead>
<tr>
<th>Controls</th>
<th>Bituminous</th>
<th>Subbituminous</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM Only</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS-ESP</td>
<td>46%</td>
<td>16%</td>
</tr>
<tr>
<td>HS-ESP</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>FF</td>
<td>83%</td>
<td>72%</td>
</tr>
<tr>
<td>PM Scrubber</td>
<td>14%</td>
<td>0%</td>
</tr>
<tr>
<td>Dry FGD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDA + ESP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SDA + FF</td>
<td>98%</td>
<td>38%</td>
</tr>
<tr>
<td>Wet FGD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CS-ESP+Wet FGD</td>
<td>81%</td>
<td>35%</td>
</tr>
<tr>
<td>HS-ESP+Wet FGD</td>
<td>55%</td>
<td>33%</td>
</tr>
<tr>
<td>FF+Wet FGD</td>
<td>96%</td>
<td>33%</td>
</tr>
</tbody>
</table>

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## Existing Source MACT Limits

<table>
<thead>
<tr>
<th>Subcategory</th>
<th>Hg (lb/TBtu)(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bituminous-fired</td>
<td>2.0</td>
</tr>
<tr>
<td>Subbituminous-fired</td>
<td>5.8</td>
</tr>
</tbody>
</table>
Mercury Emissions with Average Capture for Bituminous (46%) & Subbituminous (16%) Coals
Options Available for Reducing Mercury Emissions

1. Wet Flue Gas Desulfurization (FGD) Scrubbers.
2. Sorbent Injection.
Control of Mercury in Wet FGD Scrubbers

- Oxidized Mercury is water soluble and can be captured in wet scrubbers.
  - Some captured mercury gets re-emitted.
- Elemental mercury cannot be captured by scrubbers.

*NOTE: Low correlation of existing data; difficult to predict the mercury removal that will be achieved in a WFGD.*
Coal-Fired Power Plant – Sorbent Injection for Mercury Control

Steam Generator

Air Heater

Electrostatic Precipitator / Fabric Filter

Stack

Ash with Captured Hg

Ash Disposal/Reuse
Typical Powdered Activated Carbon Injection System
IAC Hg Control Program

- Full-scale field testing of sorbent-based mercury control on coal-fired boilers.
- Test Available Sorbents and establish Performance Characteristics.
- Design Optimum System for MACT requirements
Technology Status

1. Equipment
   • Similar equipment has been used successfully in the waste industry to inject AC into flue gas.
   • It has successfully been scaled up for full-scale utility applications.

2. Supply of Activated Carbon and Other Sorbents
   • Sufficient supply available.
   • New and improved sorbents are being commercially tested.

3. Performance
   • Will vary with type of equipment (FF vs. ESP).
   • Will vary from site to site due to flue gas characteristics (temperature, acid gases).
Mercury Control – ESP & FF

Sorbent Costs (mills/kWh) vs Mercury Removal (%)

- FF Bitum
- FF PRB
- ESP Bituminous
- ESP PRB

Mercury Control – ESP & FF
Mercury Removal – ESP

Mercury Removal (%) vs. Sorbent Injection Rate (lb/Macf)

ESP Bitum
ESP PRB
Hg Capture vs. Temperature (w/ACI)

- **ESP Bitum 300F**
- **ESP - Bitum 350F**

![Graph showing mercury capture vs. sorbent injection rate](https://www.iac-intl.com)
Representative Mercury Removal with Envergex Sorbents

Mercury Reduction Efficiency (1-Final/Baseline)

Sorbent Injection Rate (lb/MMacf)

Final = ESP Outlet Hg(total) with Sorbent Injection
Baseline = ESP Outlet Hg(total) without Sorbent

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Sorbent Lance Location – Velocity Vectors
Particle Trajectories

Particle Velocity (mps)
Normalized Dust Loading at Dust Collector Outlet Superimposed on Gas Velocity Distribution

- **CFD Design** - Significantly improved sorbent distribution

Decimal percent of average planar particulate mass flow per mass unit of transport medium.

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DISPERSER WITH CONNECTION TO LANCES
Summary
Mercury Removal Options

- **PC Fired Boiler**
- **Air Heater**
- **De-NO\(_x\)**
- **Activated Carbon**
- **ESP**
- **Fabric Filter**
- **Fabric Filter**
- **SO\(_2\) Scrubber**

**Converting Hg to oxidized form**

**Oxidizes Elemental Hg and Adsorbs**

**Absorbs Oxidized Hg**

Salable Ash Desired

Reheat optional

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