McIlvaine Company
January 2014
Hot Topic Hour on
“Material Considerations for Maintaining FGD Infrastructure”

This presentation reviews the environmental considerations of fossil fuel generation and provides an in depth overview of the materials used to increase life expectancy. Corrosion resistant organic and inorganic technologies are covered with field applications and “real world” solutions throughout.
Who We Are

- Founded in 1899
- Dedicated to Engineered Solutions based upon:
  - Inorganic technology
  - Organic technology
- Headquartered in Pittsburgh, PA
- Operations in all 50 states, Canada, Latin America, Asia and Europe
- Licensed manufacturing in key locations worldwide
- Privately owned and operated
Material Considerations for Maintaining FGD Infrastructure
Criteria for System Selection

- Chemical Environment
- Temperature (normal and upset)
- Type of Substrate
- Physical Forces/Stresses
- Maintenance or New Construction
- Cost
Systems

- Acid-Brick Linings
- Membrane/Gunite Linings
- Organic Linings
- Castable Polymer Concretes
Gunite Linings

- Lightweight/thermally insulating for steel stacks & ducts
- Low permeance when used with a membrane – “dual” protection
- Excellent chemical & temperature resistance
- Cost effective
# Refractory Linings

<table>
<thead>
<tr>
<th>Product</th>
<th>Composition</th>
<th>Density</th>
<th>Temp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 54</td>
<td>Potassium Silicate</td>
<td>125 pcf</td>
<td>1250°F</td>
</tr>
<tr>
<td>No. 54LW</td>
<td>Potassium Silicate</td>
<td>98 pcf</td>
<td>1600°F</td>
</tr>
<tr>
<td>No. 35</td>
<td>Calcium Aluminate</td>
<td>131 pcf</td>
<td>2200°F</td>
</tr>
</tbody>
</table>
High Temperature Membrane

Gunit Application of Refractory
Organic Linings for FGD

- Interlocking fiber matrix and/or glass flake provides ....
  - Low permeability
  - Enhanced tensile & flexural strengths
- Excellent chemical & abrasion resistance
- Selection of polymer formulations depending upon service conditions
- Fast, economical, spray application using conventional equipment reduces installation downtime
Fibrecrete Linings

- Bis-phenol A
- Bis-phenol F
- Novolak
- Bis-A & NovolaK Vinyl-Ester
Cross-Section of Interlocking Fiber Network
Analysis by SEM of a Fiber-Reinforced Lining in Cross-Section---in Service

![Graph showing weight percentage of CI and S as a function of depth of penetration (microns).]
Corrosion Resistance

Permeance is the most important factor....

Do not let other properties lead you away from the primary purpose of the selected material.

Ask the relevant questions:

• Does the material supplier have chemical resistance data on the products of interest?
• What is the permeance of the protective coating system at specified application thickness?
## Product Comparisons

<table>
<thead>
<tr>
<th></th>
<th>Permeance (Perms)</th>
<th>Permeability (Perm-inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfilled vinyl ester resin</td>
<td>0.7700</td>
<td>0.0154 @ 20 mils DFT</td>
</tr>
<tr>
<td>Flake Glass vinyl esters with treated flakes</td>
<td>0.0028</td>
<td>0.0002 @ 70 mils DFT</td>
</tr>
<tr>
<td>Standard flake glass vinyl esters</td>
<td>0.0086</td>
<td>0.0006 @ 70 mils DFT</td>
</tr>
<tr>
<td>Mica filled vinyl esters</td>
<td>0.0628</td>
<td>0.0022 @ 35 mils DFT</td>
</tr>
<tr>
<td>Urethane asphalt membrane</td>
<td>0.0800</td>
<td>0.0048 @ 60 mils DFT</td>
</tr>
<tr>
<td>1/8” woven roving reinforced Bis A epoxy</td>
<td>0.0136</td>
<td>0.0017 @ 125 mils DFT</td>
</tr>
<tr>
<td><strong>FibreCrete novolak vinyl ester with topcoat</strong></td>
<td><strong>0.0098</strong></td>
<td><strong>0.0005 @ 31/7 mils DFT</strong></td>
</tr>
<tr>
<td><strong>FibreCrete novolak vinyl ester without topcoat</strong></td>
<td><strong>0.0291</strong></td>
<td><strong>0.00081 @ 31 mils DFT</strong></td>
</tr>
<tr>
<td><strong>FibreCrete novolak epoxy with topcoat</strong></td>
<td><strong>0.0036</strong></td>
<td><strong>0.00018 @ 40/10 mils DFT</strong></td>
</tr>
<tr>
<td><strong>FibreCrete novolak epoxy without topcoat</strong></td>
<td><strong>0.0037</strong></td>
<td><strong>0.00015 @ 40 mils DFT</strong></td>
</tr>
</tbody>
</table>
Airless Spray Equipment

Graco 56:1 Pump

Pistol Grip Flow Gun
Application of Fiber-Reinforced Lining in Flue Gas Scrubber Duct
Thickener Tank
Mist Eliminator
Castable Polymer Concrete

- Various Polymer Chemistries available
- Chemical Resistance
- Temperature Resistance
- Strengths up to 5 times greater than standard concrete
- Utilizes standard concrete practices in terms of forming, placement and reinforcement
- Fast, economical installation - 5 cubic yards/hour using continuous mixer
- Primary used for refurbishing stack floors
Rehabilitation of Chimney Floor with Inorganic Polymer Concrete
Thank you for your time!

Please contact us with any additional questions:

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