Ceramic And Polymer Corrosion Control
Proven Technology
Advanced
CERA-CORR Systems, LLC

In House Engineering Staff

Fully Trained and Competent Crews

$40 Million Plus In Combined Financial Capacity

Largest Tile Lined Vessel Designer/Constructor In North America Outside of Power

TAC
- Quality Driven – Dominant Canadian Market Leader
- In House Design/Build Capability
- 1000+ Concrete & Tile Lined Vessels
- 25 Yrs History

UNIVERSAL BLASTCO
- US’ Largest FGD Linings Contractor
- US Pulp & Paper’s Largest Tile Lined Vessel Constructor/Linings Contractor
- QP-1/QP-2 Certification
- 25 Yrs History

BLOME
- Industries’ Most Comprehensive Corrosion Technology Product Line
- Continuous Technology Innovation
- Unlimited Chloride Resistance
- 35 Yrs History
WFGD Scrubber Material Options

- **FRP**
- **Concrete**
  - Thermoplastic
  - Ceramic Tile
- **Steel**
  - High Nickel Alloy
  - Carbon w/ Liner
    - Ceramic Tile
    - FRP (Flake Glass)
FRP WFGD Scrubber Issues

- **Excellent Corrosion Resistance**
  - Unlimited Chloride Resistance
  - Moderate Abrasion Resistance
    - *Good Maintainability*

- **Structural Limitations**
  - Constructability?
  - Longevity?
  - Upset Condition Risk

- **Limited Supply Base**
  - Cost/Schedule
Concrete WFGD Scrubber Issues

- **Excellent Corrosion Resistance**
  - Unlimited Chloride Resistance
  - Excellent Abrasion Resistance - Tile
    - Good Maintainability
  - Moderate Abrasion Resistance – Thermoplastic
    - Limited Maintainability

- **Superior Longevity / Reliability**
  - Leakage

- **Limited Supply Base**
  - Cost/Schedule/Quality Innovation
Steel (Alloy) WFGD Scrubber Issues

- **Limited Chloride Resistance**
  - 2205 Issues
  - ZLD Consequences...C-276

- **Excellent Abrasion Resistance**
  - Good Maintainability
  - Poor Reliability & Longevity

- **Limited Craft Personnel**
  - Cost / Schedule

- **Retrofitable w/ Lining**
Steel (Carbon) WFGD Scrubber Issues

- **Excellent Corrosion Resistance**
  - Unlimited Chloride Resistance

- **Excellent Abrasion Resistance – Tile**
  - Good Maintainability

- **Good Abrasion Resistance – FRP (Flake Glass)**
  - Good Maintainability

- **Medium Reliability / Longevity**
  - FRP Subject to Damage
  - Tile Dependent on Shell Stability
Proven Technology...Advanced

Concrete Construction – Tile Lined

Carbon Steel – Tile Lined

Carbon Steel - Resin Lined

Carbon Steel - Hybrid Tile / Resin Lined
# Scrubber System Comparisons

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<th>Cost</th>
<th>Service Life</th>
<th>Expected Maintenance</th>
<th>Keys to Success</th>
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| **Carbon Steel / Resin Lined** | Shell: $100/ sf  
Lining: $40/ sf  
$140/ sf | 15-18 Years | Every 8 Years | Surface Prep & cure (temp/RH mgmt)  
deflection |
| **Carbon Steel / Tile Lined** | Shell: $100/ sf  
Lining: $100/ sf  
$200/ sf | 18-20 Years | Every 15+ Years | Strict tolerances on out of roundness &  
stiffness/deflection |
| **Concrete / Tile Lined** | Complete: $350-400/ sf | 25-30++Years | Every 20-25+Years | Concrete design, sound engineering,  
construction QC / QA controls |
WFGD Scrubber Pinch Points

- **FRP**
  - Time Will Tell – Stress / Fatigue
  - Structurally Limited by Material Properties

- **Concrete**
  - Stop the Leaks
  - Compress the Schedule

- **Steel**
  - Alloy
    - Cost/Performance – Long Term Negative
  - Carbon
    - Need Effective Lining Installation Controls
WFGD Scrubber Corrosion Control

- **Success = Monolithic**

- Failures occur at edges, interfaces and seams
Concrete w/ Integral Tile Scrubber Advancement

- Monolithic Vessel

- FEA Supported Engineering
  - Harmonized Confirmation of Empirical Thermal Data
  - Seismic, Soil & Wind Condition Accommodations

- Quality - Precise Execution of Design
  - Precision reinforcement placement

- Innovative Construction Execution Schedule
  - 4 ft/day vertical run (vs 1ft/day)
Carbon Steel- Hybrid Tile/Resin Lined

- Monolithic Lining
- Optimized Cost / Schedule
- New Paradigm in Installation Process Control & QC
- “Monolithic” Warranty
  - 10 Year Turnkey
Ceramic And Polymer Corrosion Control

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