FGD Services

Offered By

Reagent Technology Services
A division of Mississippi Lime Company

McIlvaine Hot Topic Hour
January 26, 2012

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Presentation Topics

- Mississippi Lime / Reagent Technology Services
- Pulverized limestone economics
- Example
- Pulverized limestone benefits
Mississippi Lime Corporate Overview

- Private company founded in 1907
- Largest lime production facility in North America located in Ste. Genevieve, Missouri
- Integrated producer
  - Ground & precipitated calcium carbonate (CaCO₃)
  - Calcium oxide (CaO)
  - Calcium hydroxide (Ca(OH)₂)
- Headquarters in St. Louis, Missouri
- Production facilities
  - CaO – Missouri, Kentucky
  - Ca(OH)₂ – Missouri, West
  - Virginia, Mississippi, South Carolina
- RTS Division
Mississippi Lime Geographic Overview

- MLC HQ
- MLC Lime mfg
- RTS Mobile
- MLC Hydrate mfg
- Terminals, pkg.
Pulverized Limestone Preparation
Using a Dry Mill
Capital Cost Benefit

- Sargent and Lundy 2006 Flue Gas Desulfurization Technology Report
  - Reagent preparation system includes:
    - Single belt conveyor from below grade hopper
    - 2 day silos with 2 ball mills
    - Associated slurry handling equipment
  - Reagent preparation system was approximately 10% of the total process cost of a wet limestone scrubber system
- $500M FGD project would have $50M in capital associated with the reagent preparation system
- This capital would be eliminated by purchasing pulverized limestone
## Operating Cost Benefit

<table>
<thead>
<tr>
<th>Operating Cost</th>
<th>Value</th>
<th>Units</th>
<th>$/ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Energy Grinding</td>
<td>23.8</td>
<td>kwh/ton</td>
<td>$0.83</td>
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<tr>
<td>Electric Energy Ancillary Equipment</td>
<td>4.1</td>
<td>kwh/ton</td>
<td>$0.14</td>
</tr>
<tr>
<td>Grinding Media</td>
<td>22</td>
<td>grams/kwh</td>
<td>$0.68</td>
</tr>
<tr>
<td>Labor</td>
<td>6</td>
<td>FTE</td>
<td>$3.00</td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
<td></td>
<td>$0.60</td>
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<tr>
<td><strong>Total Cost Savings</strong></td>
<td></td>
<td></td>
<td><strong>$5.25</strong></td>
</tr>
</tbody>
</table>

Assumes $0.035/kwh electricity cost
Economic Decision

- For a 100,000 ton/year pulverized limestone requirement, the price could be $15-20/ton higher than crushed limestone

- Key question for a utility:
  - Is it worth paying an extra $1.5-2.0 M/year to save $50M capital costs and ~ $525k operating costs?
### Plants Selecting Dry Pulverized Limestone

<table>
<thead>
<tr>
<th>Utility</th>
<th>Plant</th>
<th>Size (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIPSCO</td>
<td>Bailly</td>
<td>615</td>
</tr>
<tr>
<td>NIPSCO</td>
<td>Schahfer</td>
<td>1,688</td>
</tr>
<tr>
<td>TVA</td>
<td>Bull Run</td>
<td>950</td>
</tr>
<tr>
<td>TVA</td>
<td>Kingston</td>
<td>1,600</td>
</tr>
<tr>
<td>Southern Company</td>
<td>Gorgas</td>
<td>1,221</td>
</tr>
<tr>
<td>Southern Company</td>
<td>Gaston</td>
<td>900</td>
</tr>
<tr>
<td>Southern Company</td>
<td>Hammond</td>
<td>800</td>
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<tr>
<td>Southern Company</td>
<td>Crist</td>
<td>970</td>
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<tr>
<td>Southern Company</td>
<td>Barry</td>
<td>750</td>
</tr>
<tr>
<td>Southern Company</td>
<td>Daniel</td>
<td>1,100</td>
</tr>
<tr>
<td>Southern Company</td>
<td>Miller</td>
<td>2,800</td>
</tr>
<tr>
<td>Ameren</td>
<td>Sioux</td>
<td>1,000</td>
</tr>
<tr>
<td>Ameren</td>
<td>Newton</td>
<td>1,200</td>
</tr>
<tr>
<td>Minnesota Power</td>
<td>Boswell</td>
<td>370</td>
</tr>
<tr>
<td><strong>Total MW</strong></td>
<td></td>
<td><strong>15,964</strong></td>
</tr>
</tbody>
</table>

- Expectation that other plants will be announced in the next 6 – 12 months
- Primary reason is that the capital reduction more than offsets the additional cost of receiving pulverized limestone
- Supply is/will be in either trucks or railcars, although barge is a viable option as well
- Some utilities plan to inject dry pulverized limestone directly into absorber vessel
A Real Life Example - Mobile
Mobile, Alabama Limestone Grinding Facility

- Strategically located to minimize delivered cost of pulverized limestone to three FGD systems
- Limestone sourced from 3rd party
- Pulverized limestone delivered by truck
- More than 100% redundancy at milling operation
- Installed capacity is greater than 500,000 tons per year
- Plant started up in 3Q 2009
Benefits of Pulverized Limestone Supply Alternative

- Major reduction in capital expenditures
- Reduction in O&M costs
- Reduction in parasitic power consumption – small but real equivalent baseload capacity addition
- Equal or better reliability
- Simplified on-site footprint and design
- Several viable location alternatives
- Improved reagent quality control and flexibility
- Opportunity to eliminate need for utility’s inventory
- Capacity is custom designed to meet plant’s limestone requirements

- Bottom Line: Limestone supplied at lower net cost
Reliability

- Limestone mine maintains crushed stone storage
- Milling plant maintains crushed stone storage
- Redundant milling capacity
- Redundant milled product storage capacity at milling plant and Utility
- Key spare parts inventory
- Inherent reliability of equipment and design

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