Dry Scrubbing

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Dry Scrubber Options

Absorber
(Calcium Based)
- Spray Dryer
- Circulating
- Entrained Flow
- Fabric Filter Almost Always Part Of The System

Calcium Based
Lime
- Standard Surface Area Hydrate
- High Surface Area Hydrate

Sodium Based
- Trona
- SBC
  - Usually Used Without Milling
  - Usually Milled Before Injecting

In-Duct
(Calcium or Sodium Based)

Circulating Entrained Flow

Almost Always Part Of The System

Use Existing ESP or Fabric Filter

P. Farber & Associates, LLC
Spray Dryer/Fabric Filter Systems Have Been Operating On Coal Fired Power Plants Since The 1980’s

- Approximately 50 Spray Dryer/Fabric Filter systems in operation on coal-fired Utilities in the US
- Largest single module ~300 - 400 MW
- Reagent - Lime slurry
- Slurry atomized in spray dryer
- Fabric filter separates particulates
- Byproduct of reaction - Natural oxidation - predominantly calcium sulfite

Photo Courtesy of Babcock & Wilcox
Circulating Dry Scrubbers Are Now Being Installed On Coal-Fired Power Plants Around The World

- Approximately 10 CDS/Fabric Filter systems in operation on coal-fired Units in the US
- Largest single module ~400 MW
- Reagent - Hydrated lime powder
- Hydrated lime and water injected separately into CDS
- Fabric filter separates particulates
- Byproduct of reaction - Natural oxidation - predominantly calcium sulfite
## Which Dry Scrubber Technology Do I Choose?

<table>
<thead>
<tr>
<th>Technology</th>
<th>Capital Cost</th>
<th>Operating Cost (At Same Removal Level)</th>
<th>SO2 Removal Capability</th>
<th>Load Flexibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spray Dryer</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Circulating Dry Scrubber</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Dry Sorbent Injection</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

1 = Lowest  2 = Medium  3 = Highest
Selection of Dry Scrubber Technologies

- The installed base of spray dryer/fabric filter systems is larger than the present base of circulating dry scrubber/fabric filter systems.
- Many Dry Injection systems are being installed.
- CDS/FF systems have an advantage in SO$_2$ removal capability and fuel flexibility.
- SDA/FF systems have an advantage in load flexibility, lime consumption, and an experience “base” [But experience base of CDS systems is growing].
- Dry injection systems have advantages in simplicity, low capital cost, and the ability to use either calcium or sodium reagents.
- Both SDA and CDS systems have approximately the same water and power consumptions. Dry injection systems have no water and lower power consumption.
- Overall selection between these 3 technologies will require an analysis guided by Utility priorities.