Portable Dewatering Option for CCP’s

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FGD BACKGROUND

Since the early 1990’s, the installation of FGD systems at coal-fired power plants in North America has changed the landscape of the supply of gypsum to end-users in gypsum wallboard, Portland cement and agriculture.

In order to provide potential customers with a suitable gypsum product, the producers of the FGD gypsum slurry have historically designed and installed gypsum dewatering systems to transform the gypsum slurry to a dewatered gypsum cake tailored to the market requirements.

SCRUBBER OVERVIEW

The primary technology installed in North American is limestone forced oxidation (LSFO) scrubber. In these systems, slurry of ground limestone is delivered to the scrubber. The limestone is dissolved and the chemistry of the scrubber maintained to enable the sulfur to be captured and gypsum precipitated from the saturated solution.

DEWATERING TECHNOLOGY

Several methods are used to separate the gypsum particles from the scrubber bleed stream. These include slurry dewatering using mechanical systems as well as ponding of the gypsum.

Mechanical Dewatering

The primary gypsum dewatering system(s) used involves concentrating the scrubber slurry using either hydrocyclones or clarifiers. The concentrated slurry is then delivered to the secondary dewatering equipment, which is a vacuum
filtration process. Horizontal vacuum belt filter system (HVBF) and rotary drum filter systems are those most generally used.

The HVBF system is used in most locations where wallboard quality gypsum is to be produced. The advantages of the HVBF include: high production throughput via continued operation capability of 24/7, minimal operational supervision and low maintenance cost.

Ponding of Gypsum

Settling ponds are also used to remove gypsum from the absorber bleed stream. While the gypsum can be removed using mobile equipment such as long reach excavators, the quality is often not suitable for wallboard without additional handling.

MARKETS FOR GYPSUM

Gypsum Wallboard

Gypsum wallboard is the primary market for FGD gypsum in North America. A typical wallboard specification for FGD gypsum is included in the table below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>&lt; 12.0%</td>
</tr>
<tr>
<td>Purity</td>
<td>&gt; 93.0%</td>
</tr>
<tr>
<td>Chlorides</td>
<td>&lt; 100 ppm</td>
</tr>
<tr>
<td>pH</td>
<td>5-8</td>
</tr>
<tr>
<td>Total Soluble Salts</td>
<td>&lt; 600 ppm</td>
</tr>
<tr>
<td>Total Dissolved Salts</td>
<td>&lt; 600 ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>No ammonia odor</td>
</tr>
<tr>
<td>Foreign Material</td>
<td>None</td>
</tr>
<tr>
<td>Particle Size Distribution</td>
<td>d50 &lt; 75 µm</td>
</tr>
<tr>
<td>Sulfite</td>
<td>&lt; 0.5 %</td>
</tr>
<tr>
<td>Insoluble Residue</td>
<td>&lt; 0.4 %</td>
</tr>
<tr>
<td>Quartz (wt. %)</td>
<td>&lt; 1.5 %</td>
</tr>
<tr>
<td>Total aluminum expressed at Fe2O3</td>
<td>&lt; 0.35 %</td>
</tr>
<tr>
<td>Total iron expressed as Fe2CO3</td>
<td>&lt; 0.35 %</td>
</tr>
<tr>
<td>CaCO3 &amp; MgCO3</td>
<td>&lt; 4.0 %</td>
</tr>
<tr>
<td>Total organic Carbon</td>
<td>&lt; 0.10%</td>
</tr>
<tr>
<td>Bulk Density</td>
<td>&gt; 60 lb./cu. Ft.</td>
</tr>
</tbody>
</table>
Portland Cement

FGD gypsum is used as a set regulator in Portland cement. The wallboard specification is typically used for the cement industry with the exception of chlorides, which can be significantly higher.

Agriculture

FGD gypsum is used as a soil conditioner for both the calcium and sulfur content of the gypsum. This market is typically very local to the utility production site, as transportation cost can quickly outweigh the benefit of the gypsum. In most cases there are two applications a year and the agricultural user will pick the gypsum up from the utility in truckload quantities.

VACUUM SYSTEM

Full Scale System

Historically, a utility has installed a full scale dewatering system when they are in the process of building a scrubber or have decided they wish to close a gypsum pond disposal site.

Typically systems are designed for worst-case coal burn and 100% availability and 50% redundancy. Also, the equipment capacity is based on the equipment supplier’s conservative production figures. The end result of this is that the system installed typically is larger, and therefore more costly to construct than required.

Fixed gypsum dewatering systems are installed for a cost of between $30 million - $120 million depending on utility requirements.

The design, purchase and construction cycle for a full-scale gypsum dewatering system ranges from 24 – 48 months.

Portable System

Superior Belt Filter, LLC (SBF) has designed and is commissioning a portable vacuum belt filter system complete with accessories that provides a mechanical dewatering alternative to a full scale system for FGD gypsum slurries.
THE ADVANTAGES OF THE PORTABLE SYSTEM INCLUDES THE FOLLOWING:

Cost

A portable unit can be brought onsite and commissioned for a fraction of the cost of a full scale unit.

Timing

A portable unit can be commissioned within one week if able to receive slurry bleed direct from the absorber or from reslurrying operations from a pond.

APPLICATIONS OF PORTABLE DEWATERING

Among the applications for portable dewatering we have identified the following:

Pond Closure

As the regulations related to gypsum ponding become more stringent, many utilities are moving to close ponds, or perhaps dewater a slipstream of gypsum slurry that was intended to the pond.
System Redundancy

In the event that the existing gypsum dewatering system does not have current capacity or that capacity is marginal, the portable dewatering system can provide redundancy. This can also be employed during extended maintenance outages of dewatering systems.

CONCLUSION

The portable system designed and constructed by Superior Belt Filter, LLC provides a cost effective, highly efficient alternative to historic models used by utilities. This system offers users the flexibility to meet the challenges of today’s environment and provide options for multiple alternatives for beneficial reuse and disposal.