Beaumont Environmental Systems

Flash Drying Operation

The operation of the RAP flash drying process is accomplished by adding lime slurry outside of the reactor. It is added as a slurry, which introduces $Ca(OH)_{2"}$ as small particles that immediately are mixed and combined as a thin coating on recycle material which is then introduced into the reactor by gravity. The resulting material is 85 to 95% solids, dry and flows well.

The recycle material returned from the baghouse is quite fine with a mean size of 46 microns and 42% below 50 microns and 96% below 200 microns. This gives us 30 to 60 % more surface area than previous reactor type semi-dry scrubbers (recycling off a cyclone) and orders of magnitude increase in surface area than old style semi-dry type scrubbers. The reason is that complete drying occurs, creating less agglomeration and some de-agglomeration, all of the recycle material is returned from the baghouse increasing the percentage of fines and finally the mechanical recycling breaks down the material as it moves through the mechanical conveying operations.

Flash drying is unique as the reaction and drying occur so quickly that we do not have to continue to add cooling water to reach temperatures in the 140 to 150 F range as is required in conventional semi-dry scrubbers. We only have to evaporate the water in the slurry. Depending on the incoming temperature and amount of sulfur needed to be removed we will exit at 170 to 250 F. This eliminates potential corrosion and possible stack modifications. We have achieved SO_2 removal rates in the high nineties at exit temperatures from 170 to over 400 degrees Fahrenheit on a one percent sulfur coal.

Control is quite straightforward; we control the addition of slurry at the mixer from stack SO_2 instrumentation. We can also add water at the mixer by specifying the RAP outlet temperature. Additional cooling will enhance removal efficiency, but only marginally. Another approach is to control the slurry concentration as the only source of water added at the mixer. The final control is the recycle rate, which is controlled by VFD drives, on the mixer and the rotary valve that supplies the dry recycle material. This is maintained by increasing recycle rate as the liquid rate is increased to the mixer.

Disposal is also quite straightforward. By returning all of the collected material from the baghouse to the recycle silo, located above the mixer, we then simply overflow the silo, transferring the overflow to the final disposal silo. The overflow screw operates continuously eliminating the need for any controls or level indicators.

The reactor can support 70% turndown for flow and has been demonstrated on 1 to 3% sulfur coals although it can be designed for lower or higher sulfur coals.
