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Flue Gas Desulfurization (FGD) Wastewater Treatment

WESTECH

DWN: RCS DATE:



The **SuperSand™ Filter** employs a backwash rinse that is performed continually while the tank is processing water. An air lift pump located at the center of the module draws the media from the bottom of the filter up into the wash box. As the media is released into the wash box, it falls into the sand scrubber where the filtered solids are separated from the sand. From there, the filtrate carries the solids out as waste. The washed sand falls down into the media bed for continued use.

Flue Gas Desulfurization (FGD), Wet Scrubber, Wastewater Treatment

Flue gas desulfurization removes sulfur dioxide from fossil fuel flue gases. Wet-scrubbing transfers the pollutants to a liquid which is treated before waterway discharge. The scrubbing solution is usually lime and a concentrated solution of calcium sulfate is produced. Blowdown is required to keep the solution below saturation so that scaling does not occur.

5 Steps of FGD Wastewater Treatment

1. pH Elevation / Metal & Gypsum Desaturation

Desaturating the stream of metals and gypsum is important to prevent scaling on equipment and is performed by dilution and lowering the temperature (remember that calcium salts are inversely soluble). The pH of the wastewater stream is then raised to between 8-10 using calcium hydroxide ($\text{Ca}(\text{OH})_2$) or sodium hydroxide (NaOH). Dissolved metals form hydroxides which precipitate as solids.

The lime or caustic is added to precipitate gypsum from the stream. Sludge is recycled from the downstream clarifier to provide seed for gypsum crystallization.

2. Heavy Metal Removal

Some heavy metals are removed as hydroxides as pH is raised. Small waste stream pH adjustment is normally accomplished through caustic addition rather than lime slurry. The use of caustic saves capital costs and reduces sludge production.

Organosulfides or sodium sulfides may be added to further precipitate heavy metals. Metal sulfides have much lower solubility than metal hydroxides. These compounds are also very effective in removing mercury down to parts per trillion levels.

3. Coagulation / Polymer / pH Adjustment

Ferric chloride is added to neutralize charged

particles, allowing flocs to form and enhancing clarifier performance. This may also precipitate other metals and organic matter. Polymer addition aids in larger floc formation, further enhancing clarifier performance. The wastewater is clarified by a WesTech Flocculating Clarifier. A rake lift is provided since inlet solids can be as high as 2%. The pH is adjusted to normal using hydrochloric acid (HCl). HCl is used because no additional sulfate needs to be added.

4. Solids CONTACT CLARIFIER™

The metal precipitates must now be removed from the waste stream. Since there is a relatively low amount of solids, it is necessary to use a Solids CONTACT CLARIFIER™ for this purpose. The Solids CONTACT CLARIFIER™ has an impeller-driven sludge recycle stream. This draws sludge from the tank bottom through a draft tube into the reaction well. This impeller acts as a high flow, low shear pump. The recycle stream is sized to 10 times the inlet flow and has suspended solids of 10,000 ppm. Incoming particles contact previously flocculated solids, yielding high removal rates. Blowdown sludge from the Solids CONTACT CLARIFIER™ is recycled to a mix tank in the feed stream. This promotes additional floc formation and solids removal.

Gravity media filtration may be used if a low suspended solids level is required prior to wastewater discharge. In this case, filter backwash is returned to the front of the wastewater treatment system.

5. Solids Dewatering

The clarifier sludge typically contains 3-5 weight percent of solids. This contains inert material and precipitated metals which are pumped to a thickener to increase the solids percentage. Volume dewatering requirements determine the choice of recessed chamber filter presses or belt presses.