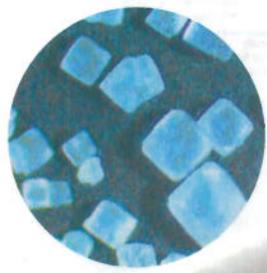


Innovative Process Solutions

HPD is a global leader in innovative process solutions which use evaporation and crystallization as core technologies.

More than 650 systems in over 30 countries have been designed or installed by HPD.

HPD has decades of experience in the power generation industry, providing wastewater treatment, volume reduction, and zero liquid discharge systems to fossil fuel and nuclear powered plants.



Thermal Treatment of Coal-Fired Power Plant Wastewater

Flexible Process Solutions for FGD Purge

Flue gas desulfurization (FGD) scrubber effluent from coal-fired power generation requires varying degrees of treatment dependent on the type of coal, water sources, and environmental regulations.

FGD purge / blowdown contains toxic constituents such as heavy metals as well as chloride and sulfate salts of calcium, magnesium, and sodium. Conventional treatment involves physical and chemical processes that remove the undesirable components to meet effluent discharge limits.

Physical, chemical, and even biological treatment methods may not be able to reduce pollutant concentrations to the part per trillion levels required for discharge of some chemical species as discharge limits become more stringent. These processes also do not address reduction of the volume of liquid effluent nor its salinity. They also do not recover water for re-use within the plant while generating large amounts of sludge which require off-site disposal.

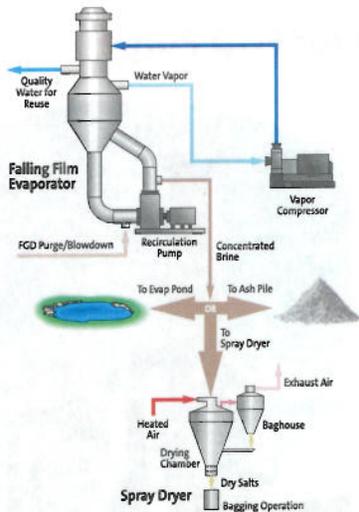
HPD provides various treatment options that offer volume reduction, recycling of valuable water, and reuse within the facility as often times water resources are extremely limited. Evaporation provides an effective alternative to standard treatment processes that allows for reclamation of process water in addition to minimizing the overall wastewater volume up to zero liquid discharge (ZLD).



Evaporation is an effective method for FGD purge /blowdown treatment

Flue Gas Desulfurization (FGD) Solutions from HPD

Two Approaches for Evaporation as Treatment Methods for FGD Purge



Evaporation without Chemical Treatment

Falling film evaporators can concentrate FGD purge / blowdown by a factor of 5-10 times, thereby recovering 80-90% of the water from the effluent stream.

The chemical compositions of the purge stream will determine the specific volume of concentrated brine that remains after recovery of quality water for re-use.

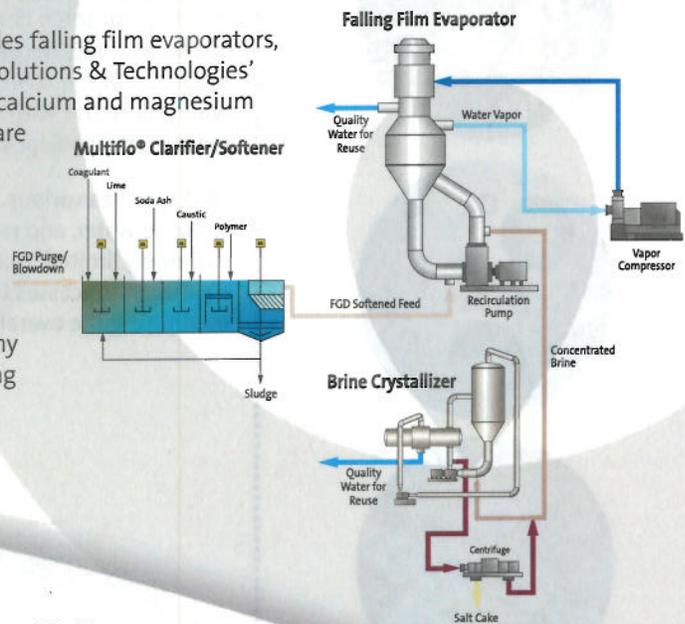
The concentrated brine blowdown from the evaporator can be discarded to an on-site evaporation pond or added to fly ash. A natural gas or oil-fired spray dryer with a bagging system can be utilized in the case when Zero Liquid Discharge (ZLD) is required and pond or fly ash disposal is not adequate.

Evaporation & Crystallization with Softening

The cost of a spray dryer and the price of natural gas or fuel oil can be prohibitive to achieve a dry, solid product. A second option is available that applies a pre-treatment step to recover additional, quality process water and uses electric power instead of natural gas to drive process equipment.

This process for treating FGD purge / blowdown also includes falling film evaporators, but incorporates a softening system such as Veolia Water Solutions & Technologies' MULTIFLO™ as a pre-treatment step. The softener converts calcium and magnesium salts in the FGD purge / blowdown to sodium salts, which are then concentrated in the falling film evaporator.

The brine blowdown from the evaporator can be further concentrated in a forced circulation crystallizer, recovering additional, quality water and producing a slurry of salt crystals. The salt crystals can then be separated in a centrifuge for proper disposal. This process is similar in many respects to systems used for Zero Liquid Discharge of cooling tower blowdown.



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