



OsmoBCTM System

OsmoBCTM Forward Osmosis Process For Flue Gas Desulfurization Wastewater

INTEGRATED FILTRATION SYSTEMS FOR INDUSTRIAL APPLICATIONS

COST EFFECTIVE TECHNOLOGY ACHIEVES
ELG COMPLIANCE

Application Background

Much of the world continues to produce energy using coal-fired power plants. The treatment of priority pollutants such as sulfur dioxides, nitrates, nitrites, particulates and toxic metals are becoming more common. With the short timeline to meet US EPA Effluent Limitation Guidelines (ELG) starting in November 2018, power plants are challenged to install and optimize multiple treatment steps to meet surface water discharge requirements for Flue Gas Desulfurization (FGD) wastewater.

Coal burning power plants produce solid waste, including bottom and fly ash and SO_x that must be removed prior to discharge into the environment. The use of wet scrubbers typically removes up to 90% of the SO_x. Due to variability of FGD wastewater composition, many steps are needed to remove toxic contaminants prior to reuse or discharge.

To meet ELG, the wastewater must be treated to reduce key contaminants, including TDS, BOD/COD, nitrites and nitrates, and selected heavy metals such as Mercury, Selenium, Arsenic and others.

Treatment and discharge of wastewater effectively,

efficiently and in an economical manner is a challenge that Fluid Technology Solutions, (FTS) Inc. has taken to the next level.

Conventional Treatment Technologies

Multiple treatment steps have been implemented to remove pollutants from wastewater blowdown from the FGD scrubber system. These include:

- Calcium Sulfate Desaturation
- Primary Clarification
- Equalization
- Trace Metals Precipitation / Suspended Solids removal
- Secondary Clarification
- Filtration
- Solids Concentration or Dewatering

Waste Streams and Control Technology Limits

Applicable performance standards and effluent limitations for direct discharges and indirect discharges have been set.

The final ELG Rule for FGD wastewater incorporates an effective chemical precipitation and biological treatment system to meet BAT limits for existing sources. For new sources, the technology basis is evaporation to meet BADCT limits.

The new control technology limits are:

Existing Sources	Daily Maximum	30 Day Average
TSS	100 ppm	30 ppm
As	11 ppb	8 ppb
Hg	788 ppt	356 ppt
Se	23 ppb	12 ppb
NO3 / NO2 as N	17 ppm	4.4 ppm

New Sources	Daily Maximum	30 Day Average
TSS	100 ppm	30 ppm
Arsenic	4 ppb	N/A
Mercury	39 ppt	24 ppt
Selenium	5 ppb	N/A
NO3 / NO2 as N	50 ppm	24 ppm

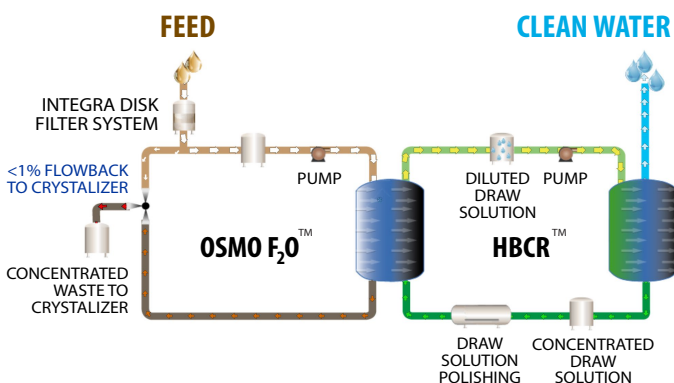
Forward Osmosis Technology Meets Control Limits

Forward Osmosis (FO) is a cost-effective technology that will produce permeate meeting BAT and BADCT limits for existing and new sources.

The OsmoBC™ Treatment Process

Membrane technology, such as forward osmosis is the most effective strategy for treating water for reuse or discharge. Fluid Technology Solutions (FTS) recommends the OsmoBC™ treatment process for FGD wastewater containing high concentration of non-biodegradable BOD, COD, TDS and TSS. The advanced forward osmosis membrane process is proven to generate clean water without excessive pretreatment and without significantly degrading flux rates for long periods of operation.

The following diagram depicts how a Forward Osmosis (FO) system is combined with a High Brine Concentration and Recovery (HBCR™) system.



The FO system concentrates the feed and a draw solution extracts the clean water. The draw solution is continuously re-concentrated and recycled to the system.

For existing sources, the OsmoBC™ treatment process produces clean water for

- High quality external and internal reuse
- Environmental discharge

For new sources, the concentrate can be sent to evaporation and crystallization to achieve ZLD. FTS offers our OsmoZLD™ process to reclaim high quality water and generate solids for further use or disposal. We offer our low temperature evaporative crystallization technology capable of employing process waste heat as a thermal source while providing high efficiency process cooling. The final products are water vapor (released to the atmosphere) and solids.

Forward Osmosis for FGD Wastewater enables ELG Compliance

Bench Scale testing of FTS's FO membranes have been shown to recover 85 to 90% clean water, while meeting discharge limits for existing and new sources.

The system filters 95% of the waste water to TDS levels below 10 ppm. With multiple passes through our HBCR concentrator system, we are consistently able to achieve ELG limits for As, Se, Hg and N for discharge and reuse. In the FTS testing, we achieved near or below detectable limits.

Product Recommendations

For optimizing water reuse and purification in Pulp & Paper Plant waters, we recommend our:

- OsmoF₂O™ FO-CTA-8040-85 Industrial Elements
- HBCR™ HBR-TFC-8040 Brine Concentration Elements

Legend

BAT – Best available technology, economically achievable

BADCT – Best available demonstrated control technology