

Power Generation

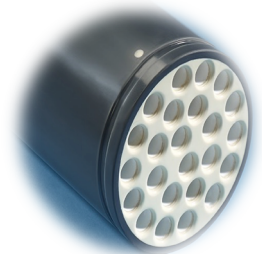
Industry Challenges

The global demand for energy continues to accelerate. Power generation is one of the largest water-consuming industries worldwide. Billions of gallons of water are used each day to produce electric power across all plant production units, including cooling water to condensers, feed water to boilers and scrubbing medium to remove flue gas pollutants. Since water is the lifeblood of a thermal power plant, obtaining clean makeup water and dealing with large flow of wastewater is becoming increasingly complex for any power generation facilities. As rules and regulations change in the power generation sector, new technology is often necessary to meet more restrictive guidelines. The escalating industry standard for energy savings, reliable treatment methods, and solutions to water availability challenges lead to demanding technological innovations.

Duraflow (DF) developed cost-efficient and regulation-compliant membrane technology to help power plants to achieve specific water purity, wastewater recycling and effluent discharge objectives. The DF tubular membrane can be applied for softening, metal-, solid- and organic-removal of cooling tower blow-down, flue gas desulfurization (FGD) blow-down, RO brine, ash pond water, demineralization regeneration waste and equipment upkeep wash-down water.

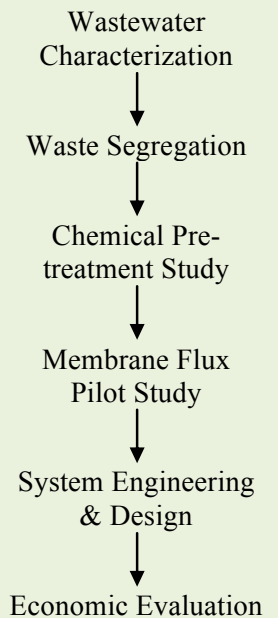
Duraflow Solution

- **Cooling Tower Blowdown** – Calcium, magnesium, silica and COD are the major problematic chemical build-ups in the cooling tower recirculation loop that can be removed by combining a custom formulated softening chemistry with DF membrane filtration. The filtrate produced, with low NTU and SDI, will feed to a high-purity water treatment system for reuse and recycle.
- **Flue Gas Desulfurization Blowdown** – Gypsum de-saturation, lime softening and sulphide chemistry are employed for precipitation of hardness (Ca, Mg), heavy metals (Cd, Hg) and selected non-metals (F, B). The pre-treatment process generated high concentration of TSS, which is separated by DF membrane filtration prior to final discharge or desalination for recycling.
- **RO Brine Wastewater** – The RO reject stream produced from the ultra-pure water treatment system and other high TDS side streams can be treated and reused via chemical softening designed to precipitate hardness followed by DF microfiltration and RO.



**Duraflow 24-Tube
Microfilters**

DF Design Approach for Power Plant Wastewater



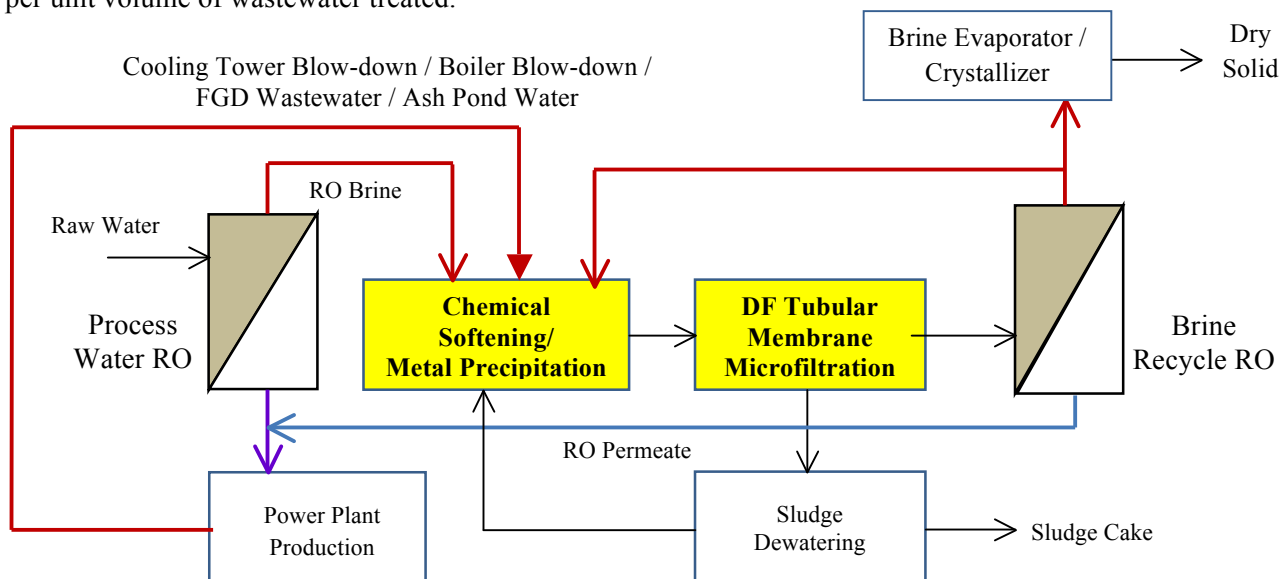
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DF Microfiltration



After chemical softening/reaction, the wastewater is processed through the Duraflow microfiltration membrane filters designed for separation of the precipitated suspended solids from water. The waste solution is pumped at a high velocity through the membrane filters connected in series (train). The turbulent flow, parallel to the membrane surface, produces a high-shear scrubbing action which minimizes deposition of solids on the membrane surface. During operation, clear filtrate permeates through the membrane, while the suspended solids retained in the re-circulation loop are periodically purged for further de-watering. The filtrate is directed to the POTW for discharge or to the desalination system for recycle or reuse.

Duraflow microfiltration membranes are manufactured in a tubular configuration capable of handling high solid concentration. The membranes, made of PVDF, are cast on the surface of porous polymeric tubes to produce a nominal pore size of 0.1 micron. The extraordinary chemical resistant property of PVDF allows the use of a wide range of chemicals - acids, bases and solvents for cleaning of the persistent fouling substances. An automatic back-pulse mechanism is an integral part of the operation design to provide periodic physical surface cleaning. The DF system is designed to run at optimum operating condition to achieve high energy-efficient performance. A total of up to 24 filters can be connected in a train to reduce floor space requirement and lower the electrical consumption cost per unit volume of wastewater treated.



Power Plant Water Purification & Wastewater Recycle Process Flow Diagram