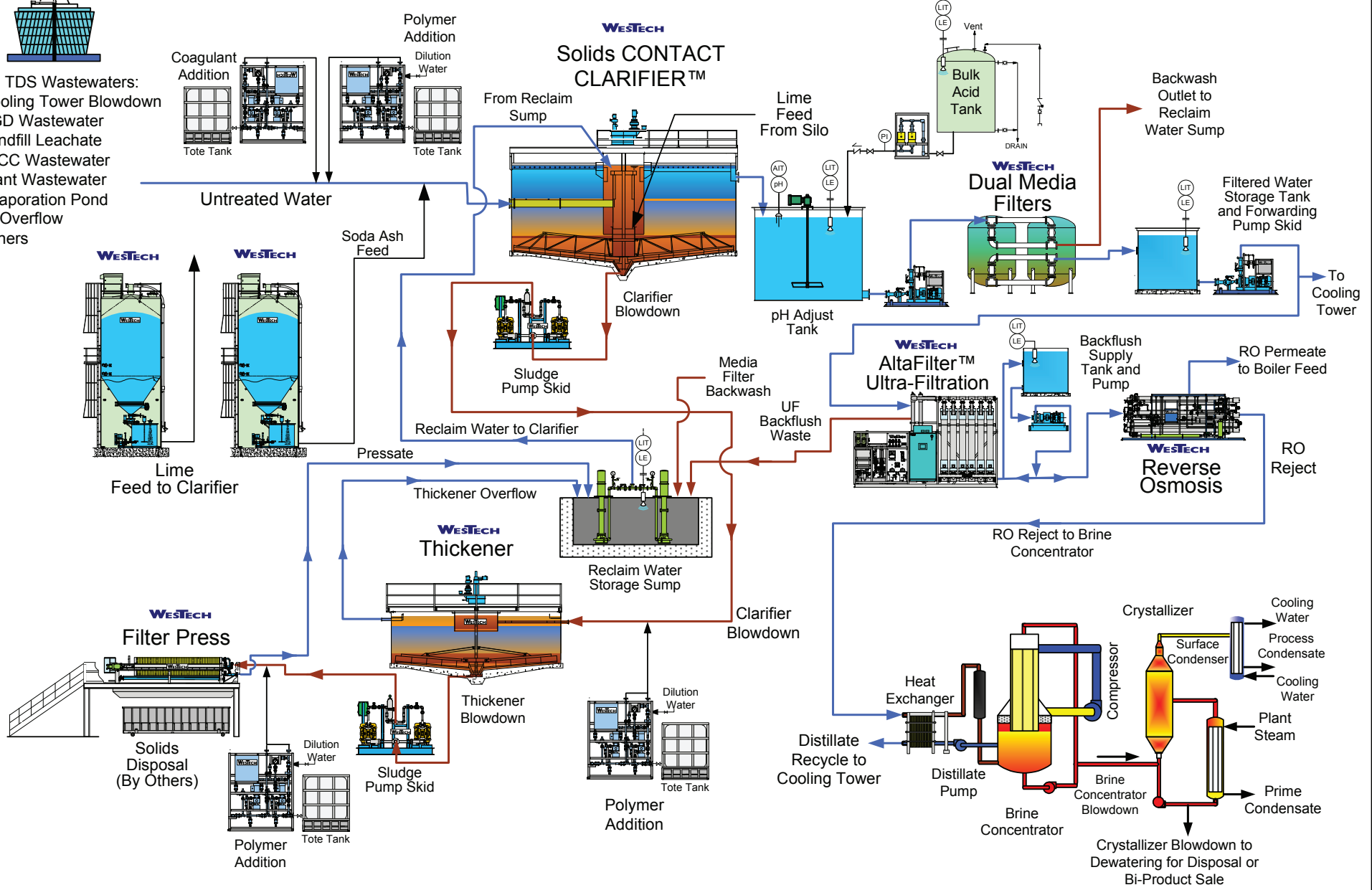


- High TDS Wastewaters:
- Cooling Tower Blowdown
  - FGD Wastewater
  - Landfill Leachate
  - IGCC Wastewater
  - Plant Wastewater
  - Evaporation Pond Overflow
  - Others

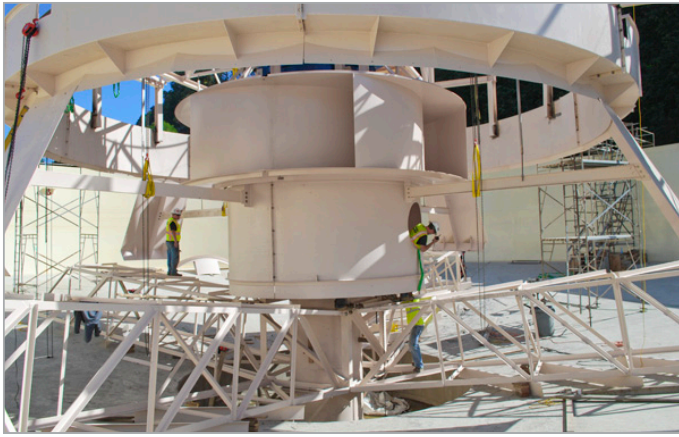


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# Zero Liquid Discharge

**WESTECH**

DWN: RCS DATE:



The WesTech **Solids CONTACT CLARIFIER™** combines mixing, internal solids recirculation, gentle flocculation and gravity sedimentation in a single unit. The low shear impeller provides high volume recirculation and low floc shear, while expending less horsepower when compared to a conventional unit. Superior clarification provided by the Solids CONTACT CLARIFIER™ extends the life of the ultrafiltration membranes and reduces the amount of cleaning cycles, giving WesTech the most value from their membrane ultrafiltration system.

## Zero Liquid Discharge: Crystallizer Pretreatment

Discharge requirements for industrial wastewater are becoming stricter. Many companies are moving to zero liquid discharge (ZLD) systems. In this example, water with high total dissolved solids (TDS) is treated before it is sent to a crystallizer. Crystallization is an evaporation process that creates a pure water distillate that can be sent back to the process. The remaining dissolved solids form crystals that can be removed and sent for disposal or used for something like road salt. The pretreatment process protects the crystallizer and the reverse osmosis filtration system by removing material that could harm them. The pretreatment includes three major steps: cold lime softening, filtration, and sludge treatment.

### Cold Lime Softening and Clarification

Softening is the removal of elements in the water like calcium, magnesium, and silica that could cause fouling or scaling of reverse osmosis or crystallizer equipment. Softening begins with chemical addition. Coagulant and polymer improve the clarification process by encouraging individual particles to form fast settling clusters of particles. The Solids CONTACT CLARIFIER™ Softener provides a reaction zone for the removal of hardness. Lime and soda ash are added in the reaction zone just before the feed water.

- **Coagulant (when necessary) allows particles to come together.**
- **Polymer helps individual particles form large fast settling clusters.**
- **Lime is added to increase the pH to remove calcium and magnesium hardness.**
- **Soda ash is added (when necessary) to remove calcium hardness.**

Internally recirculated solids react with lime and soda ash and form heavy faster settling particles. The sludge is scraped to the center and removed for dewatering.

Acid is added to the softened water to stop the softening reaction. The pH is lowered to less than 8. Usually hydrochloric acid is used because it doesn't add sulfates that could form gypsum scale in the reverse osmosis and crystallization processes.

### Filtration

Three stages of filtration are used; each provides pretreatment to the next. The dual media filters and the AltaFilter™ Ultrafiltration System remove any remaining solid particles. The backwash water is recycled back to the clarifier. Reverse osmosis removes the dissolved solids from the water. The treated water is sent back to the process. The concentrated dissolved solids stream is sent to the crystallizer.

### Sludge Treatment

The underflow of the Solids CONTACT CLARIFIER™ is pumped into a thickener. Polymer may be added to improve settling and clarity. The thickener increases the concentration of the sludge. The overflow is sent back to the clarifier. The thickened underflow is sent to a filter press or other type of vacuum or pressure dewatering filter.

In the filter press the water is forced out of the sludge under pressure. It may require additional polymer to function properly. The cake is then hauled off for disposal. The pressate and any wash water get pumped to the reclaim water storage sump with the backwash from the filtration systems and then it is recycled back into the clarifier.