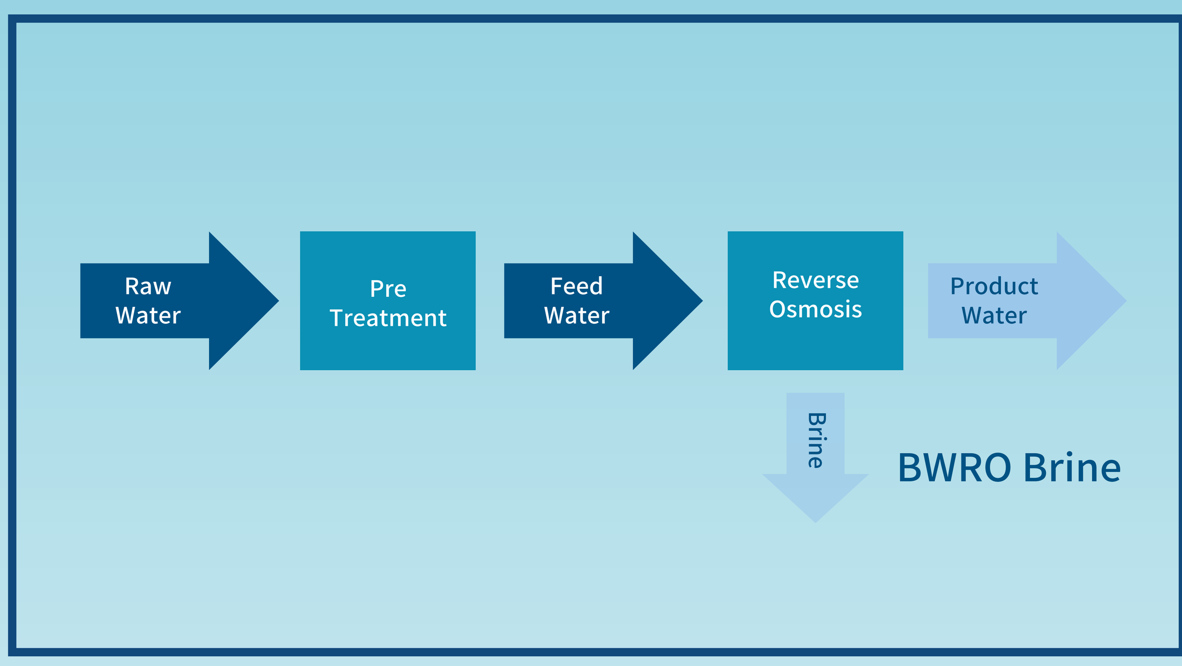
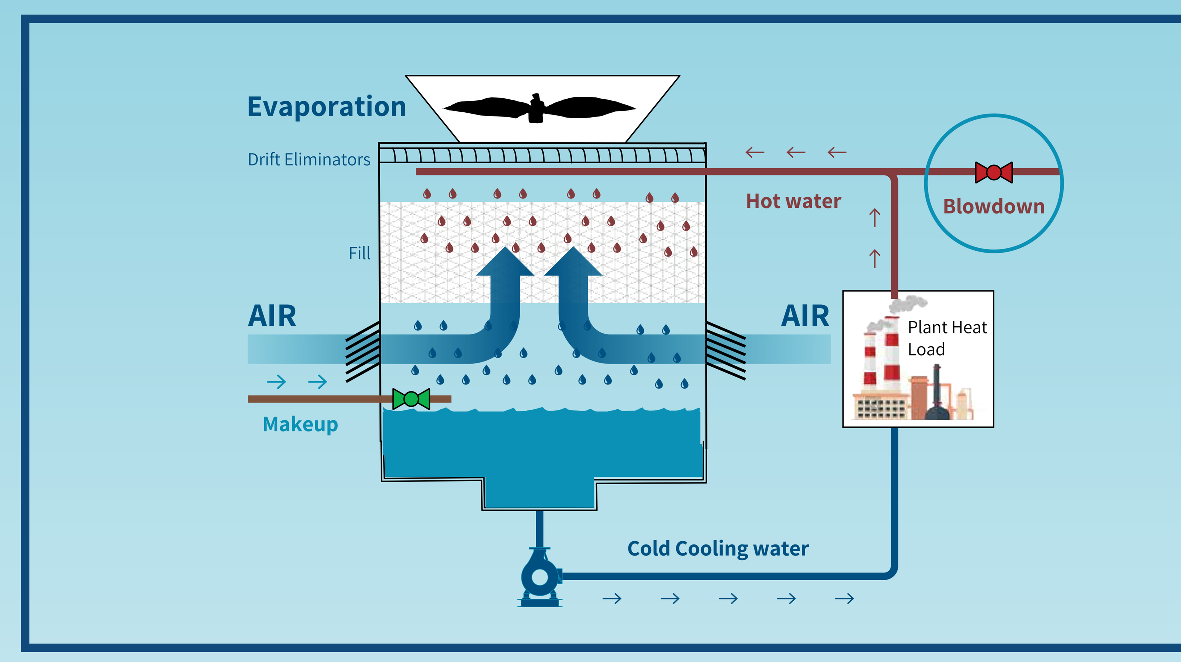
Industrial Wastewater Discharge Management

Industrial Wastewater Sources:

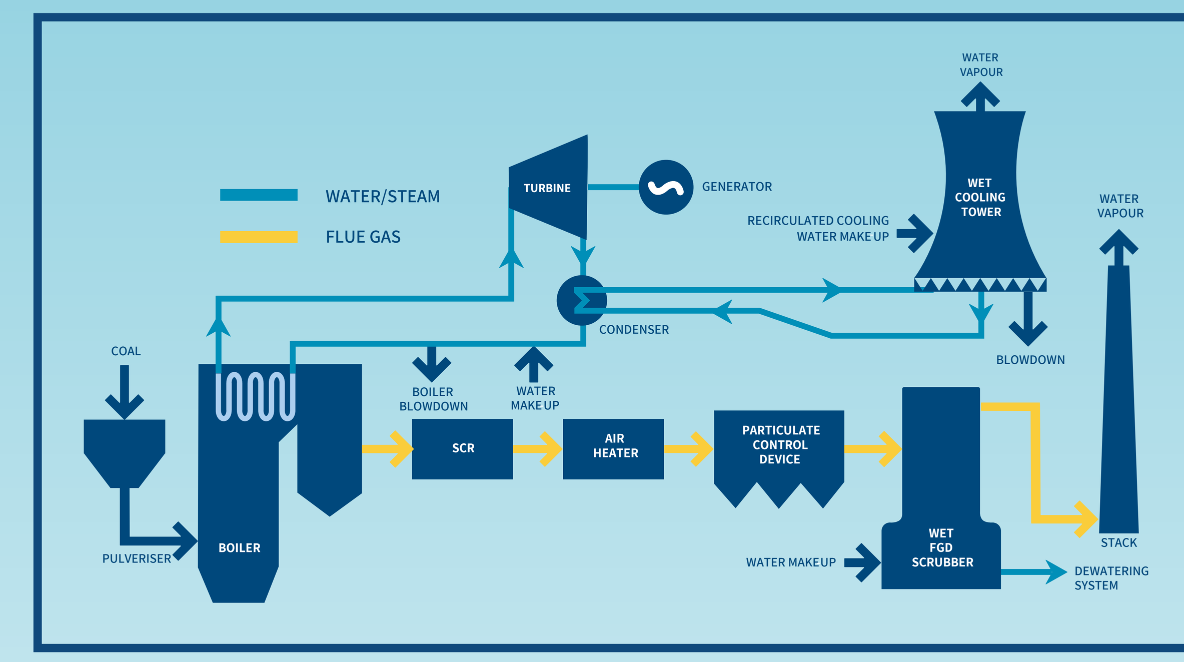
1. Reverse Osmosis Brine



2. Cooling Tower Blowdown

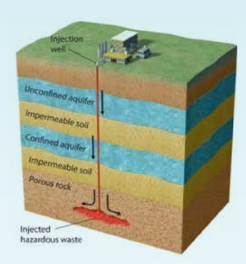


3. Power Industry – make up water and blowdown



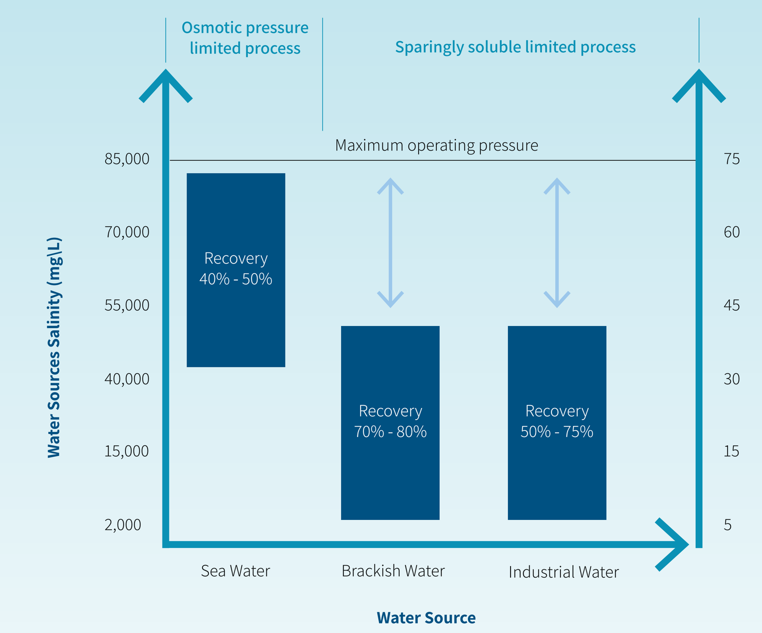
Industrial Wastewater Discharge

- Surface disposal (rivers, lakes, etc.)
- Disposal to the local sewer system (WWTP)
- Evaporation ponds
- Deep well injection
- Treatment for discharge or reuse

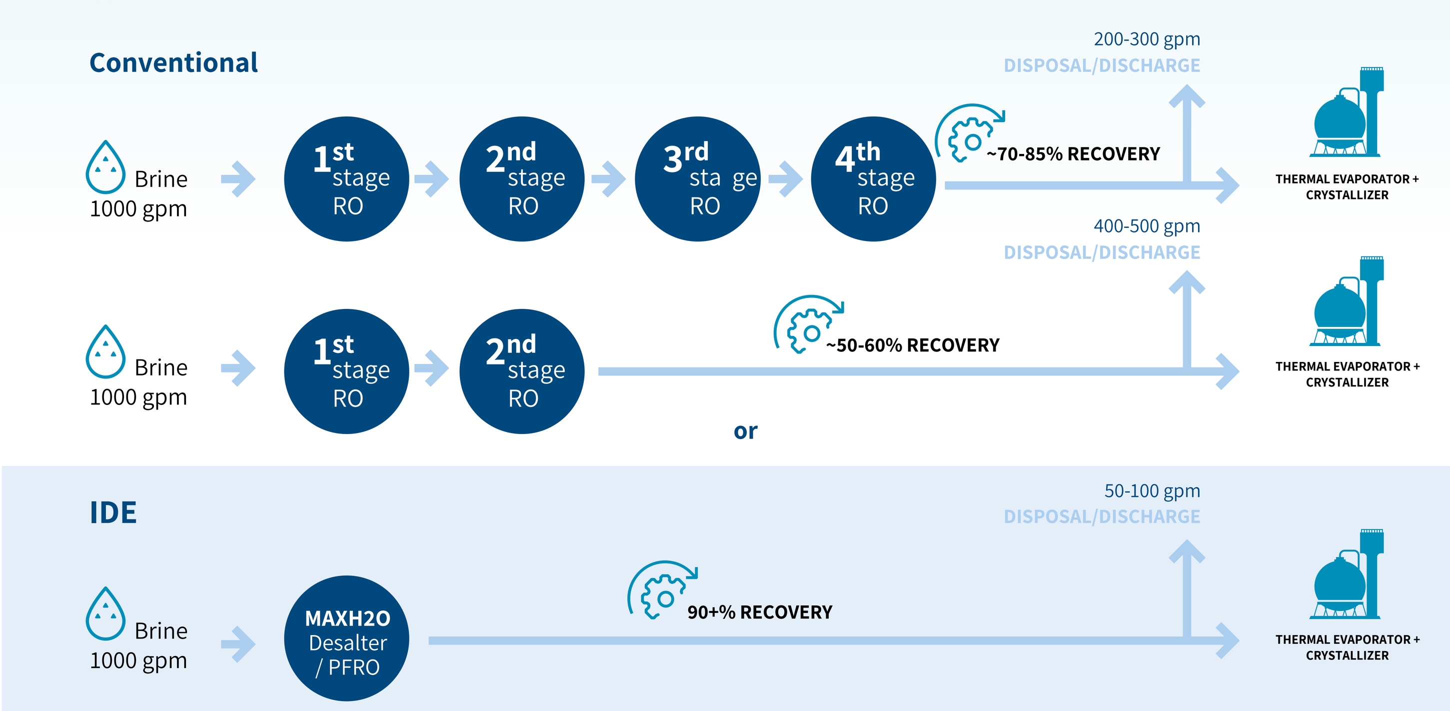


Challenges

- Strict regulation limit of discharge (Sulphate, TDS, chlorides, phosphate and others.
- Wastewater/Blowdown quality varies dramatically due to operational parameters and makeup quality and source.
- Industrial Brine and BWRO brine are governed by water chemistry as opposed to seawater → **water chemistry limits the recovery of RO.**

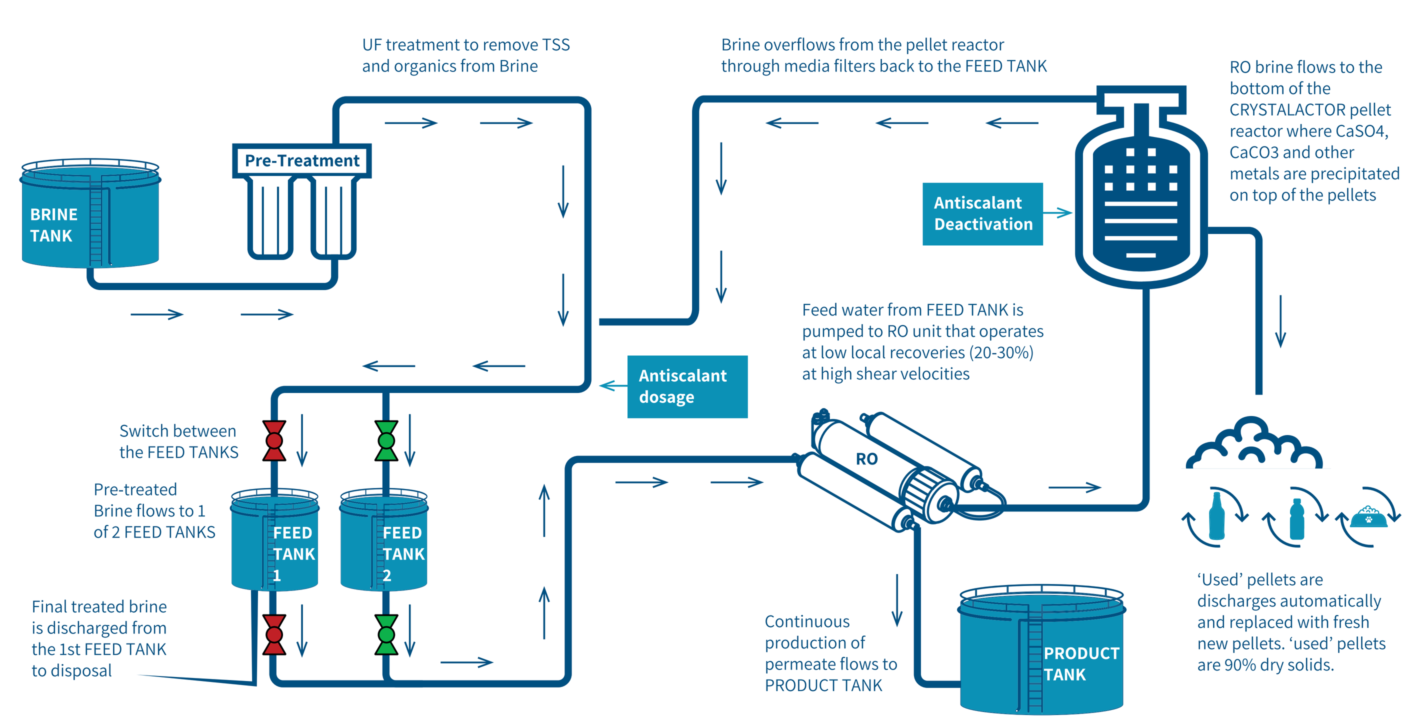


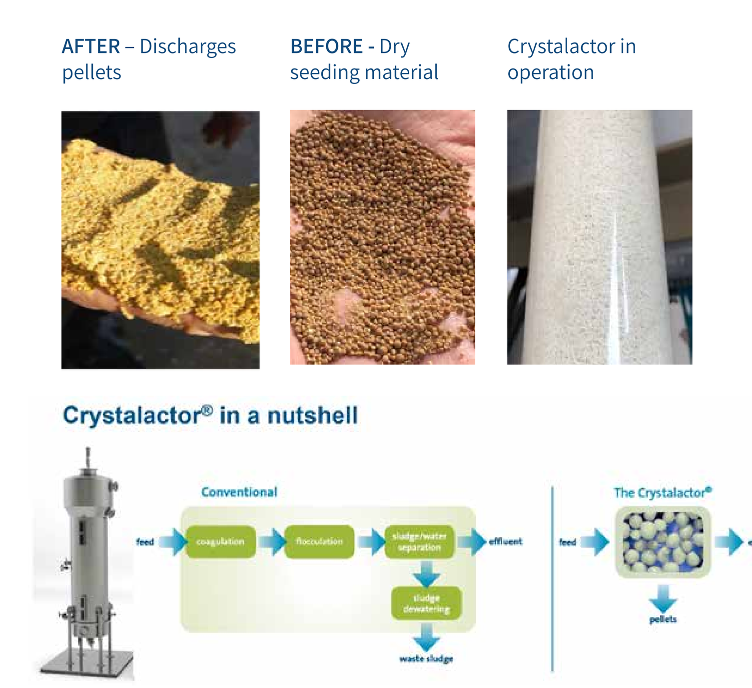
Mitigation - ? The full ZLD scheme ?



IDE Solution-MAXH_2O Desalter

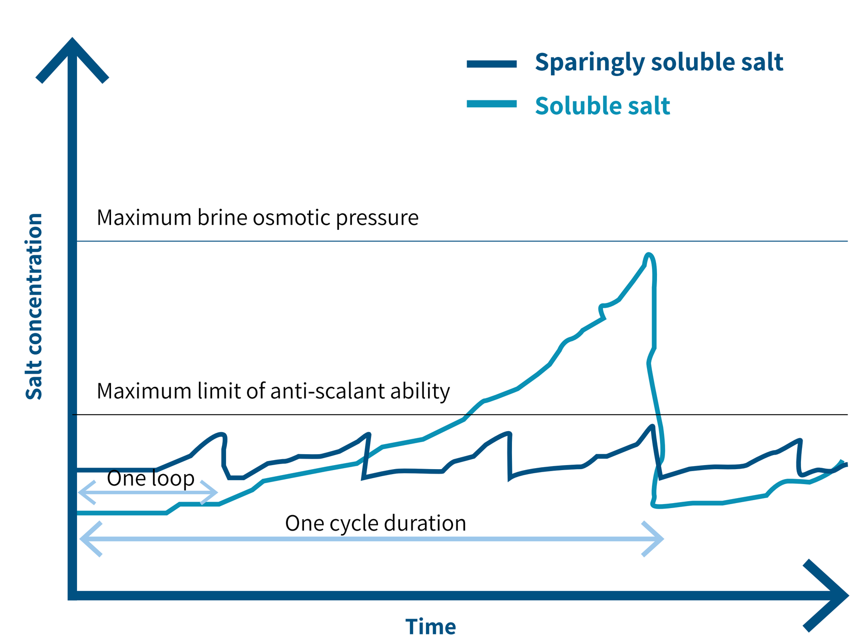
- The **MAXH_2O** Desalter overcomes variable changes in the feed flow and composition.
- Operates at very high recovery without compromising membrane service life.
- Pushes the limits of calcium carbonate, calcium sulphate, and silica precipitation.
- Discharges pellets contain less than 10% water which undergrows gravity dewatering without dewatering systems.





Operation Principal- Salt Concentration Changes during the Cycle

- Sparingly soluble salts Saturation Index is maintained below the maximum threshold of Antiscalant → preventing formation of scaling on membranes.
- By eliminating the limiting factor of chemistry → Concentration of soluble salts to the osmotic pressure is possible.
- Ability to handle changing BD qualities and flows without affecting performance.
- In **MAXH_2O** Desalter, the bacteria has to constantly adopt to varying conditions of gauge pressure and osmotic pressure. This slows their reproduction rate.
- High shear velocities of the brine helps to prevent formation of organic matter and bacteria depositions.



MAXH_2O Desalter Solution - Summary

	MAXH2O Desalter	Other membrane based technologies
Stages	**1 stage** (2 – 4 elements / pressure vessel in each stage)	**Multi stage** (3 stages of RO + 2-3 stages of precipitation units)
Instantaneous recovery	**15 – 30%**	N/A
Total recovery	**Up to 98%**	**50-60%** for a single stage (higher with interstage precipitation units)
Flux	Almost equal in all elements	Not equal (frequent change of membrane)
Residence time	**Low**	**High** (scaling)
Feed TDS	**Can handle changing TDS levels**	**difficulty handling changing TDS levels**
Bio-fouling tendency	**Reduce tendency for bio-fouling**	**Low** anti-biofouling capabilities
Scaling tendency	**Extremely low** – below the antiscalant max threshold	**High** due to alkaline nature of blowdown
Operational expenditure	**Low** (low chemicals consumption and No sludge handling)	**High** (to sustain RO membrane and for Intermediate precipitation)
Brine scaling potential	Final brine has **low scaling potential**	**Low** if last stage is precipitation unit / **high** if last stage is RO