

BERGHOF MEMBRANE TECHNOLOGY GmbH

Utilization of Tubular UF Membranes in Zero Liquid Discharge Application

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Membranes
Think outside the box

Summary

- **Introduction**
- **Zero Liquid Discharge (ZLD)**
- **Chemical Resistant (CR) Tubular UF Membranes**
- **Case Study – Thermal Solar Plant, Mojave, CA**
- **Conclusions**

Berghof Group

Your Innovation Hub



Berghof Membranes

Think Outside the Box

Berghof Membrane Technology GmbH, part of the Berghof Group, is the leading manufacturer of tubular membranes for the filtration and separation of process streams and wastewater for industrial applications.

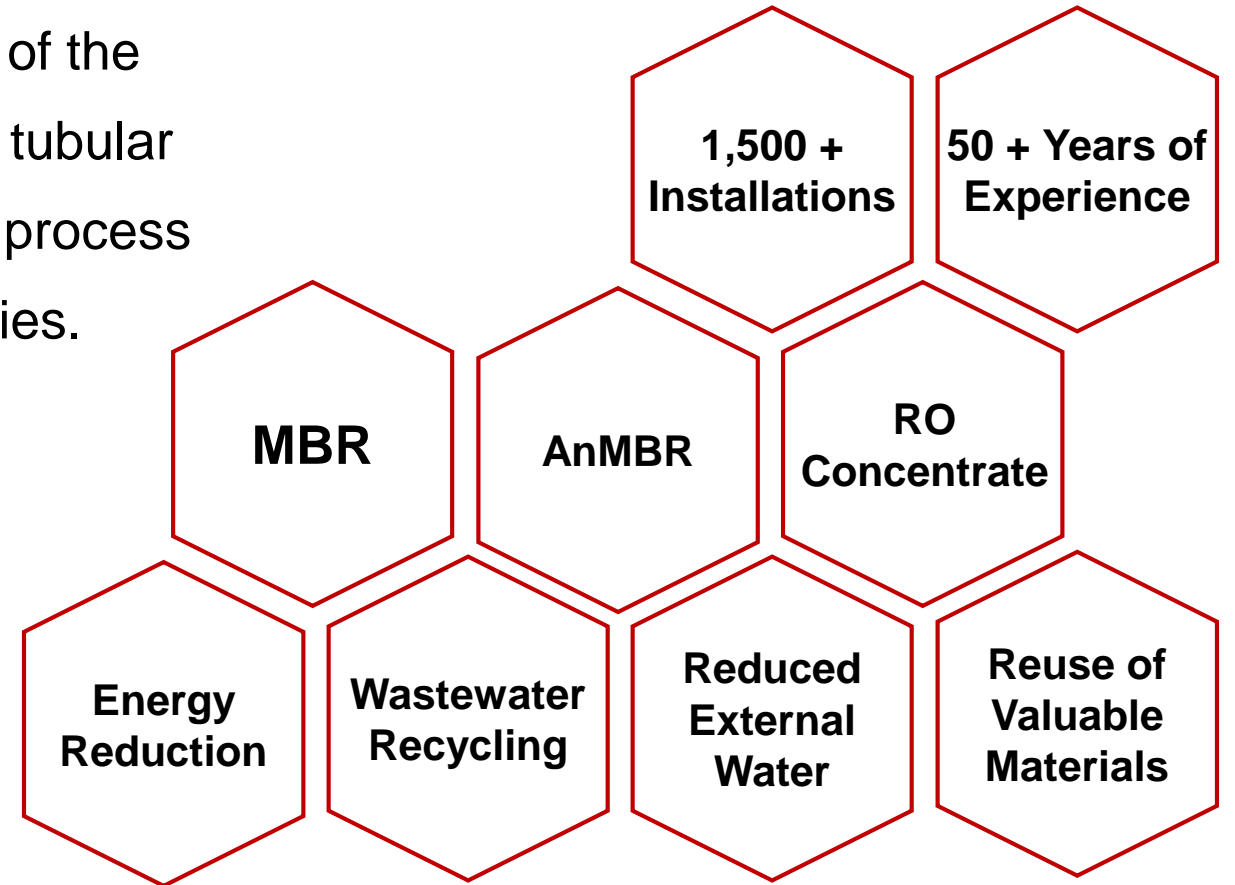


Membranes
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Berghof Membranes

The Leader in Tubular Membranes

Berghof Membrane Technology GmbH part of the Berghof Group, is the leading manufacturer of tubular membranes for the filtration and separation of process streams and wastewater in a variety of industries.



About Berghof Membranes

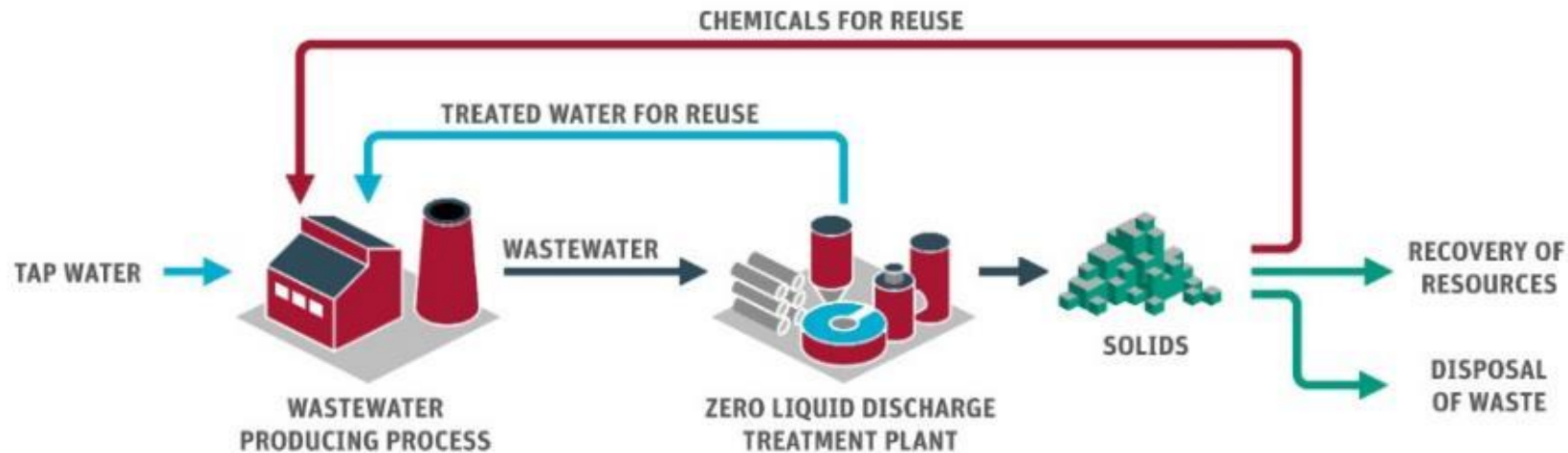
More than a membrane supplier

- **Tubular Membrane Modules:** 5 mm, 8 mm, Chemical Resistant
- **B^o-SMART[®]** External Filtration System
- **B^o-CARE[®]** Service and Support Program



Zero Liquid Discharge (ZLD)

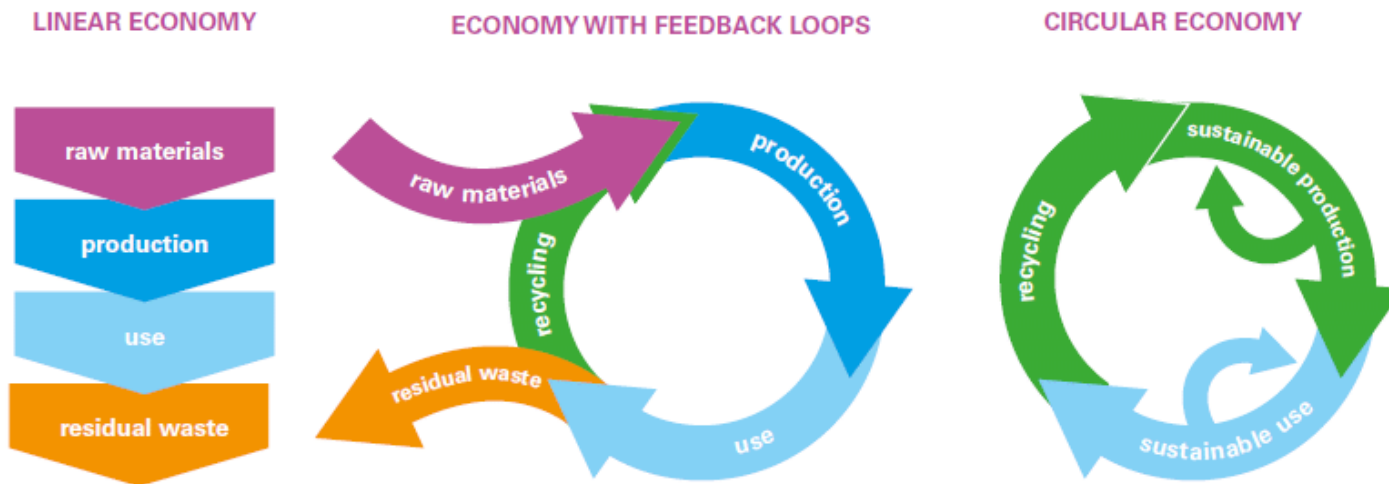
- **ZLD** is a water treatment process in which all wastewater is purified and recycled and therefore leaving zero discharge at the end of the treatment cycle
- **ZLD treatment** method includes ultrafiltration, reverse osmosis, evaporation/crystallization and deionization.



Zero Liquid Discharge (ZLD)

ZLD technologies helps plants to meet discharge and water reuse requirements, enabling industries to:

- Meet stringent environmental discharge regulations
- Treat and recover valuable products from waste streams
- Improve management of produced water
- Transition from “Linear” to “Circular Economy”



Zero Liquid Discharge (ZLD)

- **Circular economy** is a global driver for water reuse applications (incl. ZLD) and new technologies



In 2013 State Council said that 10 sectors & industry parks need to transition to a circular economy

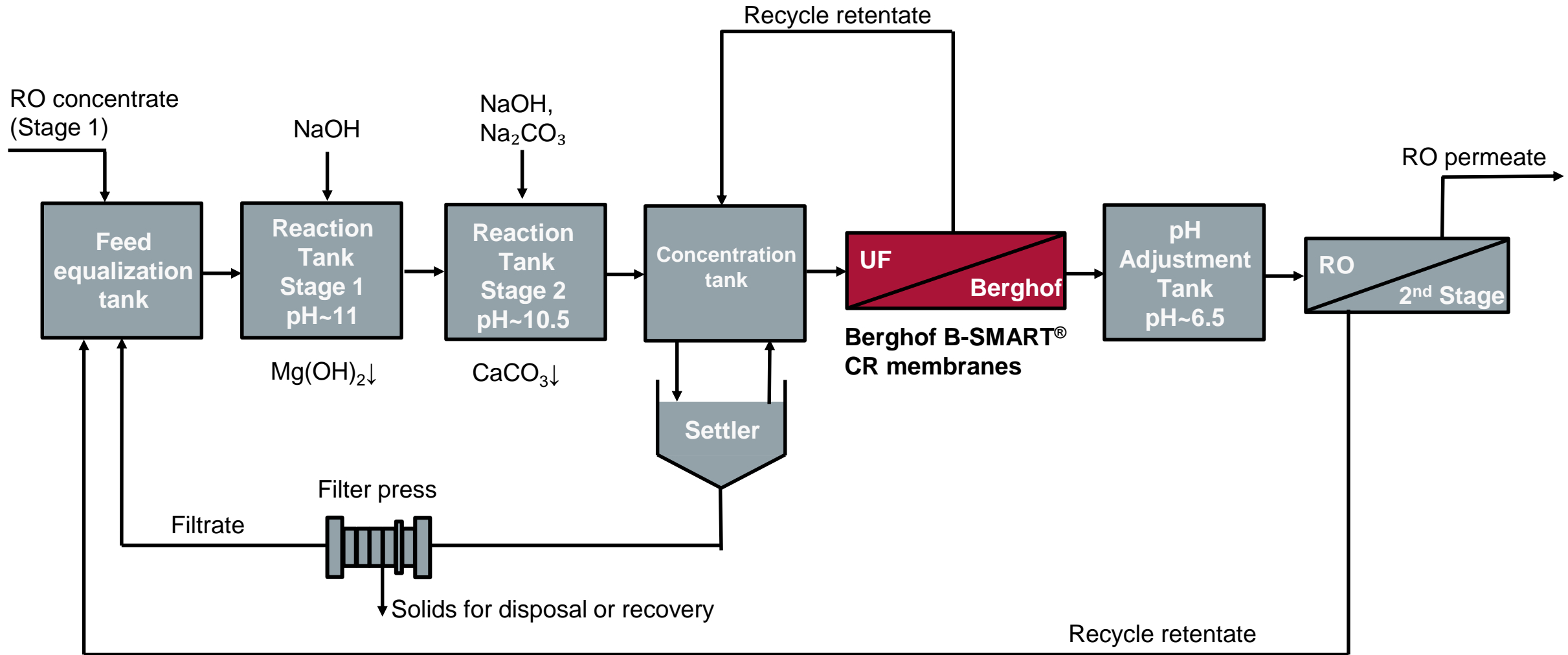
1. Coal
2. Power
3. Steel
4. Nonferrous metals
5. Petroleum & Petrochems
6. Chemical
7. Building materials
8. Paper
9. Food
10. Textile



US\$1trn/year
CAN BE SAVED GLOBALLY
FROM REDUCING MATERIAL USE

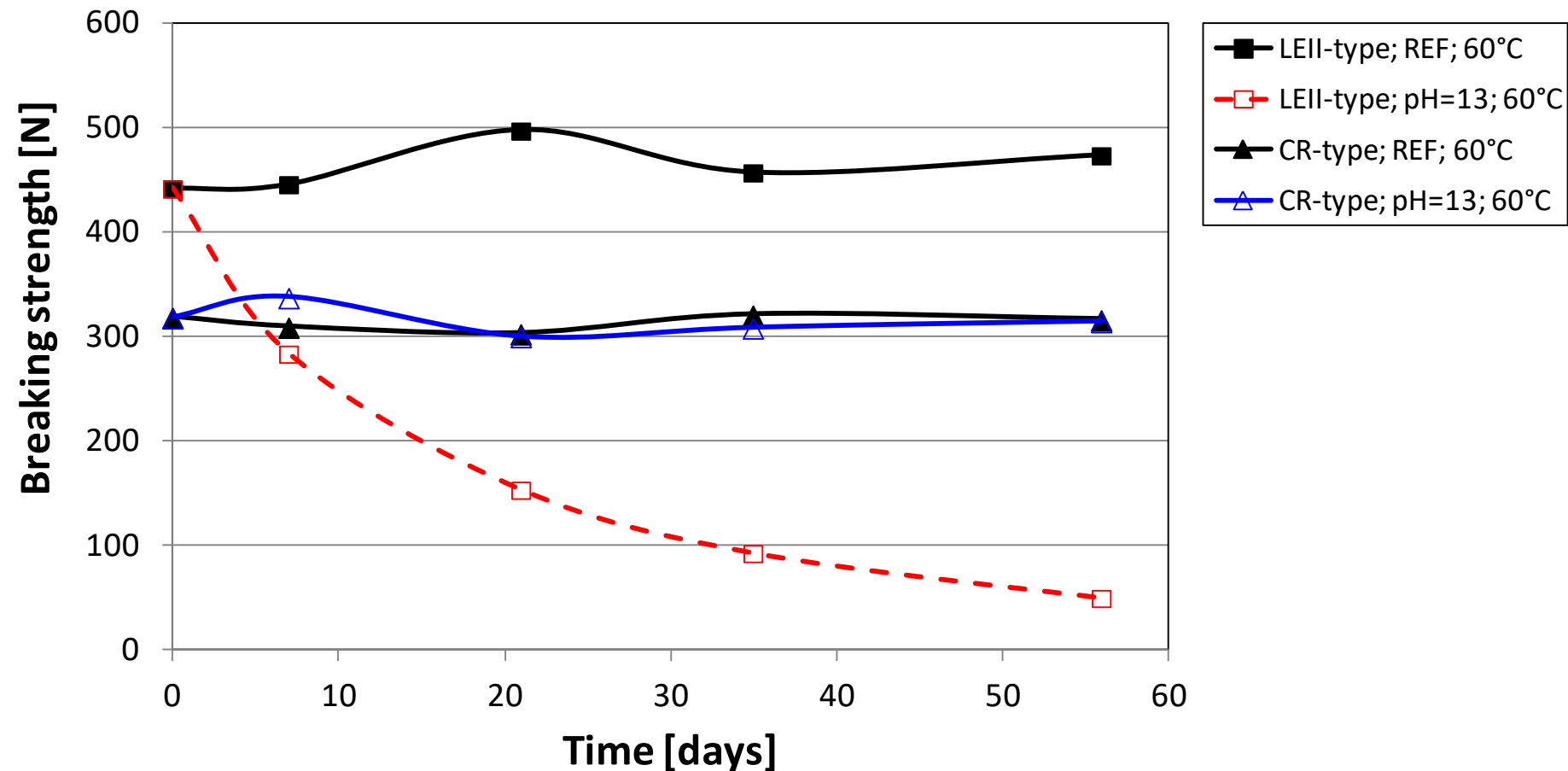
Note that these 10 industries complement the 10 industries identified in the The Made in China 2025 Plan >> [China's Water Challenges](#) >> [Thirsty Power](#) >> [HKH 16 vs. G20](#) >> [Revamping Business](#) >> [Made in China 2025](#)

Zero Liquid Discharge (ZLD)



Tubular CR (Chemical Resistant) Membranes

- CR Membranes Polyvinylidene fluoride (PVDF)



Case Study

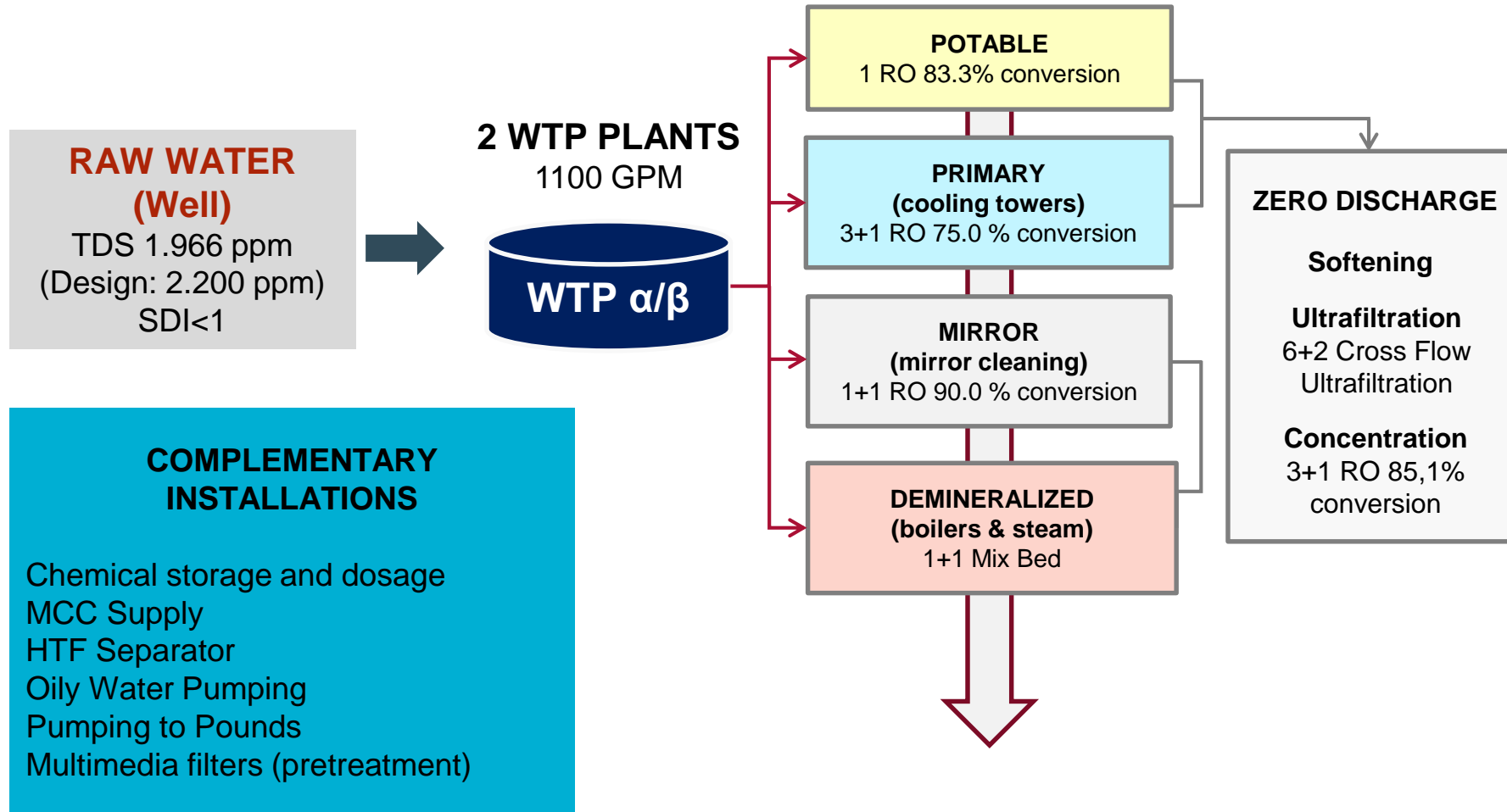
Thermo Solar Plant – Mojave, CA



Early 2015 LEFingenieros successfully completed the commissioning of both zero discharge plants

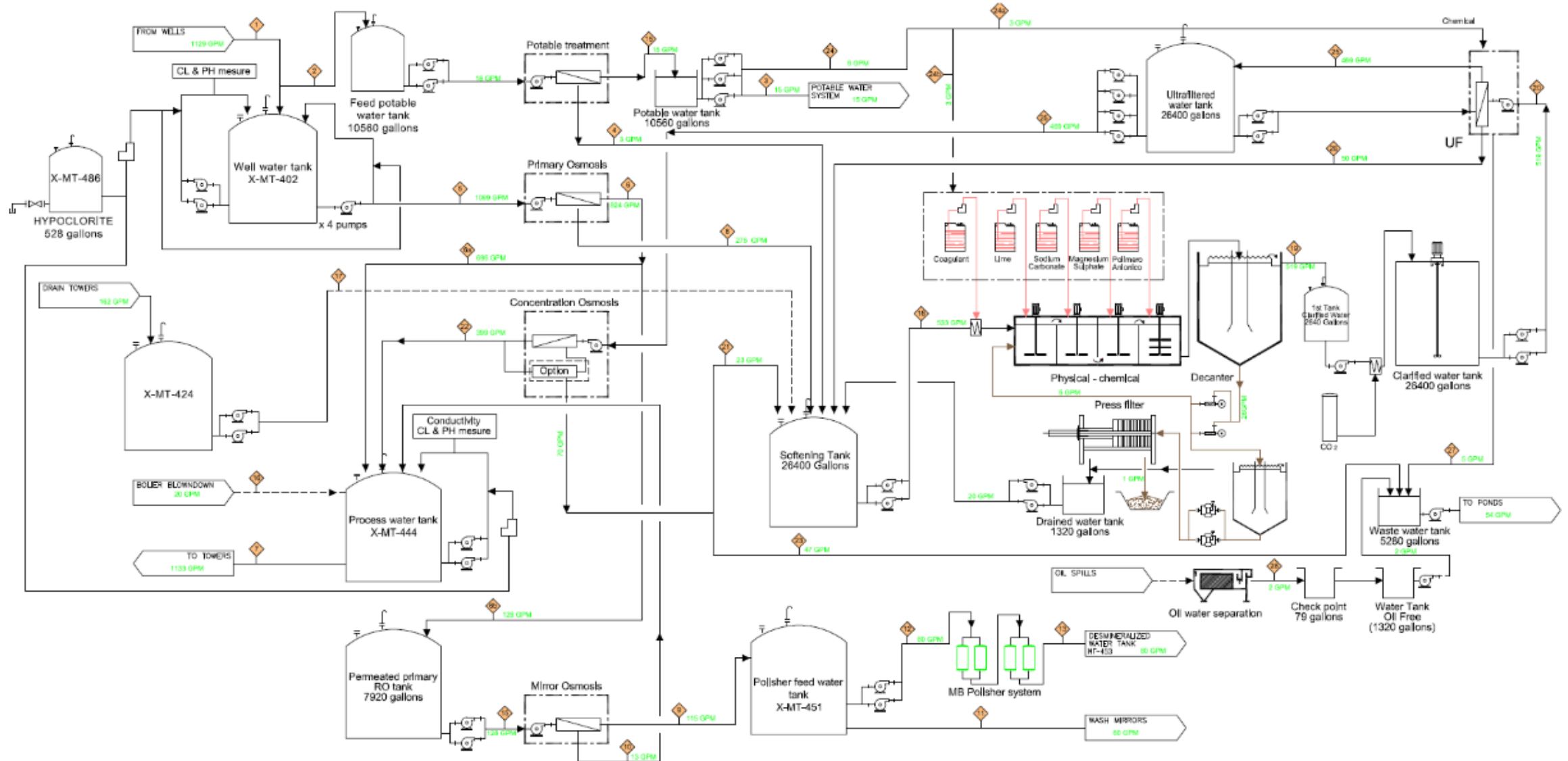
Case Study

Thermo Solar Plant – Mojave, CA



Case Study

Thermo Solar Plant – Mojave, CA



Case Study

Thermo Solar Plant – Mojave, CA

Process	Volume [GPM]	[m ³ /day]
Treatment		
RO concentrate	903	4922
Cooling tower blowdown	486	2650
Filter press recycle	60	327
UF recycle	150	818
Recycled water		
UF permeate	1407	7668
RO permeate	1197	6523
Evaporation		
Evaporation pond	162	883

Conclusions

- **Zero Liquid Discharge** is promising treatment process which is promoted by circular economy and stricter regulations on wastewater disposal.
- **Chemical Resistant membranes** stable at high pH were developed to meet ZLD process requirements
- Since 2015 Thermal solar plant is operational with ZLD wastewater treatment process that **recycles each day approximately 1.7 million gallons**

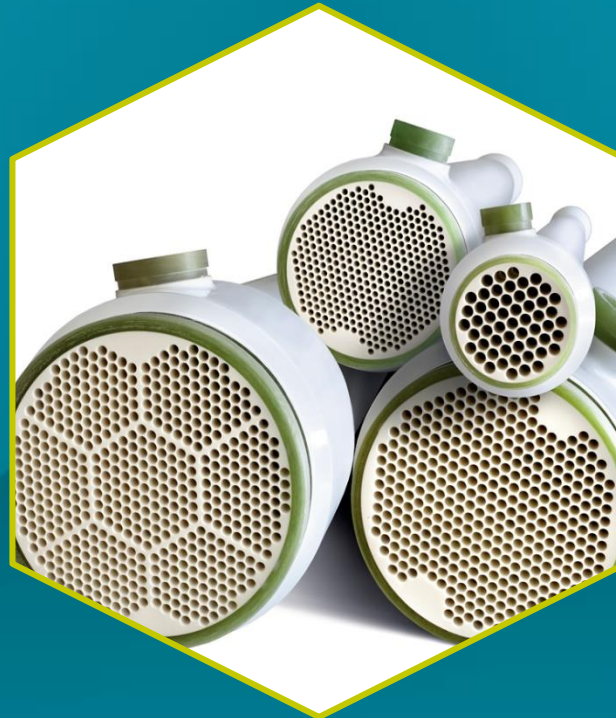
More than just a membrane supplier

B^oCARE[®]

Service and Support Programs



Tubular UF
Membrane Modules



B^oSMART[®]

Intelligent Software &
Engineered Systems



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