GE Power & Water
Water & Process Technologies

AIChE Industrial Water Reuse

Applying Advanced Technologies to Reuse Applications

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GE's Portfolio

Our leadership in equipment solutions:

- Advanced ultrafiltration, membrane bioreactor, reverse osmosis membranes and membrane chemistries
- Mobile fleet and water outsourcing capabilities
- Tough-to-treat applications, such as unconventional fuels and mining
- Packaged water treatment equipment
- Analytical instruments for measuring water quality

Our leadership in chemical and knowledge management solutions:

- Cooling and boiler water technologies that enable customers to protect their assets
- Chemical treatment for ethylene, styrene and elastomer production facilities
- Refinery treatment solutions focused on tough-to-treat crudes
- Remote monitoring and diagnostic solutions

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US Power Plant
Reusing Municipal Waste Effluent

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RePAK* UF-RO at US Power Plant

Challenge: Lower cost of make-up cooling water in a northeast US Power Plant
Solution: RePAK UF-RO treats municipal waste effluent to cooling water quality

Trash Burning Power Plant in Pennsylvania

- Initially using city water to feel 900 gpm make-up cooling water
- Rate increases hurting profitability of power plant
- Negotiated low cost long term off-take agreement for effluent with nearby Waste water treatment plant
- Scope: Two GE RePAK UF-ROs
- Approximate equipment cost of $1.0MM

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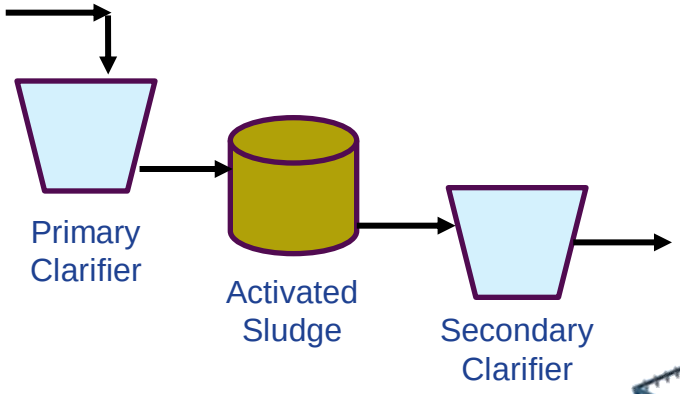
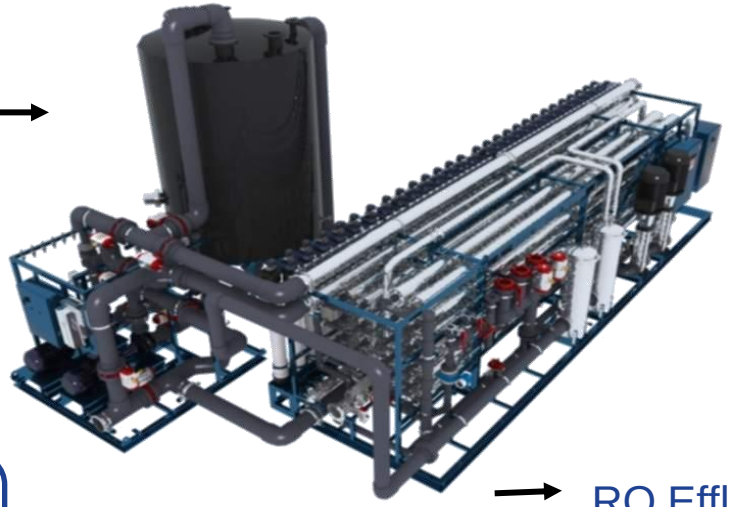
Process Flow



Feed Water Quality Limits (UF feed)

- Ave. TSS / TOC < 15 mg/L Peak =< 50 mg/L (72hrs)
- BOD Ave. < 15 mg/L Peak =< 30 mg/L (72 hrs)
- COD Ave. < 45 mg/L Peak =< 100 mg/L (72 hrs)
- TDS = < 3000 mg/L. Temperature = 15-30C



RePAK - UF+RO
Tertiary Package

Design parameters:

- UF Average Flux: 30 gfd
- RO Average Flux: 11-12 gfd

RO Effluent:

- ~ 95% reduction in TDS
- < 1mg/L BOD
- < 10 mg/L COD

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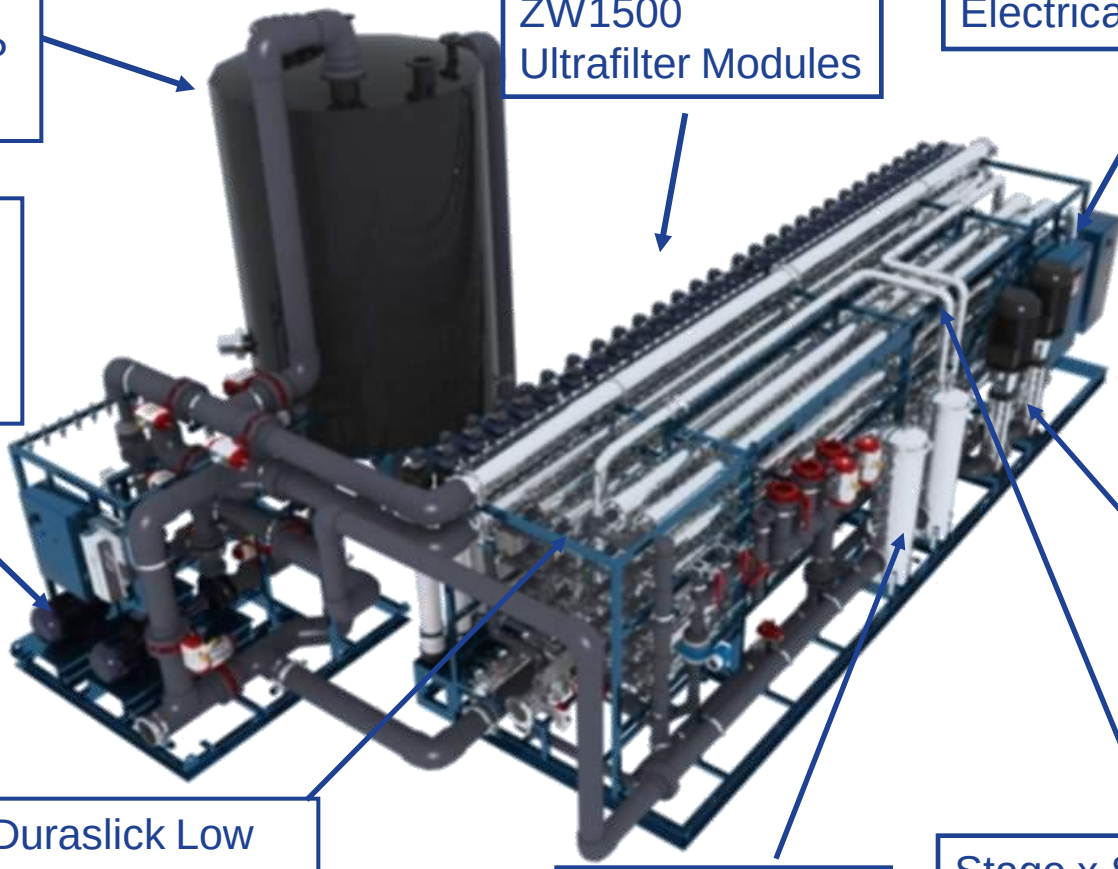
Re-PAK Scope Outline



UF buffer / backwash / CIP tank

ZW1500 Ultrafilter Modules

Electrical Cabinet / PLC / HM

UF backwash / CIP pump & RO Feed Pump Skid (with VFD/starter)

RO Pump VFD's

Grundfos RO Pump

Duraslick Low Fouling Membranes

Cartridge Filters

Stage x Stage CIP Manifolds

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Not shown and shipped separately are:
UF feed pump, Self Cleaning Screen, Modulating Feed Valve (pressure), and Air Blower package for air wash

Coca Cola in Asia

Improving Water Yield

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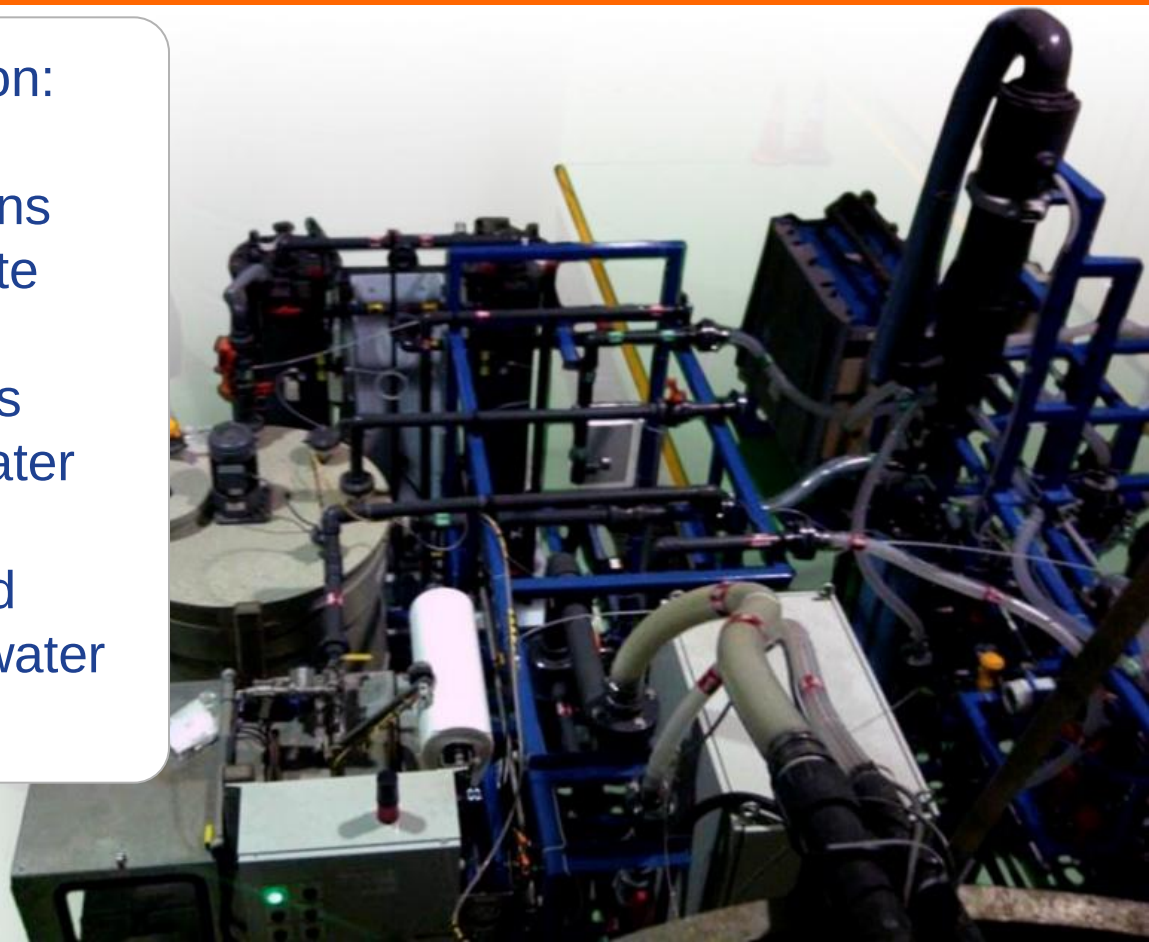
AquaSel* at Coca-Cola Plant: Near Zero Liquid Discharge

Challenge: Relieve water shortage & improve water yield in a beverage facility
Solution: AquaSel (non-thermal brine concentrator) with 36,000 gpd capacity

In 1000 hours of pilot operation:

- AquaSel captured and converted 1.5 million gallons (5,678 m3) of a water waste stream for reuse
- Captured water quality was equal to incoming fresh water source
- AquaSel system recovered 99%+ of ingredient room water waste stream



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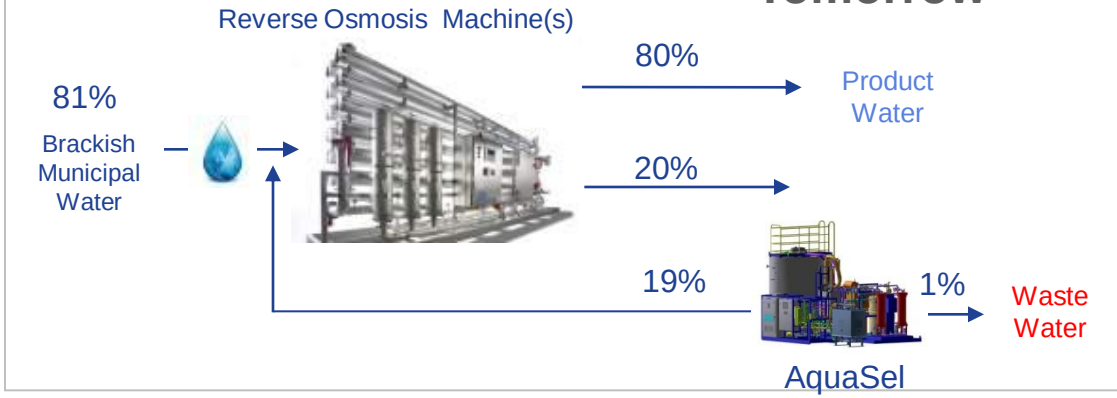
Innovative Technology to Save Billions of Gallons of Water Per Year.

Today

- 20% of purchased water goes to waste
- Over 1300+ Installed GE Systems

Tomorrow



- Bolt on proprietary technology
- Waste water ↓90%
- Purchased water ↓ 10%
- Saving billions of gallons of water per year at Bottlers
- **Supports sustainability metrics**

Improving Water Use Ratio

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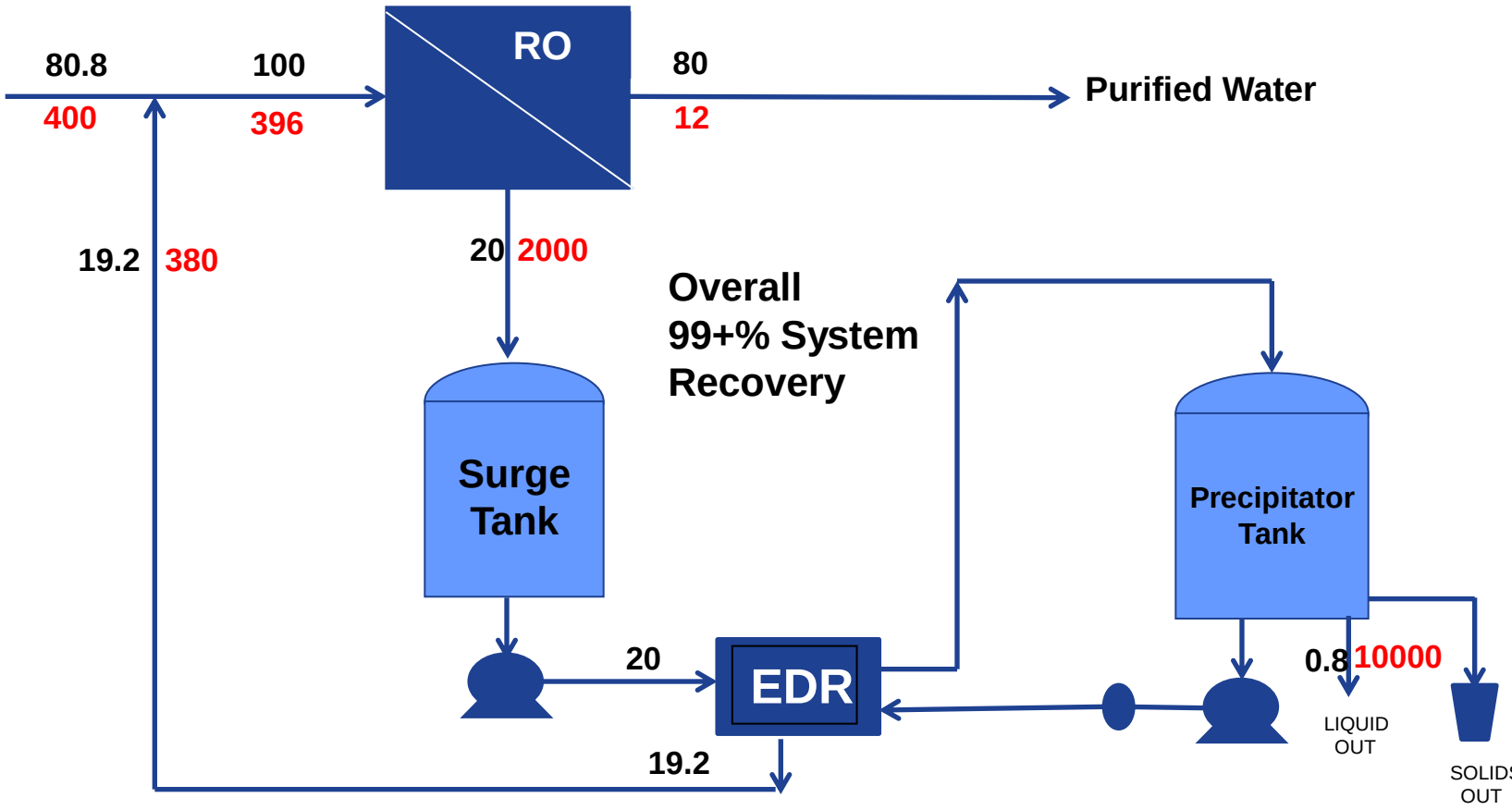
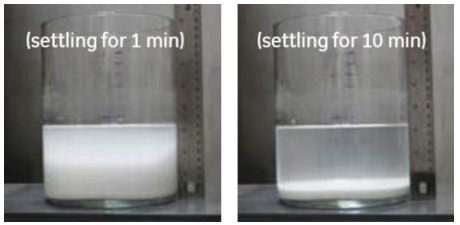
AquaSel Flow Sheet



1. **Black Numbers** are units of Flow
2. **Red Numbers** are units of TDS



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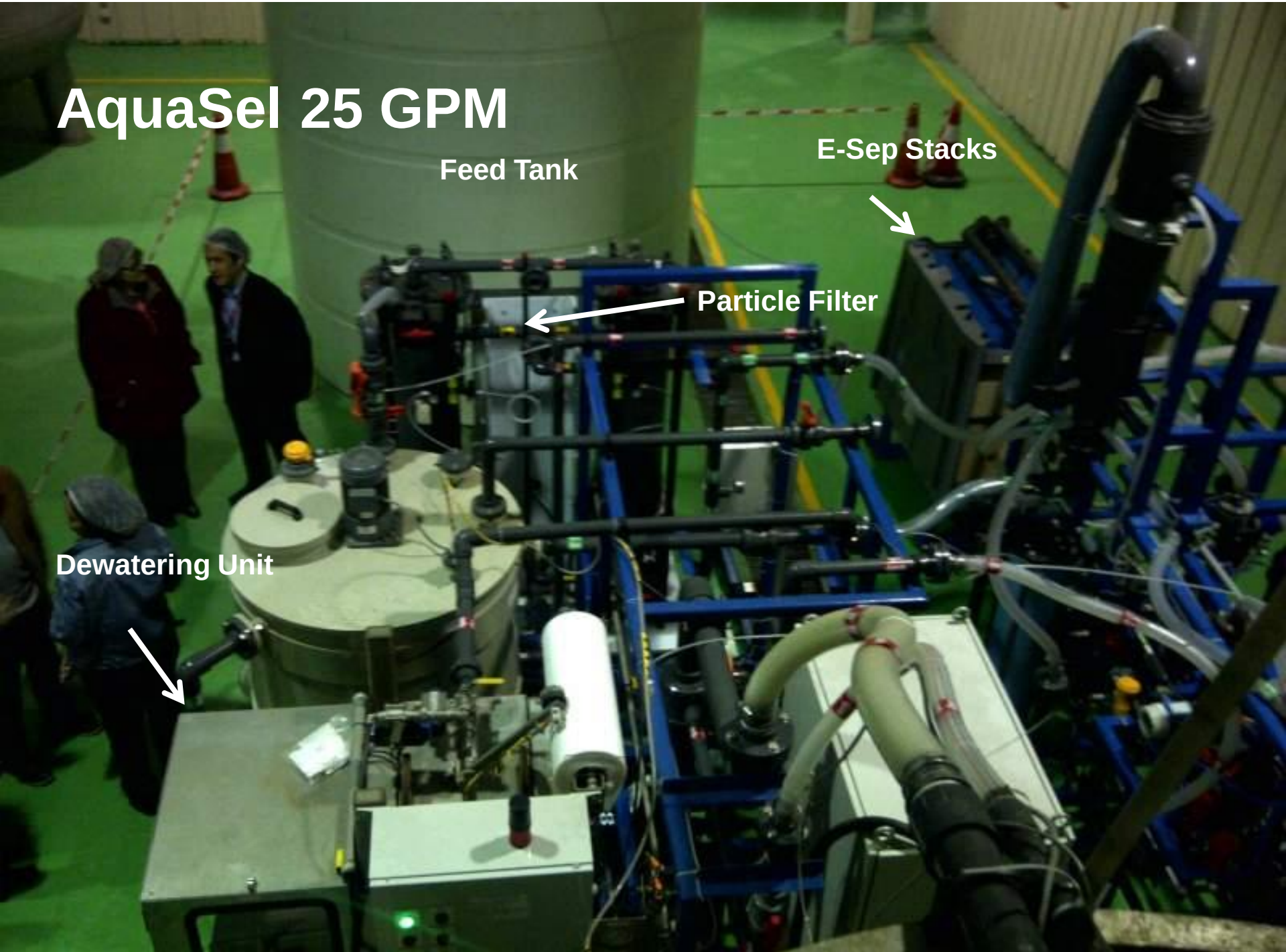
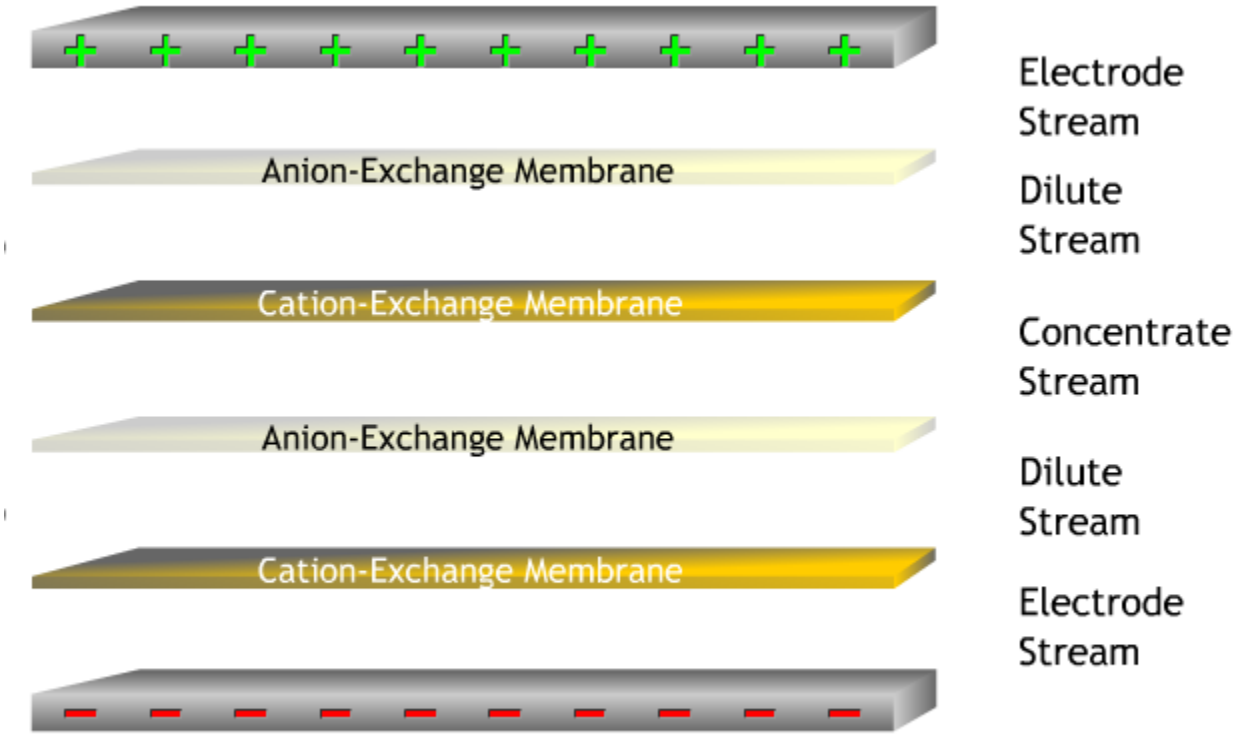

AquaSel 25 GPM
Feed Tank
E-Sep Stacks
Particle Filter
Dewatering Unit

E-Separation Process Overview

Use electrical potential to drive ionic salts through the membranes



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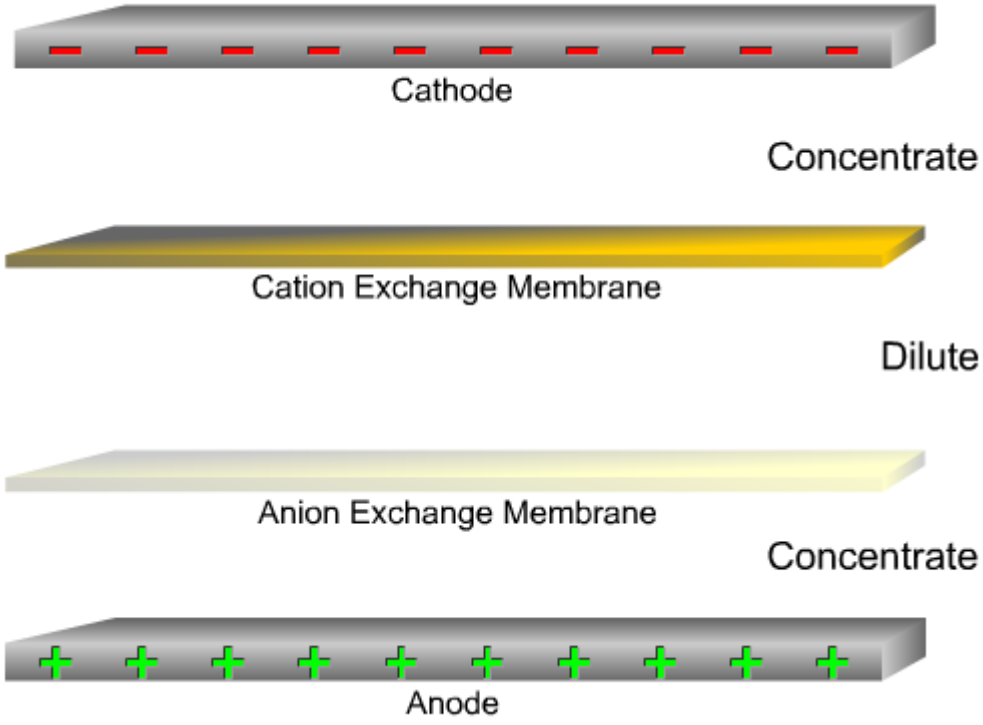
Polarity Reversal

- Minimizes scaling and colloidal deposition
- Breaks up freshly precipitated scale and flushes them before they grow and cause damage
- Reduces slime or similar formations on membrane surfaces



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More Case Studies

Harvesting wastewater in Australia

Challenge: Ongoing drought challenged availability of water for golf course

Solution: Sewer mining water reuse plant provides irrigation water

Pennant Hills Golf Club, Australia's first commercial sewer mining water reuse plant

- Conserves 25 million gallons of Australia's fresh water a year
- Advanced MBR produces 172,000 gallons of high quality water per day which is used to irrigate 55 acres
- "We are proud to be the first to embrace this innovative approach. It is bringing us a drought-proof supply of water that minimizes impact on Australia's fresh water reserves." — Steve Walker, president, Pennant Hills Golf Club

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Creating “NEWater” in Singapore

Challenge: Inadequate supplies of renewable fresh water

Solution: Treat and reuse wastewater effluent for local industry

Bedok NEWater Factory

- Transforming wastewater into high quality industrial feedwater and potable water
- The final product is termed “NEWater”
  - Initially used as a feed for the electronics industry, wafer fabrication plants, and commercial building cooling towers
- A growing percentage is released back into local reservoirs for indirect potable reuse applications

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Thank You