energy recovery™

Trends & Developments in Advanced Energy Recovery Technologies for Desalination

May 30, 2013

Distributor for Germany, Austria, Switzerland, Czech & Slovak Republic
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ROC®
Reverse Osmosis Components

Agenda

- Who is Energy Recovery "ERI"?
- Desalination Systems
- The PX™ Pressure Exchanger Technology
- SWRO Engineering Design & Optimization
- Retrofit and Expansion Plant Designs
- Case Studies – PX Installations
- Centrifugal Pumps & ERD Solutions
- PX Hands-On

Making Desalination Affordable

WHO IS ENERGY RECOVERY?

Energy Recovery Inc

HEADQUARTERS/MANUFACTURING/CERAMICS

San Leandro (San Francisco)
California USA

REGIONAL OFFICES

China, Spain, UAE

Company Profile

Background

- Established in 1992, Headquarters in California
- Global Sales and Technical Presence
- More than 14,000+ Energy Recovery Devices & Pumps Installed/Contracted
- Saving more than 10 Billion kWh of Energy per Year
- More than 400 OEMs
- PEI acquisition in 2009

Technical Expertise

- Highest Efficiency, Durability and Reliability ERDs
- Precision Manufacturing and Ceramics Expertise
- 24/7 Service and Support
- Technical Review, On-site Commissioning, Start-up, Training
- Best-in-it's-Class ERD and Pump Solutions

State-of-the-Art, Materials Science Manufacturing

Creating advanced ceramics components requires specialized equipment, a fully equipped materials lab, engineers, and optimized processes

Over 400 Clients

Inima Grupo OHL

Hyflux™

aqualia

DOOSAN

BEFESA

Valoriza Agua

TOYOBO

suez environnement Degrémont

Aquatech

IDE technologies ltd.

Cadagua

GE Water & Process Technologies

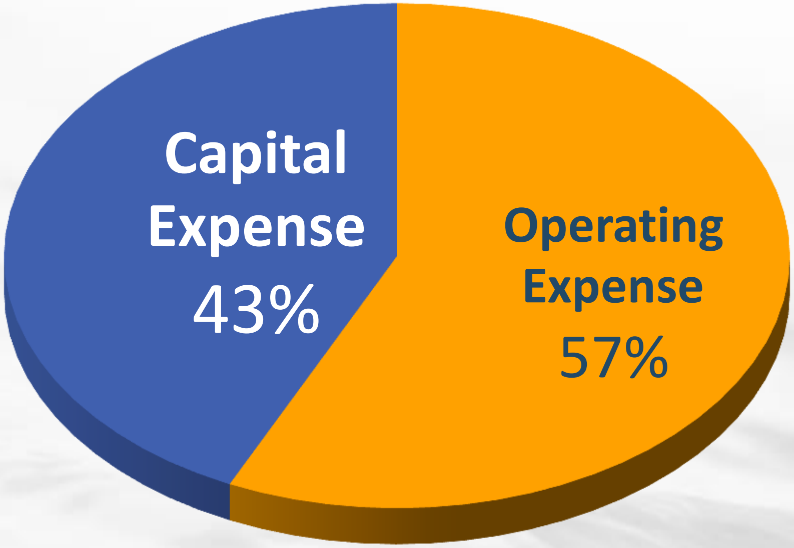
acciona Agua

Hitachi Aqua-Tech Engineering Pte. Ltd.

Biwater

AQUA ENGINEERING

Desalination Plant Capital & Operating Costs

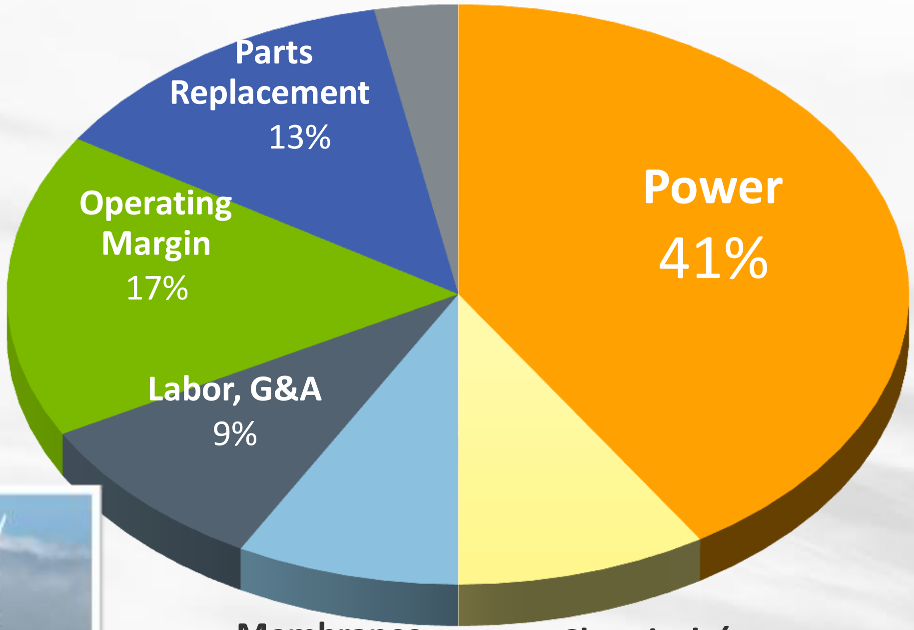


ASSUMPTIONS

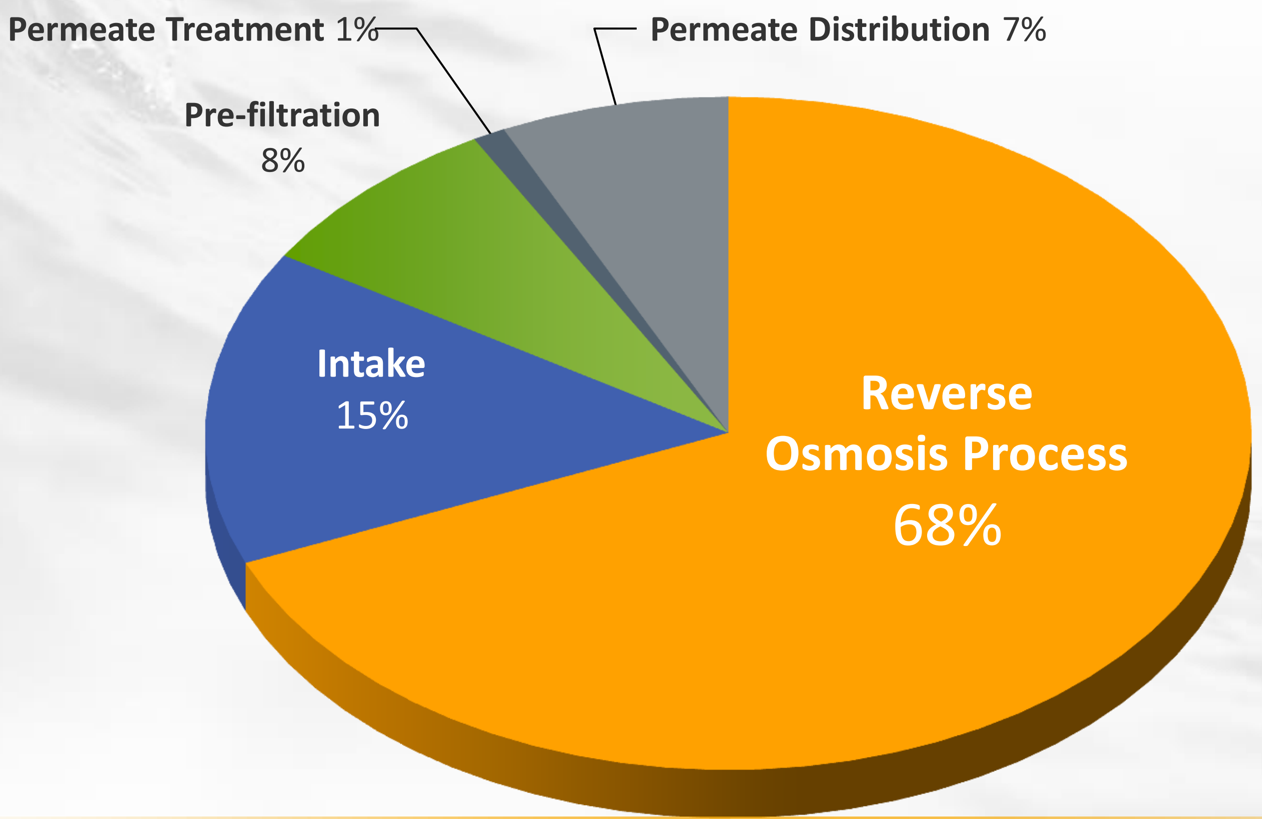
Power Cost USD/kWh	0.09
Debt Equity Ratio	80/20
Debt Interest Rate	8%
Equity ROI	18%

Operating Expenses— Breakdown

Perth Seawater
Desalination Plant
2008



Power Use — Breakdown (Seawater RO)



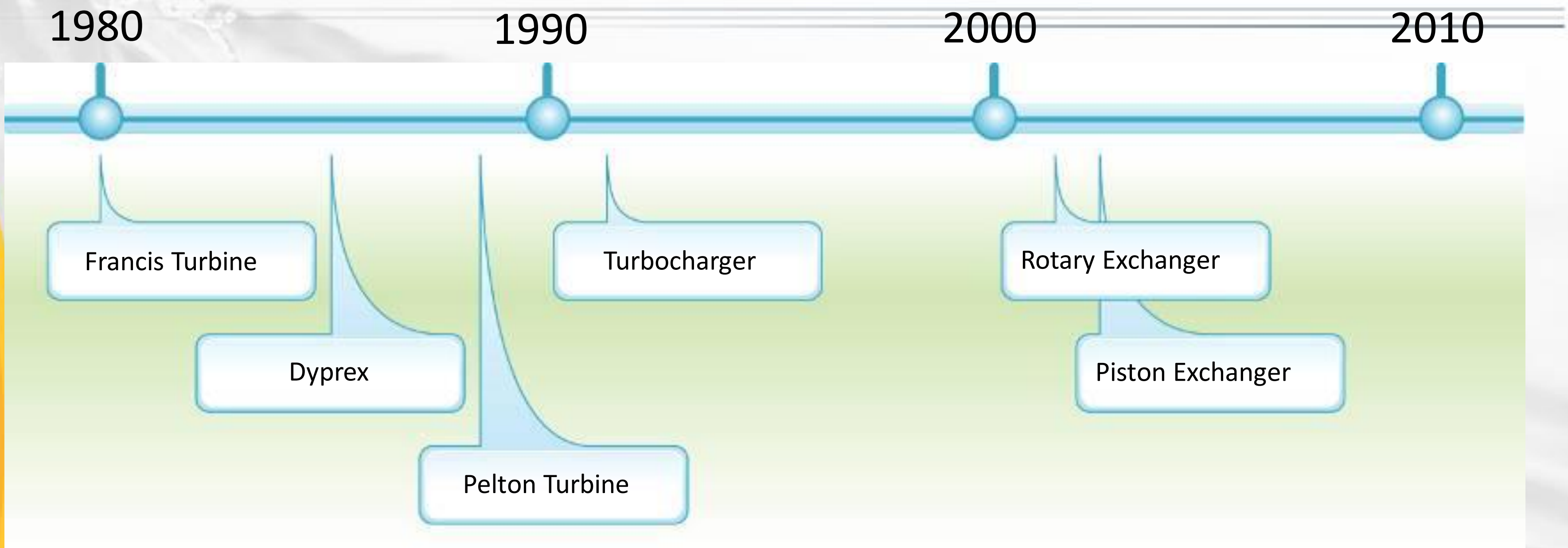
RO power consumption is approximately 20% (up to 45%) of total SWRO cost

Source: *Affordable Desalination Collaboration,* 2008

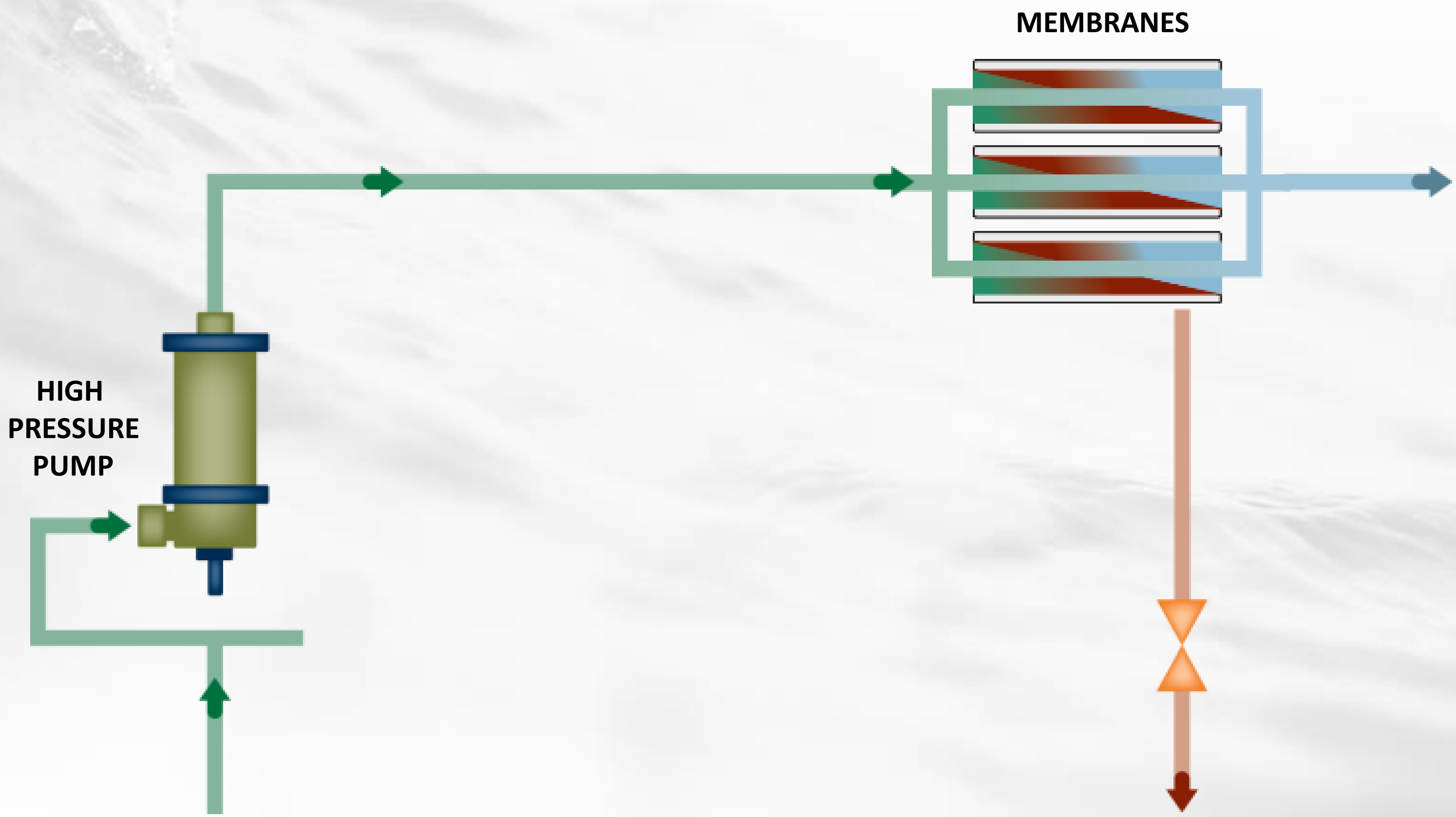
Making Desalination Affordable

DESALINATION SYSTEMS

Desalination Systems

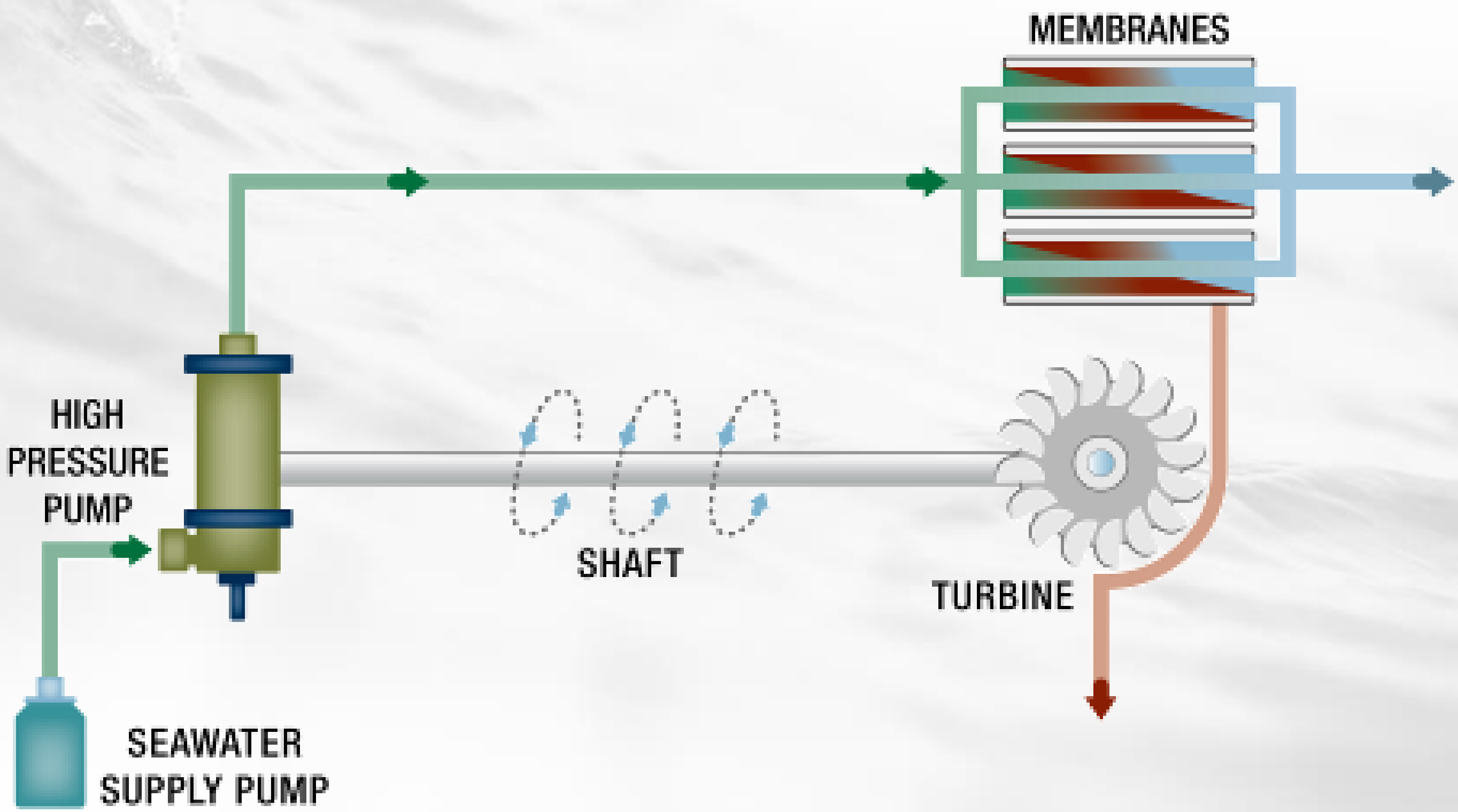


Seawater RO: Before Energy Recovery Devices



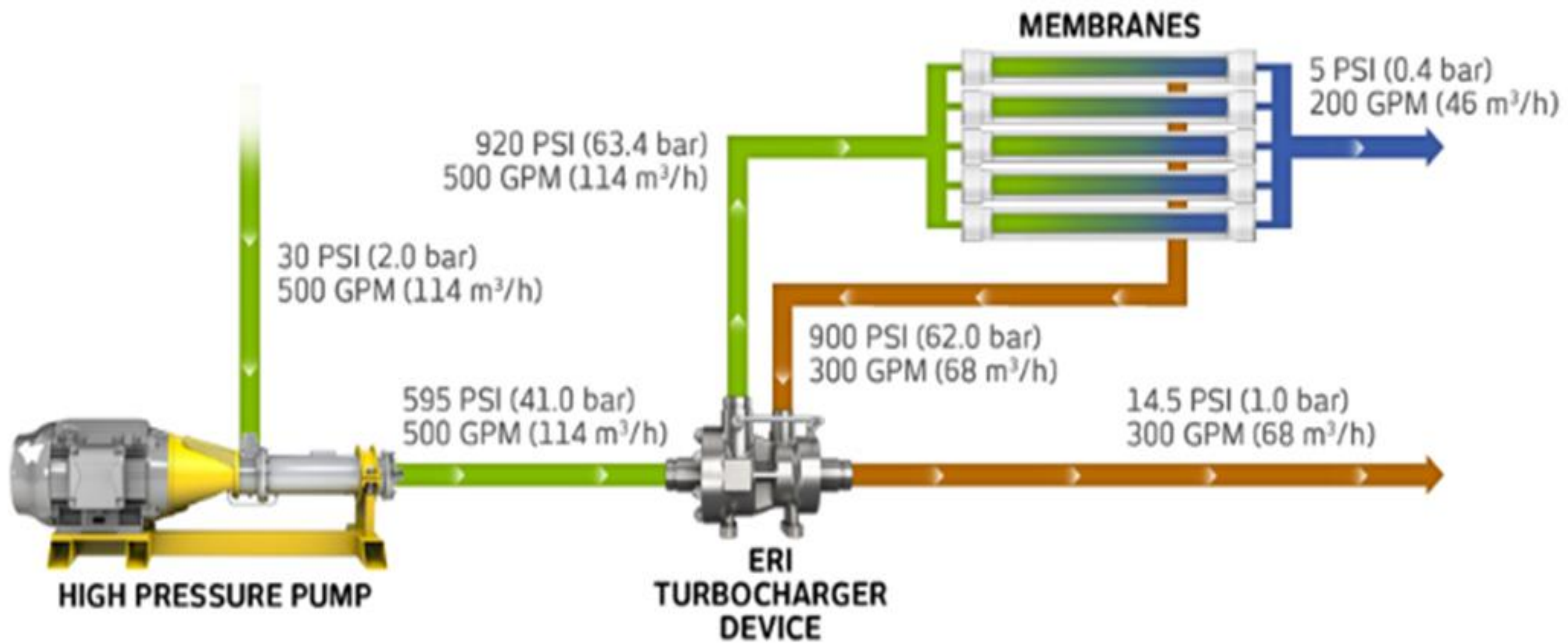
Issues: high pumping costs, wasted energy, lack of optimization

Seawater RO: Pelton Wheel/Francis Turbine Energy Recovery Devices

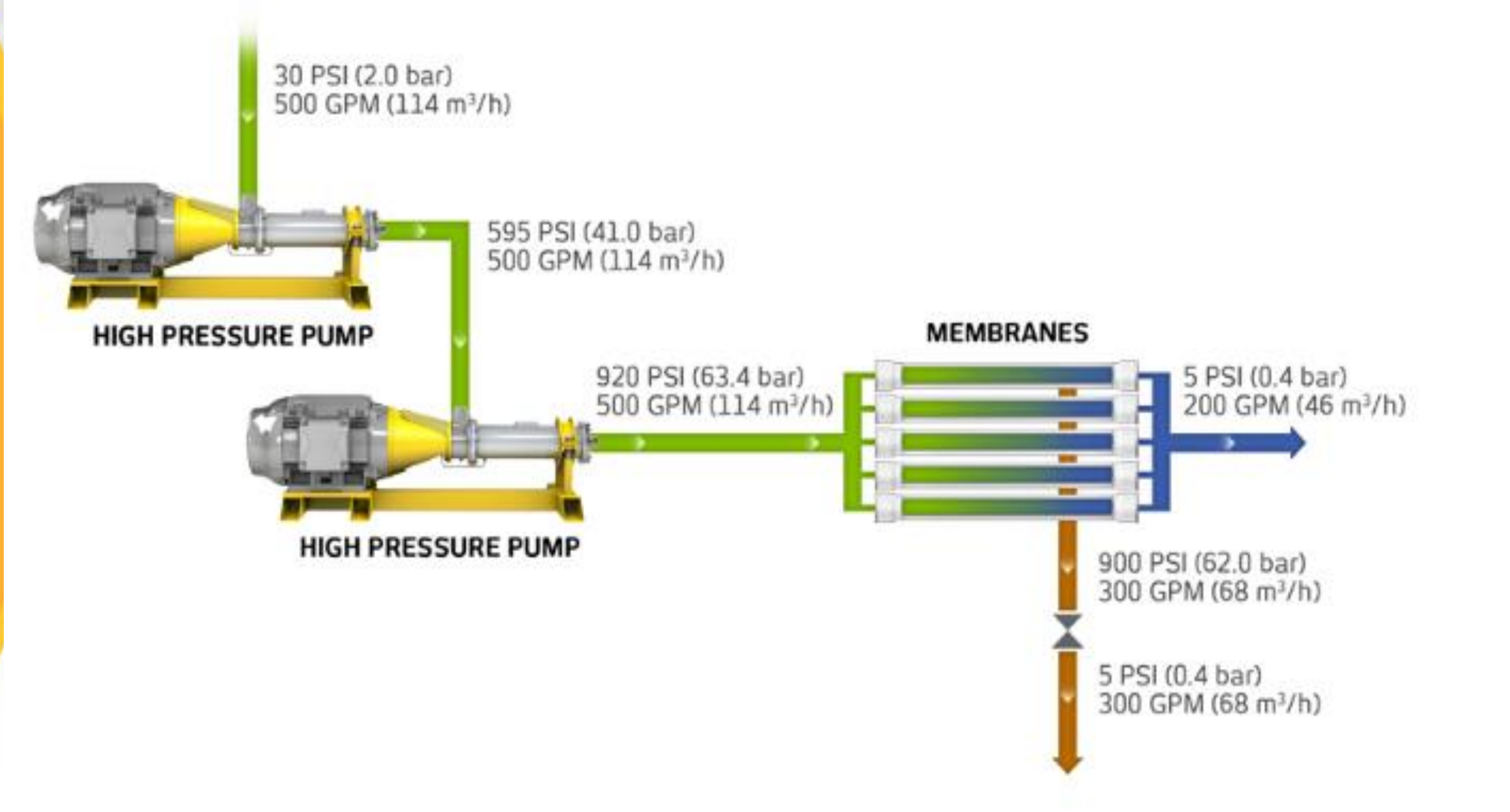


Hydraulic --> Mechanical --> Hydraulic

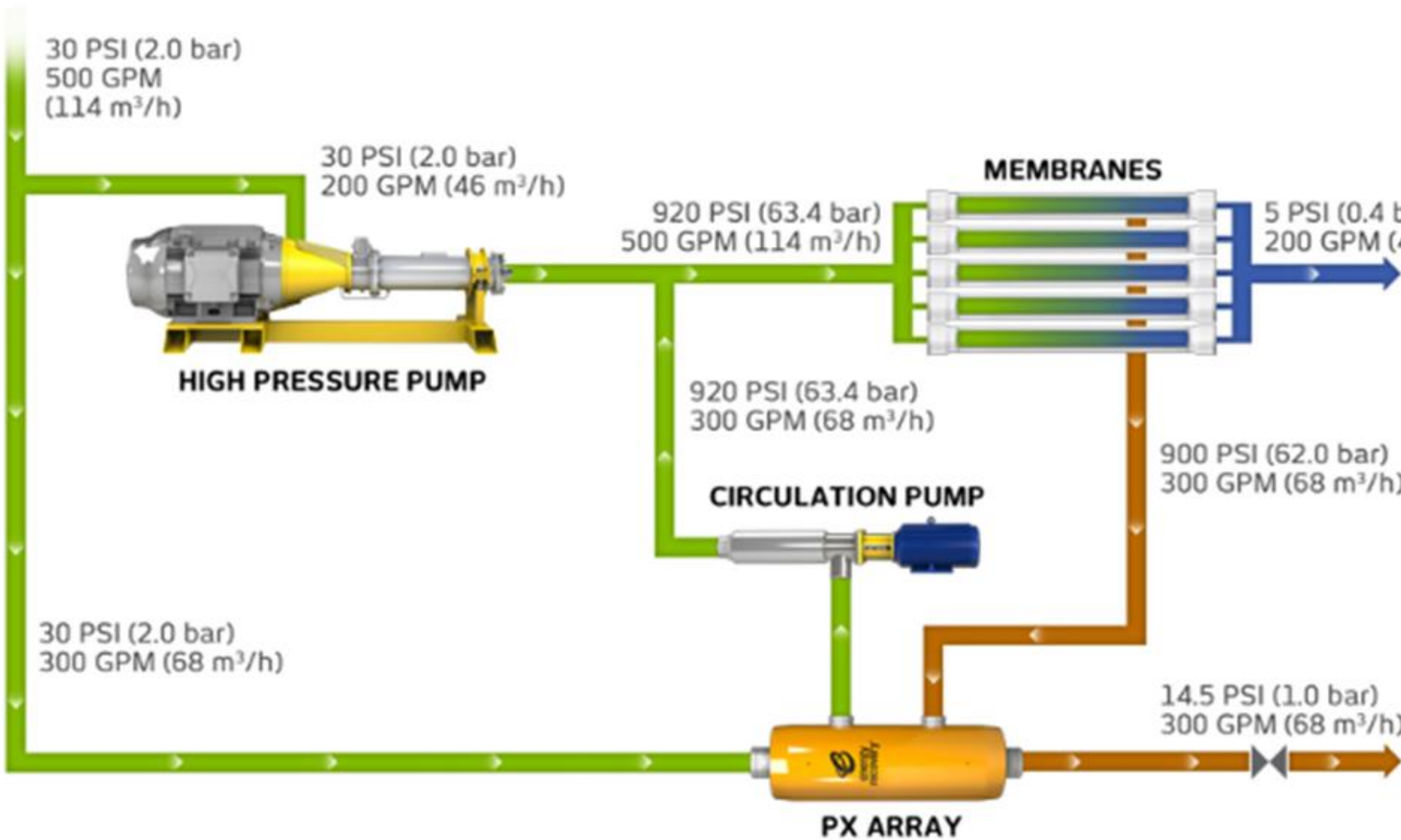
Seawater RO: ERI TurboCharger™ Energy Recovery Devices



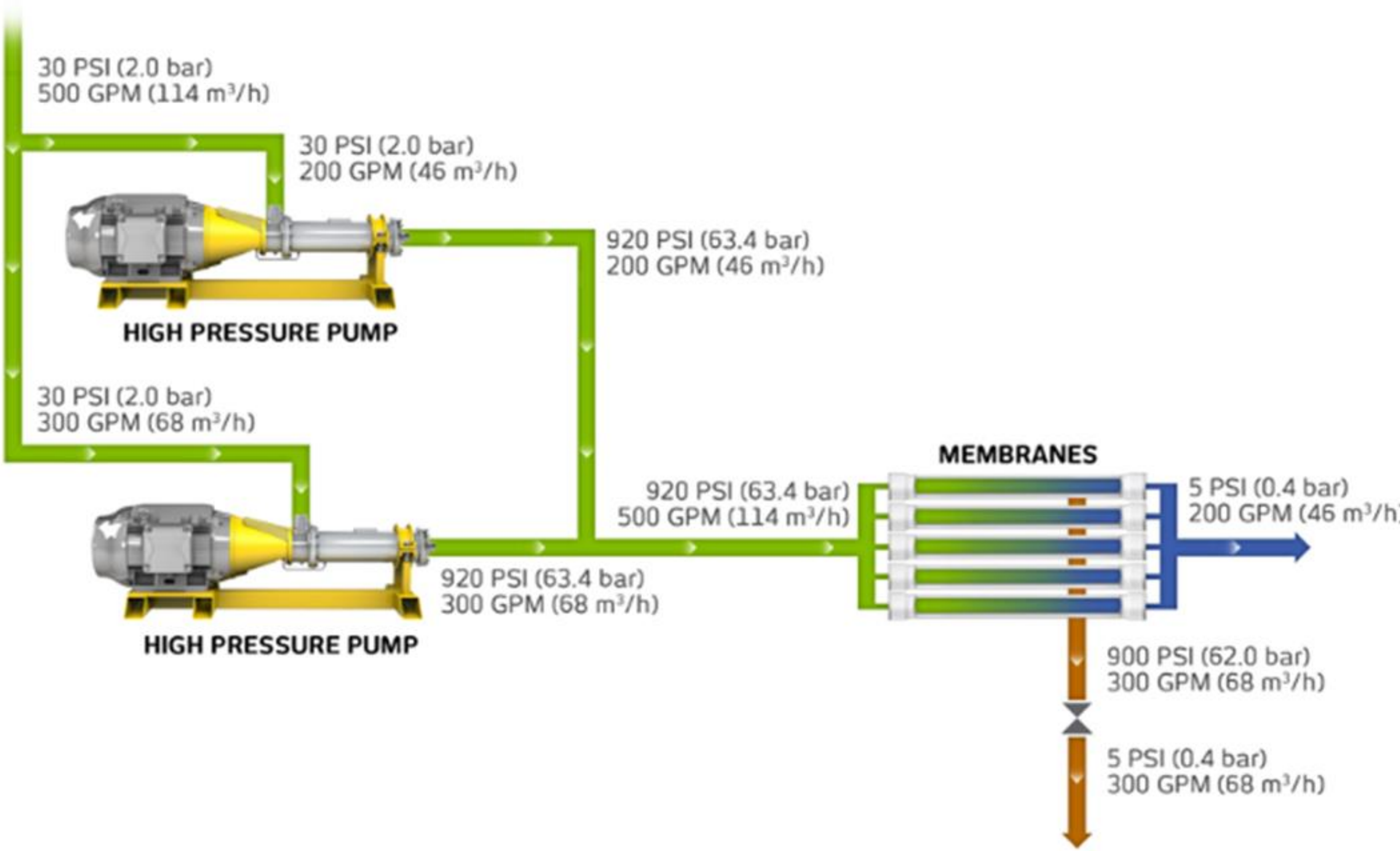
Seawater RO: ERI TurboCharger™ Energy Recovery Devices



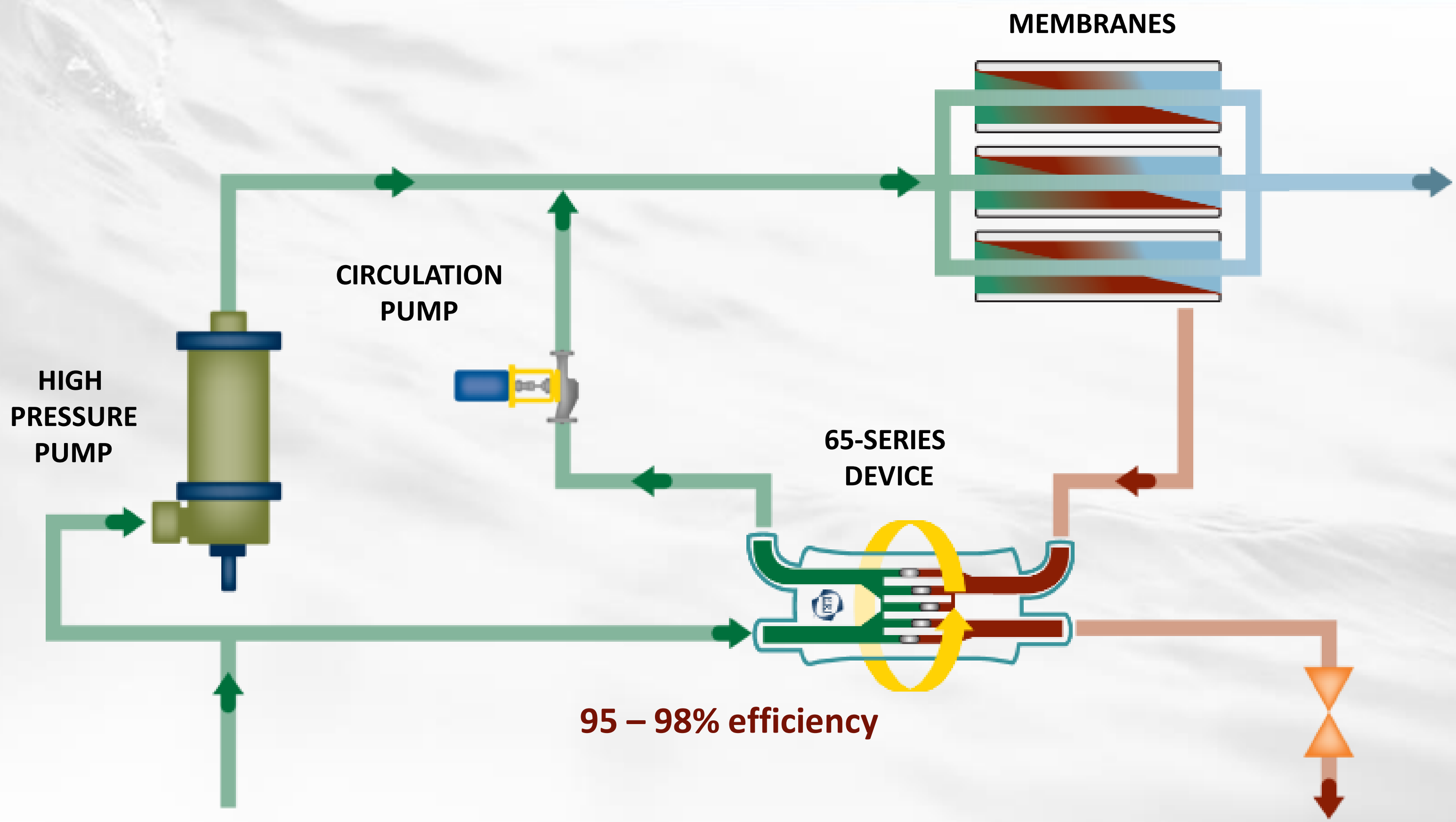
Seawater RO: ERI PX Pressure Exchanger™ Energy Recovery Devices



Seawater RO: ERI PX Pressure Exchanger™ Energy Recovery Devices



Seawater RO: Positive Displacement Energy Recovery Devices

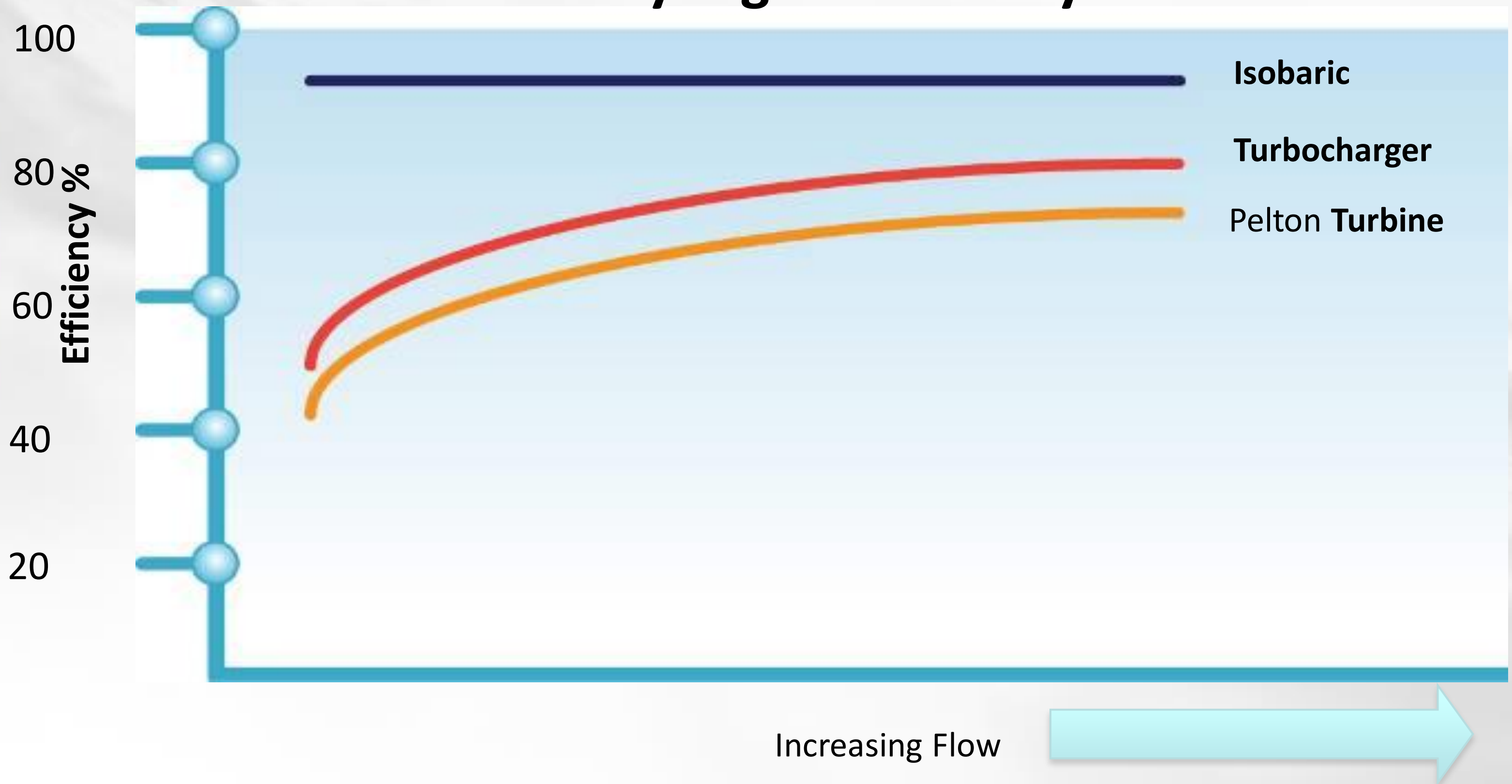


Smaller pump, high constant efficiency, flexible operation

Hydraulic --> Hydraulic

Constant High Efficiency

Isobaric energy recovery systems have high efficiency regardless of system size

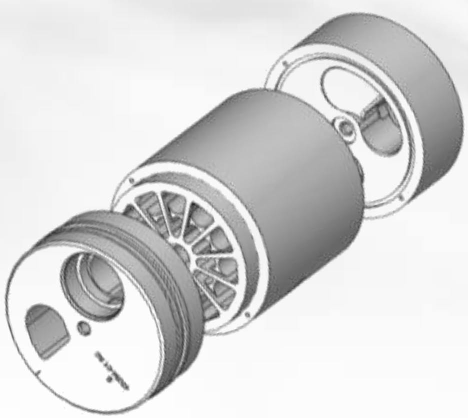


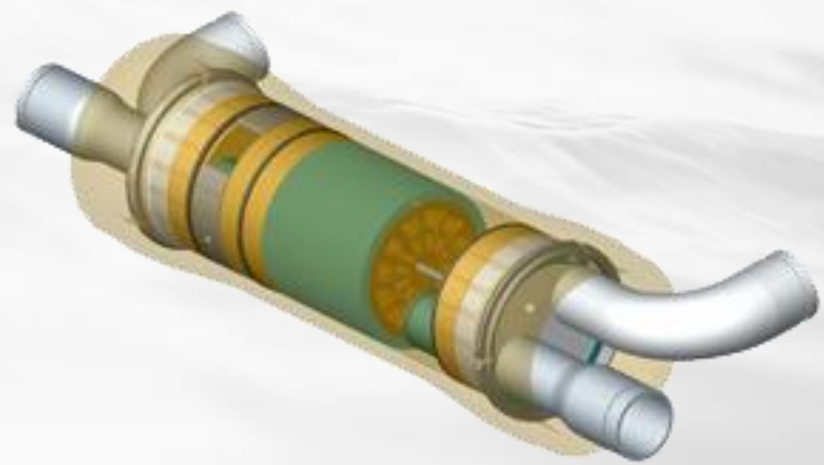
An Isobaric High Efficiency Energy Recovery Solution

THE PX™ PRESSURE EXCHANGER™ DEVICE

The PX™ Device

- 2 high-pressure connections
- 2 low-pressure connections
- Ceramic cartridge

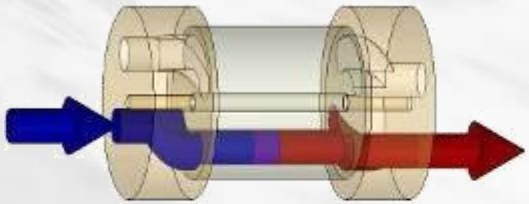




rotor/sleeve assembly, end covers

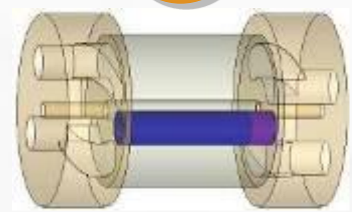
The PX™ Device at Work

1



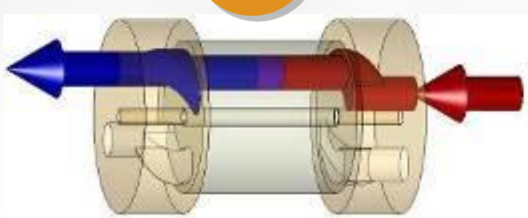
Low-pressure feed water fills rotor chamber, displacing brine

2



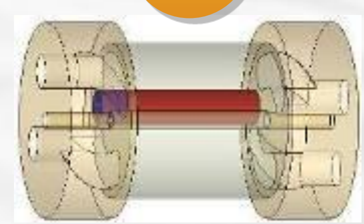
Rotor chamber seals, containing low-pressure feed water

3



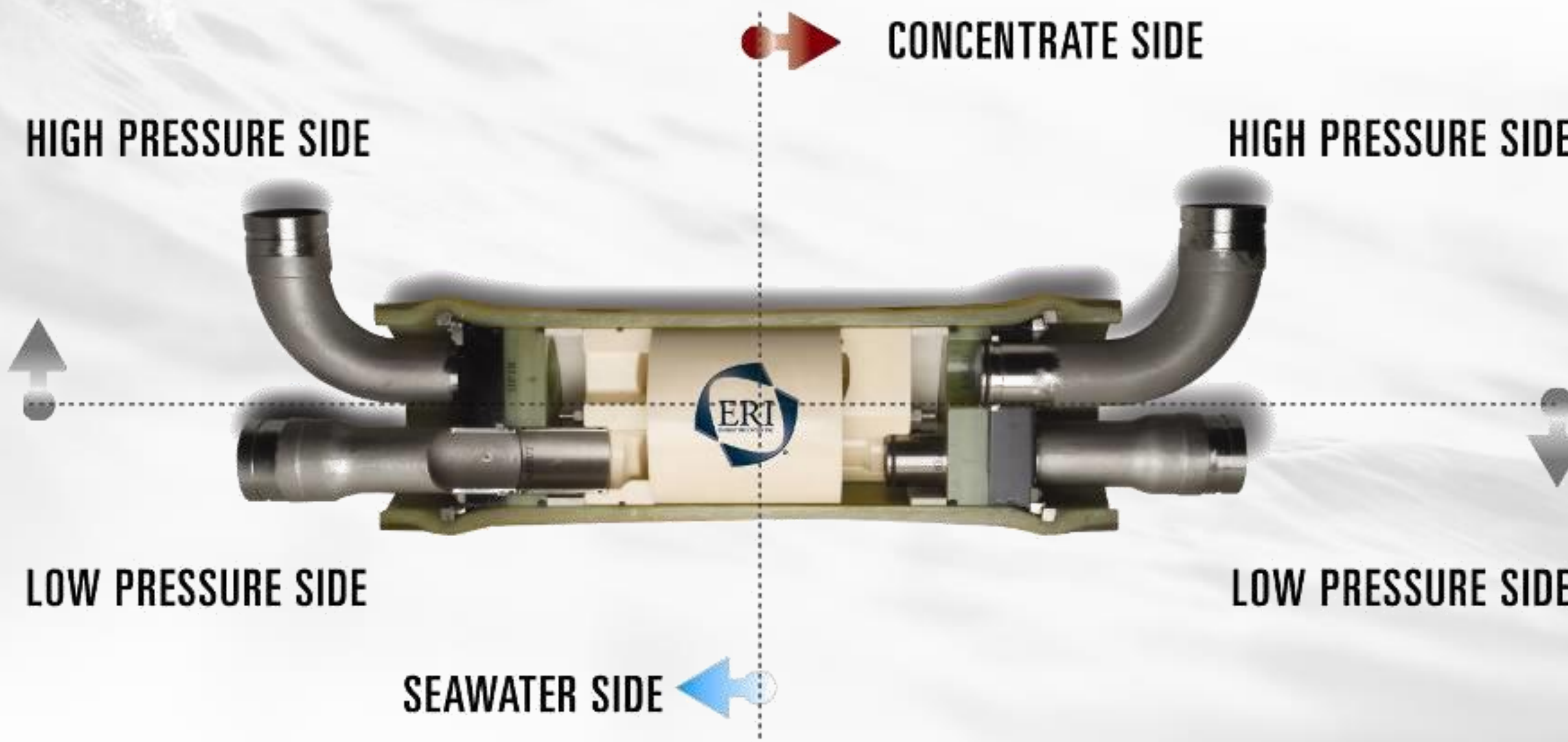
High-pressure brine pressurizes and displaces feedwater

4



Rotor chamber seals, containing high pressure brine

A Look Inside the PX™ Device Pressure Vessel



Isobaric Technology:

Product	
65-Series PX-180 PX-220 PX-260 PX-Q260	
4S-Series PX-30S PX-45S PX-70S PX-90S PX-140S	

Product	
Quadribaric Technology™ PX-300 PX-Q300	
Circulation Pumps	 

GRUNDFOS

- BMEX Skid

The PX™ Energy Recovery Technology Advantage

- Highest Energy Efficiency Guarantees ~ 97.2%
  - Performance never degrades over time
  - Saving clients more than $1 billion in energy costs alone each year!

- Uptime: 99.8% Availability Advantage
  - Zero unplanned downtime can offer average savings of $15 million over the life of a plant*
    - *estimated for a typical 100K m3/d plant
  - PX energy recovery devices are never responsible for plant down-time or loss of production

- Lowest Lifecycle Costs
  - Best Economics: Highest Return on Investment

Energy Recovery Device – PX™ Technology Advantages

- Durability – Designed for a lifetime
  - Designed for plant lifetime (25+ years minimum)
  - Robust ceramics- improved formulation
  - Never corrodes or fatigues
- No Scheduled Maintenance
- Modularity & Flexibility
  - Scalable (limitless capacity)
  - Flexible operations (recovery/flows)
  - Built-in redundancy
  - Flexible orientation

Energy Recovery Device – PX™ Technology Advantages

Quickest Start-up

- Installation time - Starts up within days
  - 5-6 times faster than other piston-type isobaric ERDs
  - Weeks versus months
- No controls, wires or electrical connections
- All devices automatically adjust speed to match flow
- Lightweight/Small footprint

Energy Recovery Device – PX™ Technology Advantages

- Rotor
  - One moving part Hydrodynamic bearing
  - Automatic speed adjustment
  - No material to material contact

- State-of-the Art Materials
  - Ceramics
  - Extremely durable material (3X steel hardness)
  - Never corrodes
  - No fatigue

The Latest Generation:
Q Series PX-Q300

Benefits

- Highest Efficiency Guarantee – 97.2%
- Lowest Lifecycle Costs- Best ROI
- 99.8% Uptime – zero planned down-time
- Ease of Installation – minimal footprint

Features

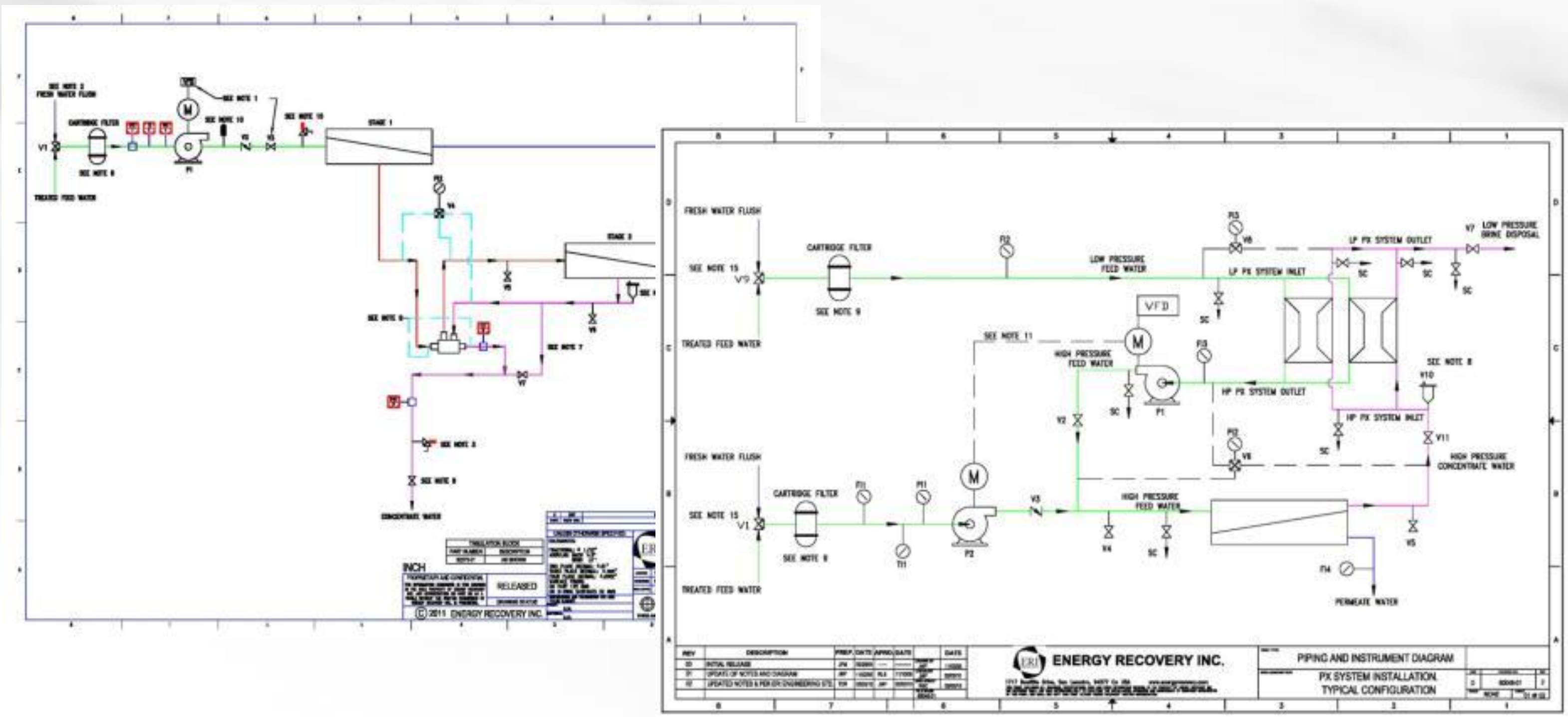
- Quietest PX technology – Below 81dB
- All other nice features of the PX device family..

SWRO ENGINEERING DESIGN & OPTIMIZATION

ERI Services

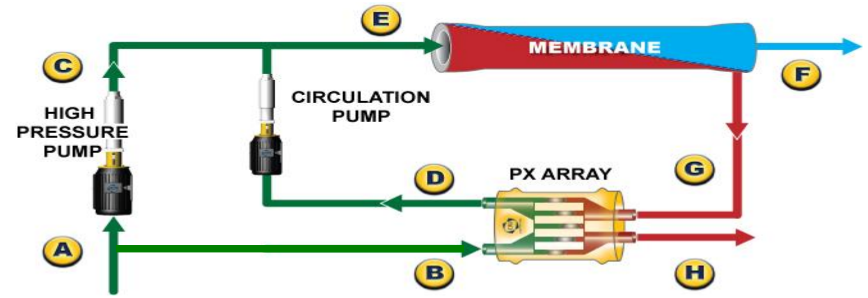
ERI is Pleased to offer the following Services:

- P&ID Reviews
- Control Logic Reviews



Energy Recovery Power Models and Selector Tools

1/4/2008 **PX® Energy Recovery Device System Analysis**



		A	B	C	D	E	F	G	H
FLOW	US gpm	408	222	186	222	408	183	224	224
	m3/hr	93	50	42	50	93	42	51	51
	m3/day	2,222	1,211	1,012	1,211	2,222	1,000	1,222	1,222
PRESSURE	psi	24	24	943	919	943	0	928	15
	bar	1.7	1.7	65.0	63.4	65.0	0.0	64.0	1.0
QUALITY	mg/l	39,000	39,000	39,000	41,025	40,103	200	72,751	70,745

PX UNIT PERFORMANCE

PX model		PX-260
Number of PX units	quantity	1
PX unit flow	m3/hr	50.9
PX lubrication per array	m3/hr	0.5
PX lubrication flow	%	0.9%
Dfferential pressure HP side	bar	0.6
Differential pressure LP side	bar	0.7
PX efficiency	%	97.2%
PX mixing at membrane feed	%	2.8%
Operating capacity	%	86.2%
Energy recovered	kW	139.9

HIGH PRESSURE PUMP

HP pump efficiency	%	68%
HP pump motor efficiency	%	92%
HP pump power consumed	kW	118.0

CIRCULATION / BOOSTER PUMP

Circulation pump efficiency	%	65%
Circulation pump motor efficiency	%	91%
Circulation pump VFD efficiency	%	97%
Total circulation pump power	kW	3.9

SYSTEM FEED PUMP	kW	**0.0**

INPUT DESCRIPTIONS		**INPUTS**
Units Metric or English	M or E	**M**
Manual or auto efficiencies	m or a	**a**
Permeate flow	m3/day	**1,000**
RO recovery rate	%	**45%**
RO feed pressure	bar	**65.0**
Membrane differential pressure	bar	**1.0**
PX LP discharge pressure	bar	**1.0**
Feedwater salinity	mg/l	**39,000**
Cost of power	$/kWh	**$0.10**
HP pump efficiency	%	
HP pump motor efficiency	%	
Circulation pump efficiency	%	
Circulation pump motor efficienc	%	
Circulation pump VFD efficiency	%	
PX device design margin	%	

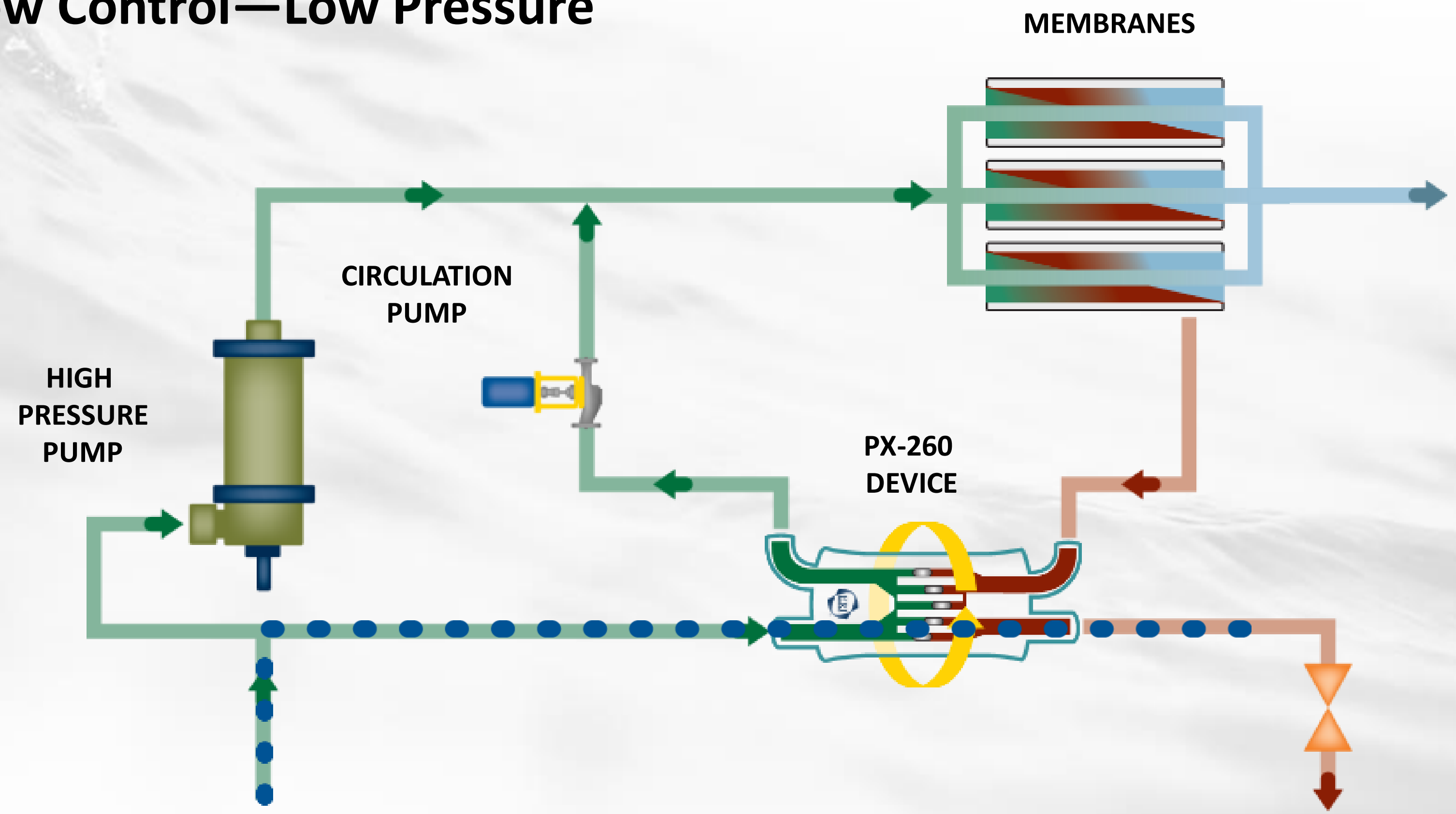
PX SYSTEM POWER RESULTS

Total power consumption	kW	122
Specific power consumption	kWh/m3	2.93
Specific power consumption	kWh/kgal	11.1
Power cost saved with PX	$/year	$ 122,510

Warnings	NONE
Suggestions	NONE

SWRO Engineering Design

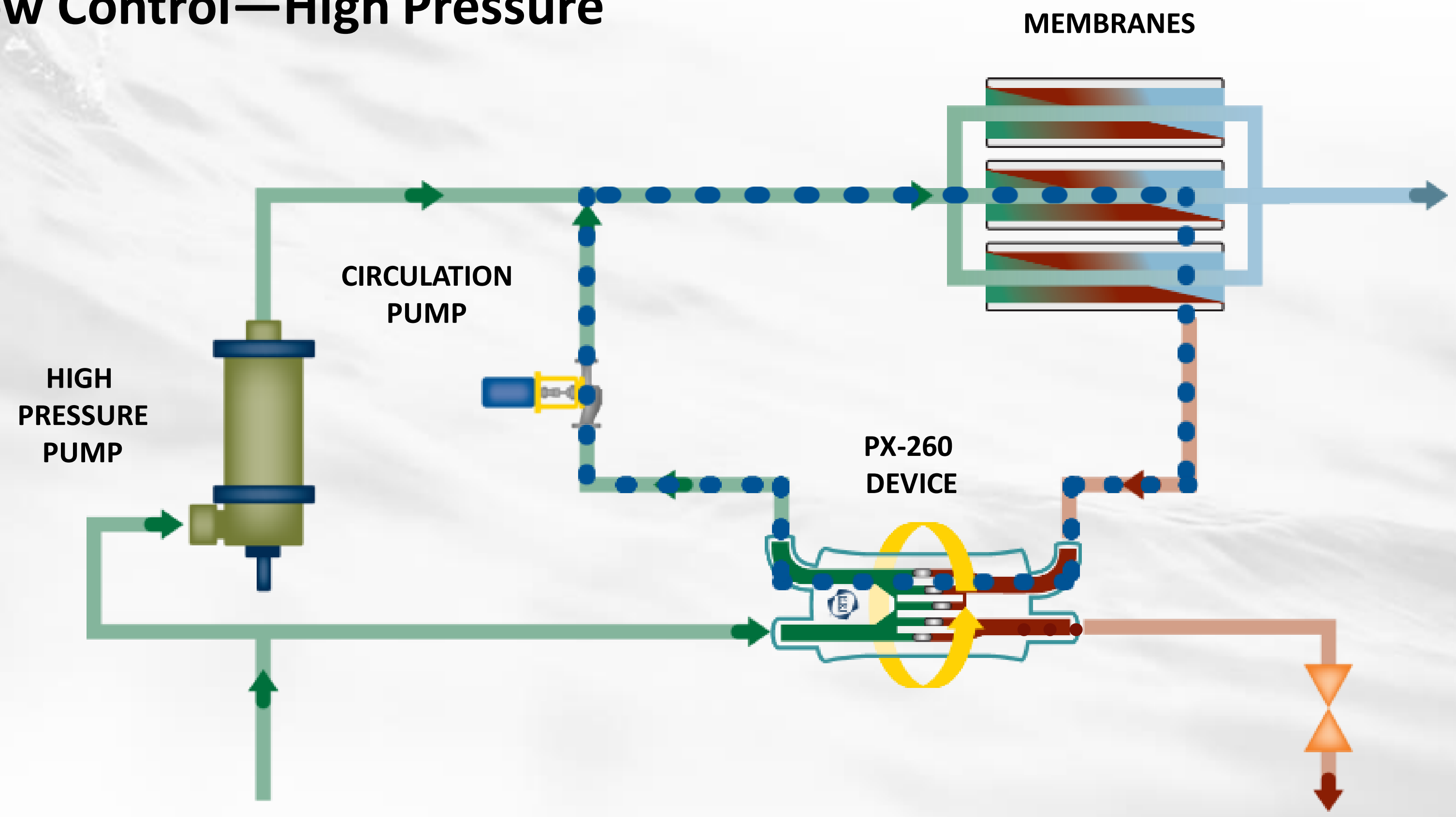
Flow Control—Low Pressure



LP flow rate set by discharge flow control valve

SWRO Engineering Design

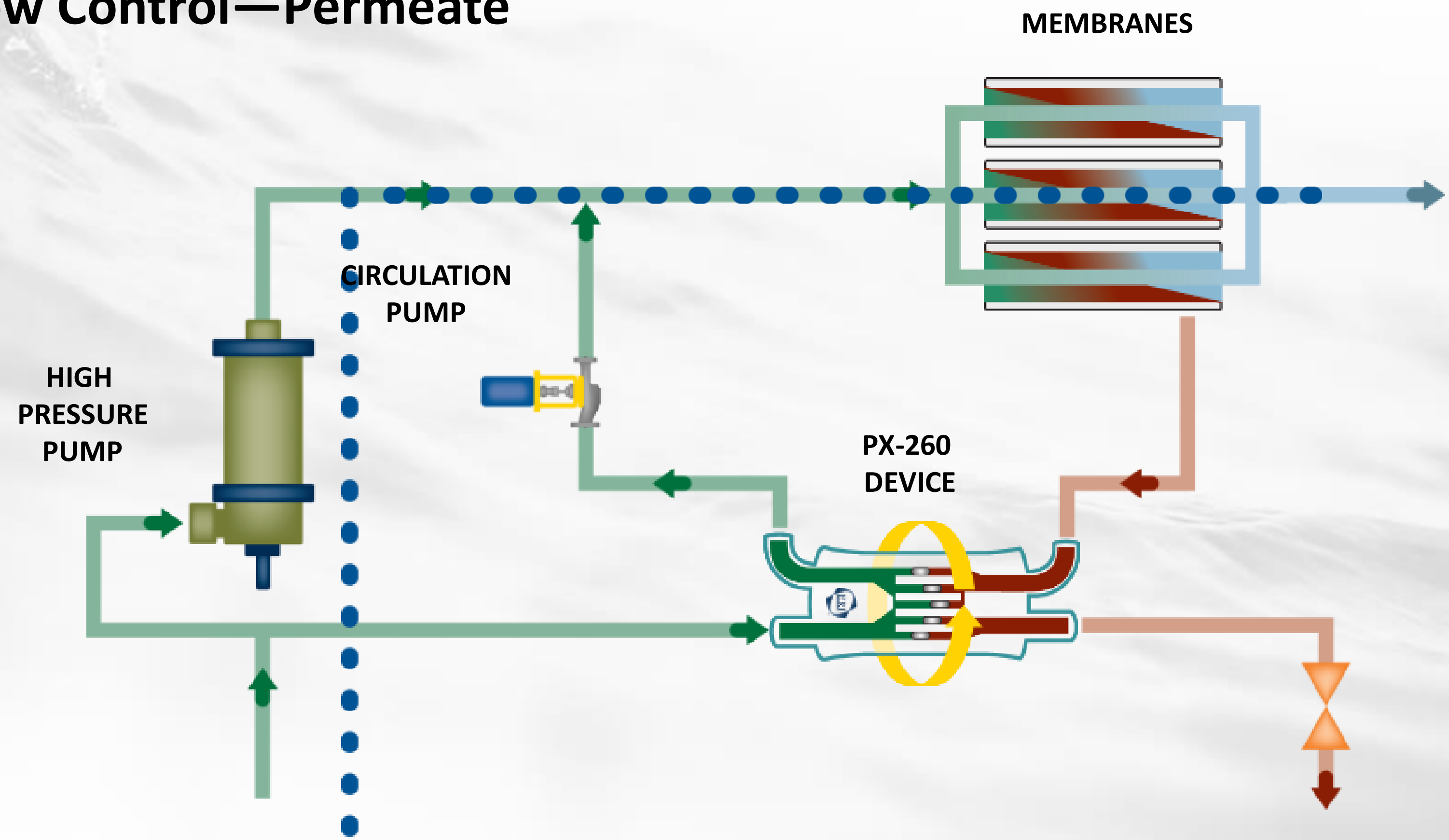
Flow Control—High Pressure



HP flow rate set by booster pump

SWRO Engineering Design

Flow Control—Permeate

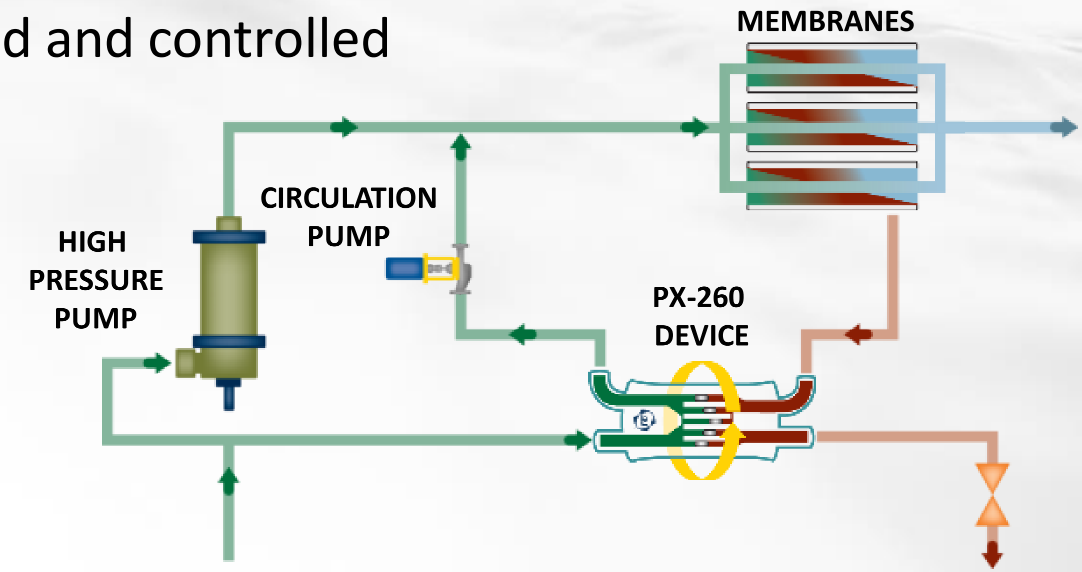


Permeate flow rate set by high pressure pump and membranes

SWRO Engineering Design

PX Flow Control

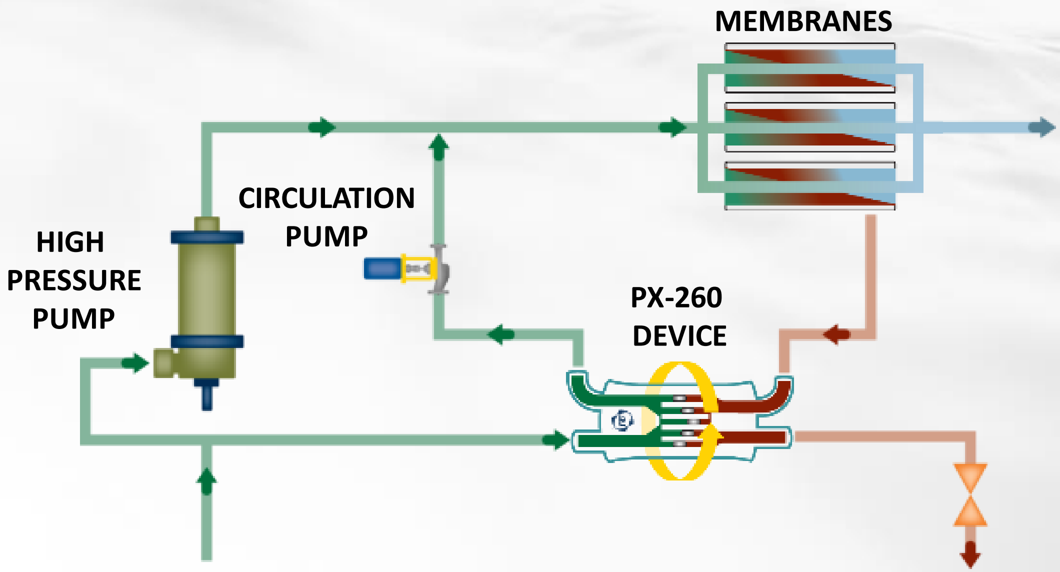
- The PX™ works like two parallel pipes
- High-pressure flow rate controlled by booster pump
- Low-pressure flow rate controlled by discharge valve
- High-pressure pump flow is permeate flow
- All three main flows are independent
- HP and LP flows must both be metered and controlled



SWRO Engineering Design

Pressure Control

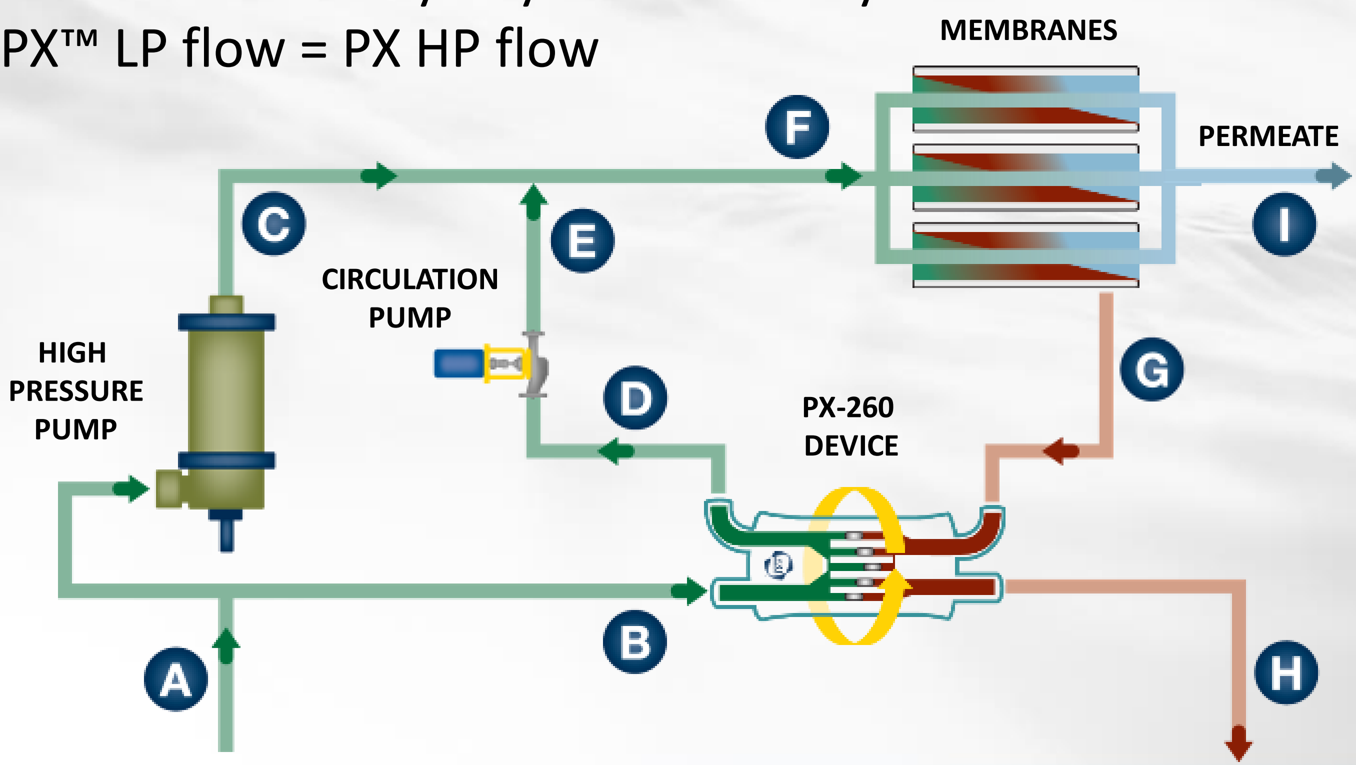
- LP valve does not directly affect membrane pressure
- System pressure determined by membrane condition, feed temperature and feed salinity
- Supply pressure changes cause LP flow rate changes
- PX™ LP out pressure must be maintained above minimum



SWRO Engineering Design

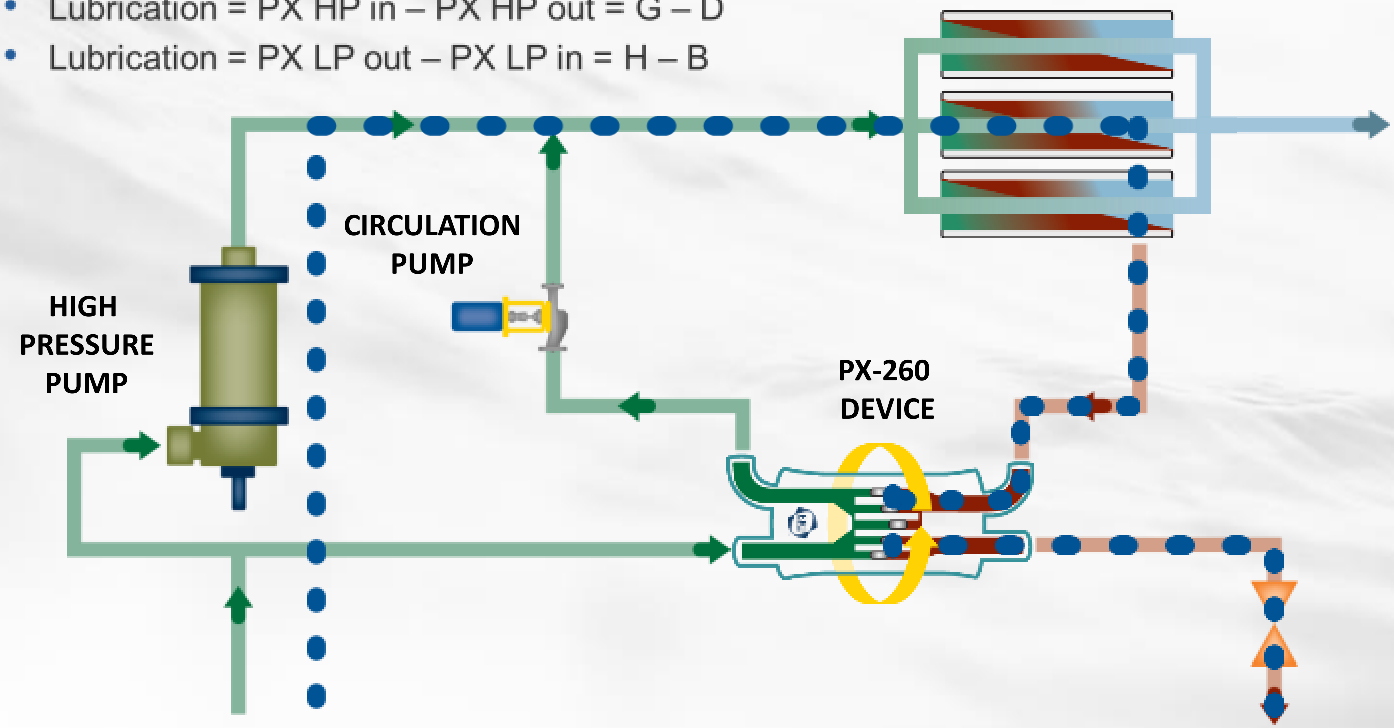
Water Recovery

- Membrane water recovery = I / F
- System water recovery = I / A
- Membrane recovery = system recovery if PX™ LP flow = PX HP flow



SWRO Engineering Design

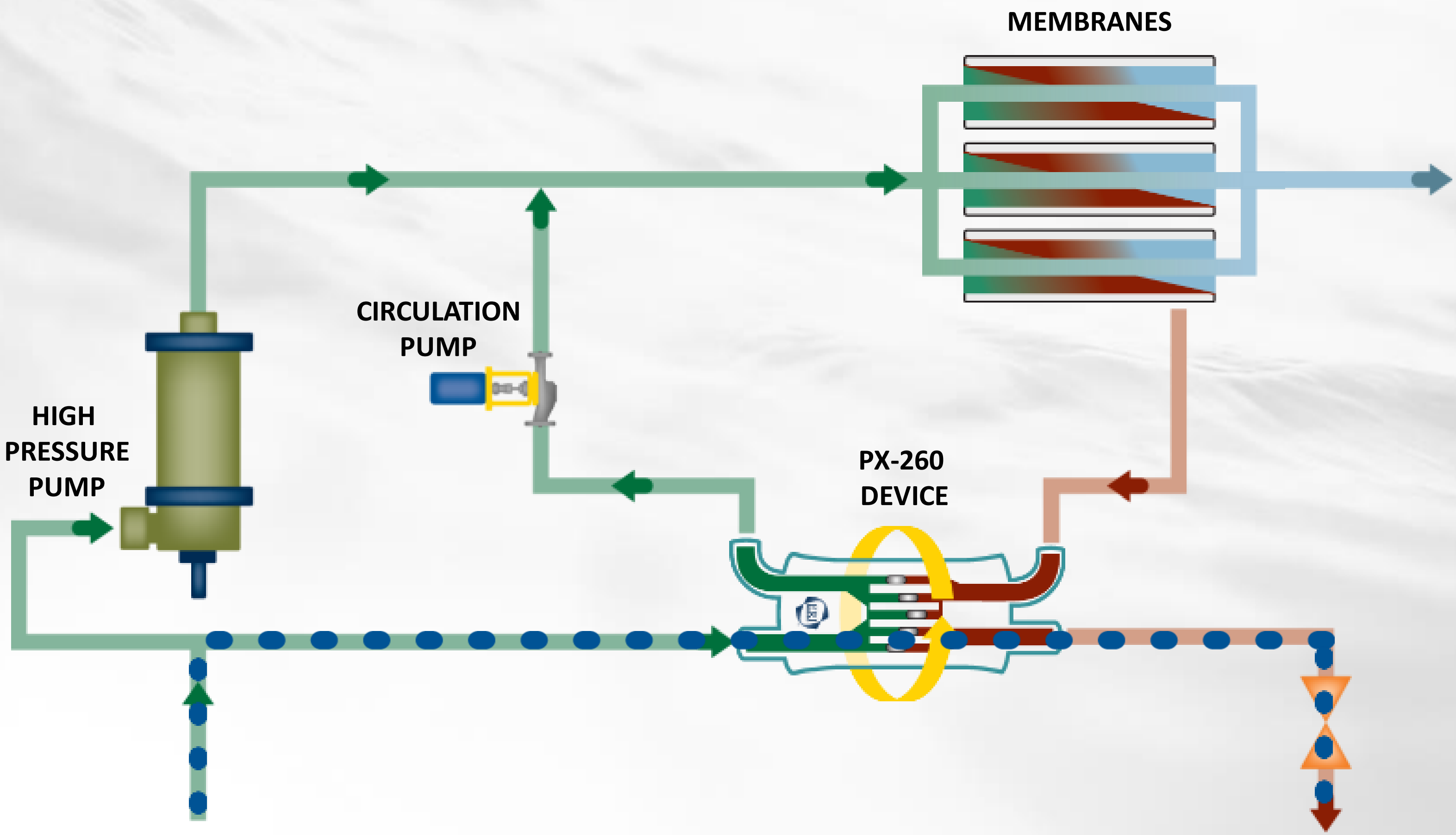
- PX Lubrication – High Pressure Flow Through Hydrodynamic Bearing
  - Lubrication = HP pump – permeate = C – I
  - Lubrication = PX HP in – PX HP out = G – D
  - Lubrication = PX LP out – PX LP in = H – B



Lubrication flow rate dictated by system pressure and temperature and PX seals

SWRO Engineering Design

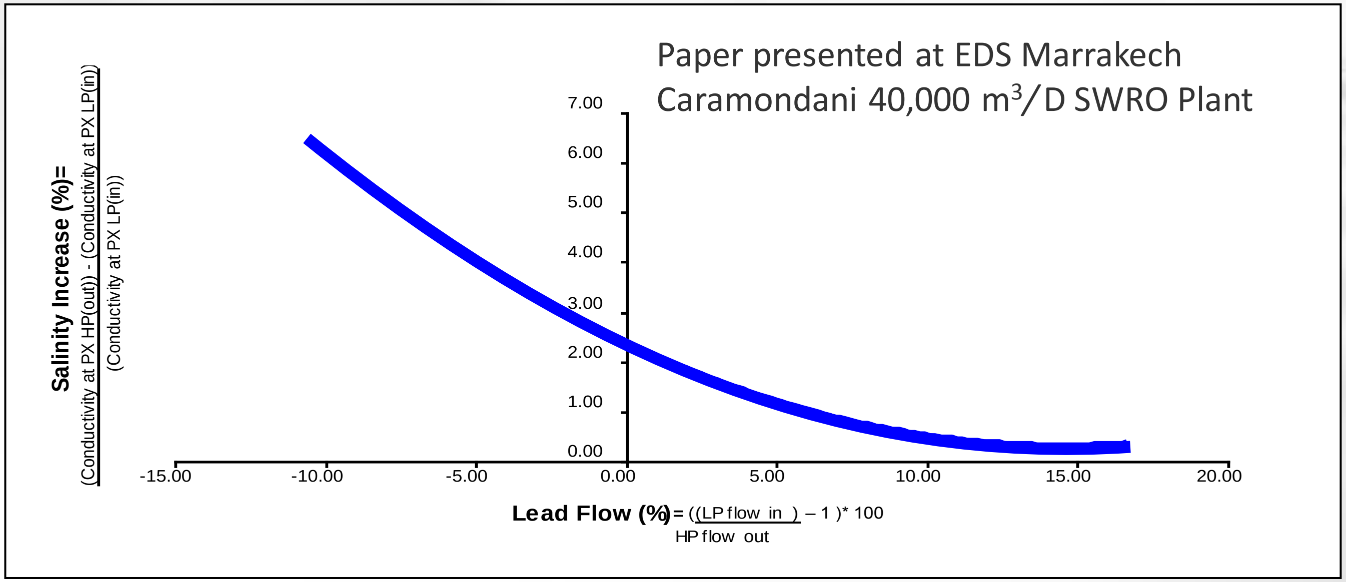
Mixing Effects– Lead Flow or “Overflush”



SWRO Engineering Design

Mixing

- Feed water salinity increase @ 40% recovery = 2.5%
- Operating pressure increase = 1.3 bar
- Operator Options:
  - Accept pressure increase (= 2°C feed temp decrease)
  - Decrease recovery by 2%
  - Increase low-pressure supply to the PX™ by 5%



SWRO Engineering Design

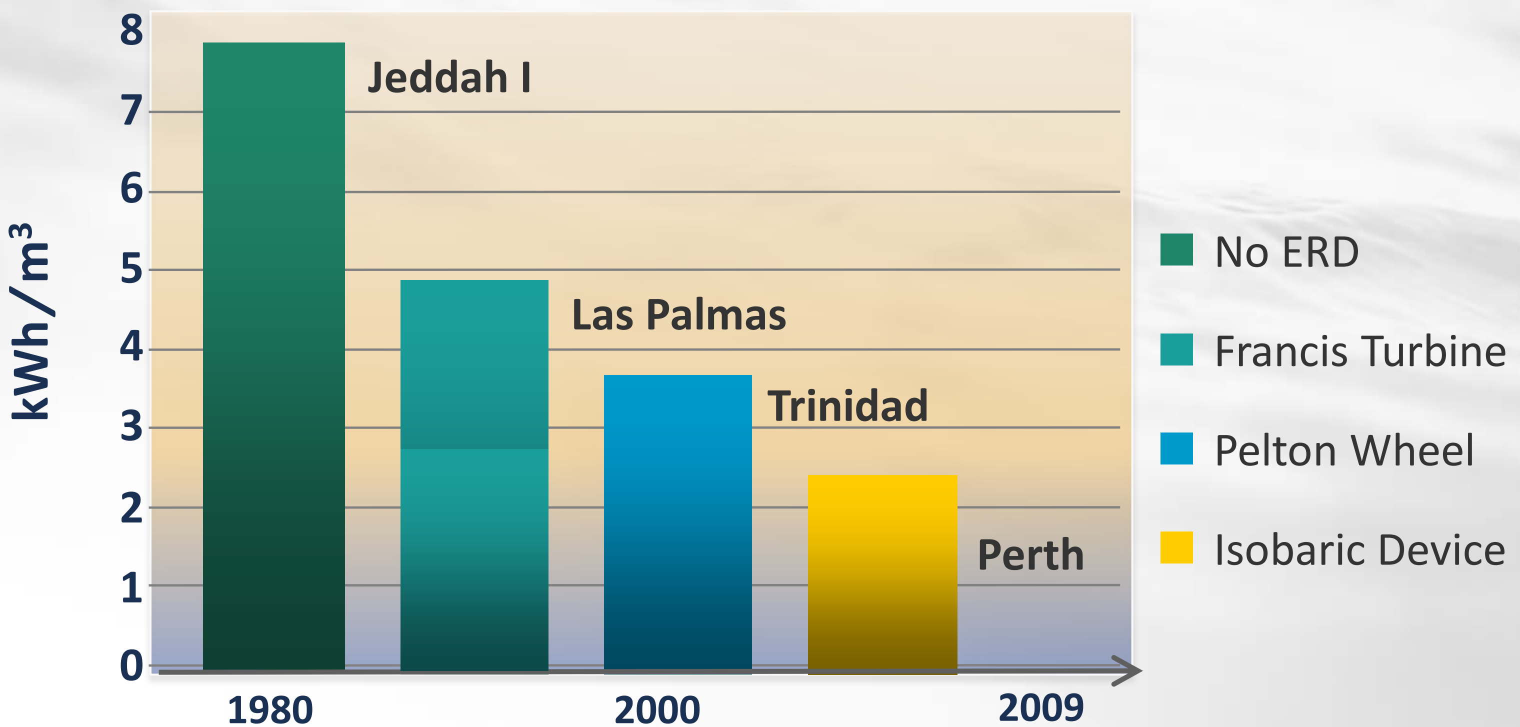
Engineering Design Summary

- HP and LP flows are independent
- Good flow control: stay within limits of PX™ unit
- Constant PX device feedwater pressure
- Get the air out
- Equal flow to all PX units in arrays
- Maintain adequate back-pressure
- Lowering recovery usually improves SWRO performance

RETROFIT AND EXPANSION PLANT DESIGNS

Retrofit

- Retrofit = modifying an existing plant by adding newly developed devices that were not available when the plant was made.
- Improvements in ERD, membranes and centrifugal pumps designs have enormously reduced the RO Specific Energy Consumption.

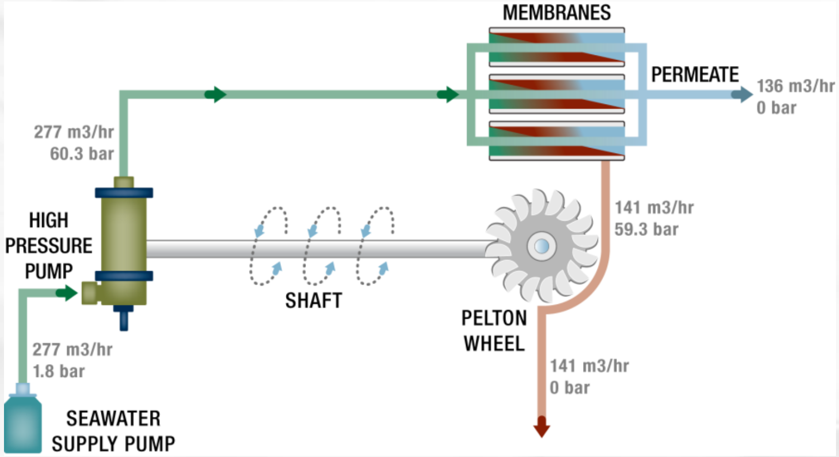


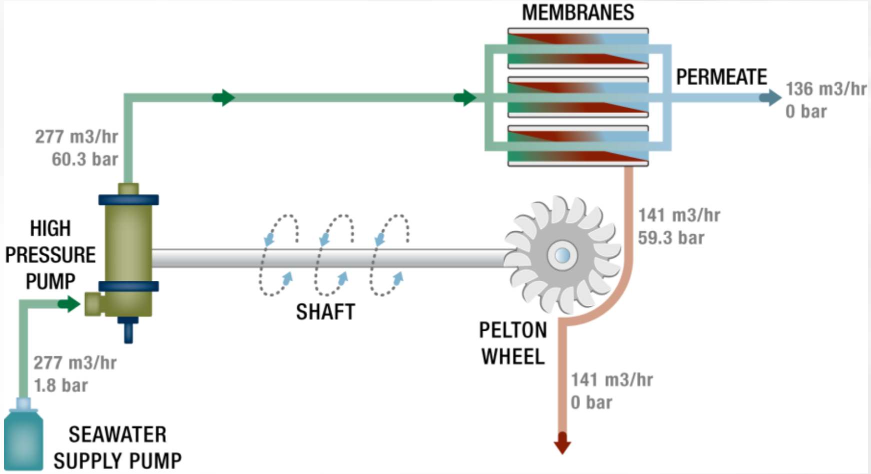
Retrofit Benefits

- Highest Efficiency currently available
- Upgrade to the latest advanced technologies widely used today
- Enhance plant performance
- Expand plant capacity and production supply
- Reduce operational costs
  - Significant reduction in energy costs and CO_2 emissions.
  - All achieved with minimum additional equipment and reduced civil works.
  - Flexibility, constant efficiency over a wide range, variable recovery rate operating ability.

Retrofit with Isobaric ERD's

- Before: Original system with Pelton Wheels

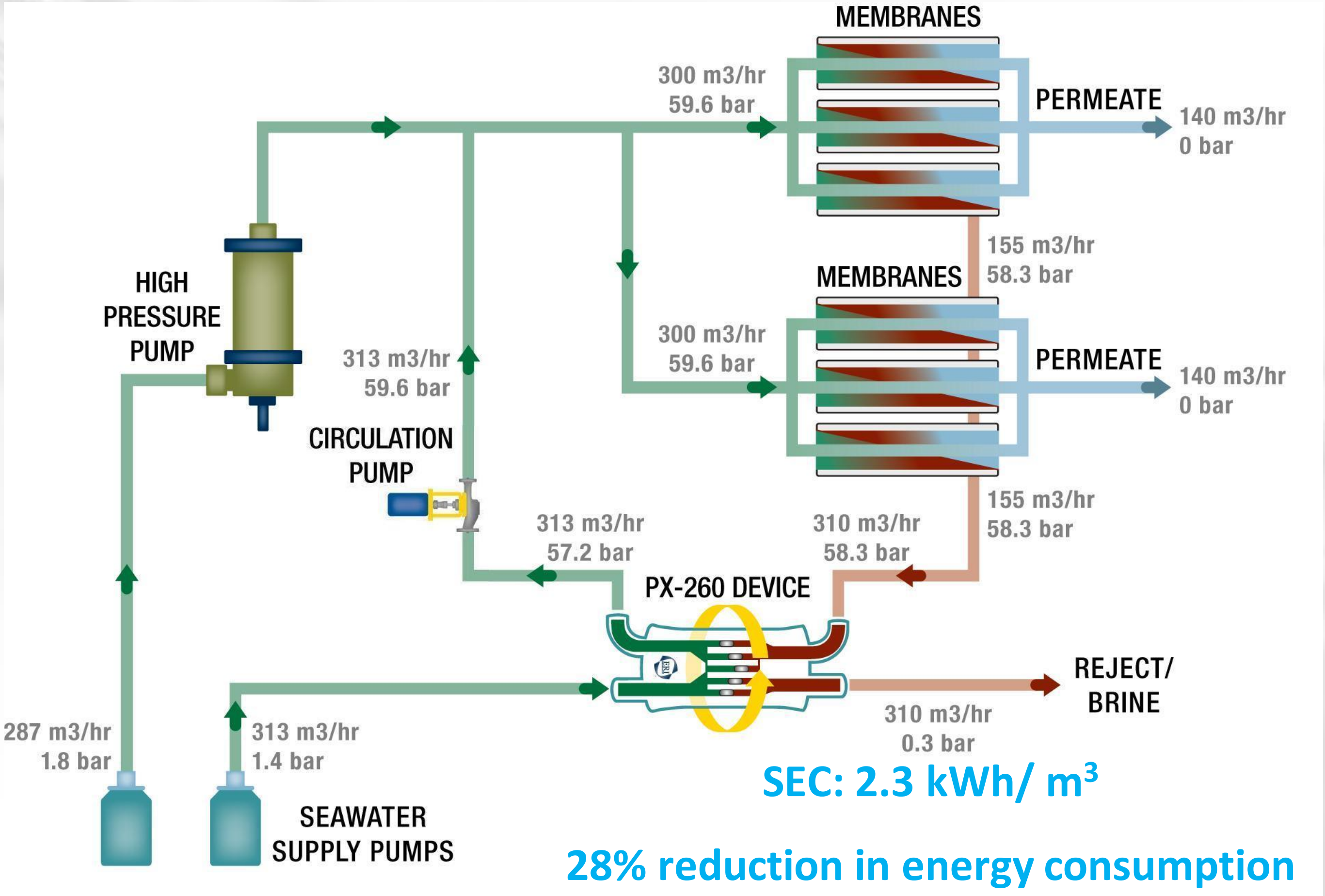




SEC: 3.2 kWh/m^3

Retrofit with Isobaric ERD’s

- After: Modified system with Isobaric ERD’s



Retrofit Case Study

Tordera SWRO Plant, Spain. Expansion Retrofit.

- Original capacity 28,000 m^3/d, 4 trains 7,000 m^3/d each.
- Expanded capacity 64,000 m^3/d. 4 trenes de 16.000 m^3/d c/u.
- Recovery 45%, 15 PX-260 units per train

Before: SEC with Pelton: 3.06 KWh/m^3

After: 2.56 kWh/m^3

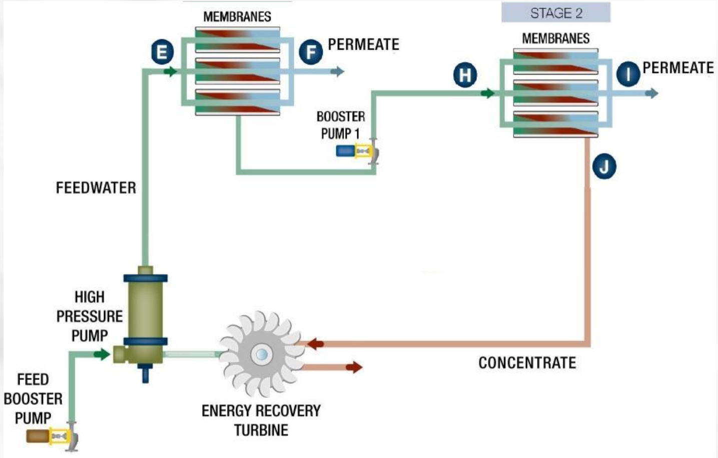
16.3% reduction in SEC

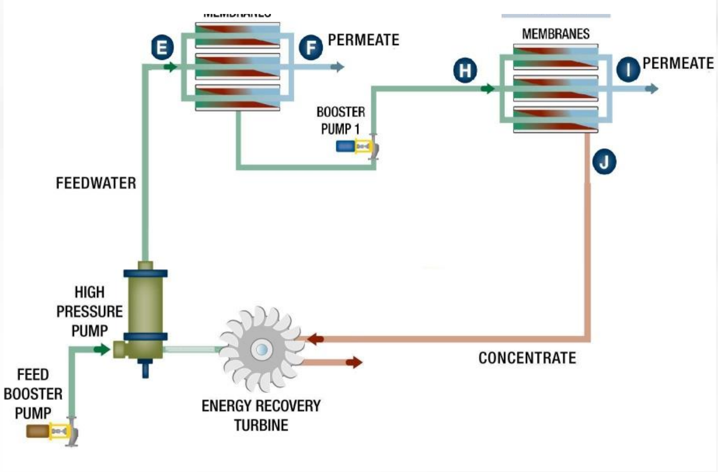
Same HPP, new motor, new membranes in the new trains.

Retrofit in two-stage systems

- SWRO system with inter-stage booster pump

BEFORE



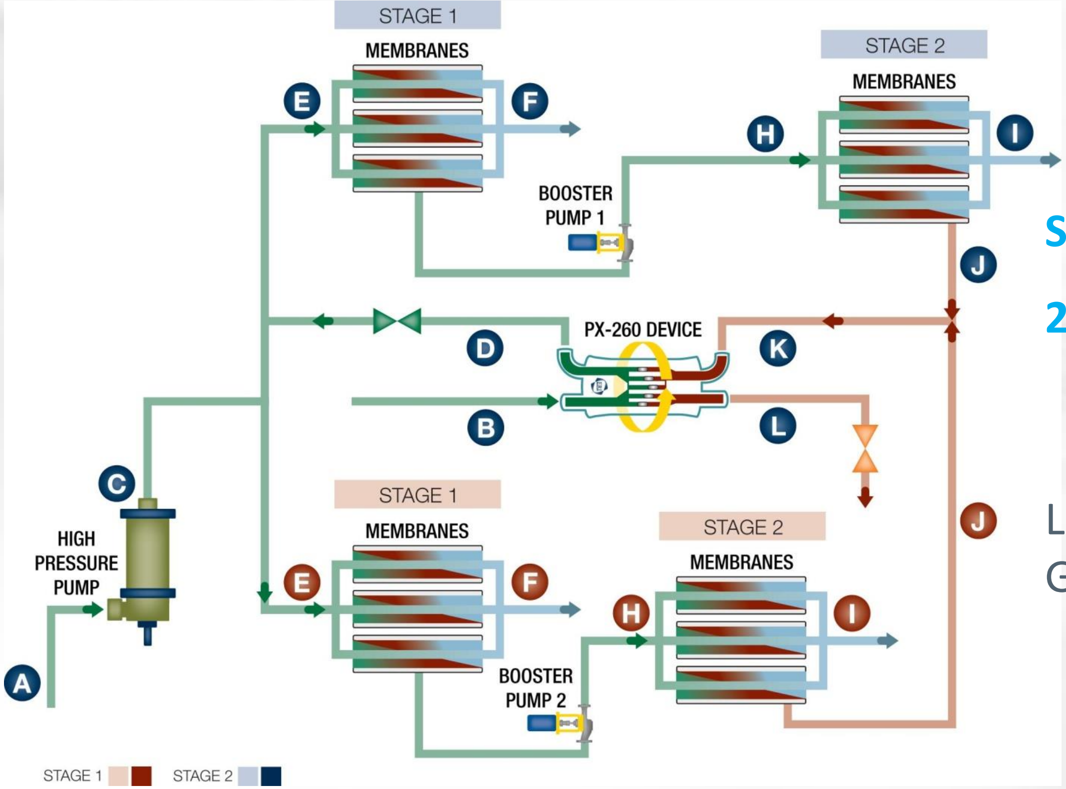


SEC: 3.48 kWh/m^3

Retrofit in two-stage systems

- SWRO system with inter-stage booster pump

AFTER



SEC: 2.68 kWh/m3

23% reduction

Las Palmas III SWRO Plant, Grand Canary, Spain

Retrofit Case Study

- Las Palmas III SWRO Plant. Retrofit of two-stage system
- Two 7,500 m3/d RO trains combined in a single 15,000 m3/d train.
- 15 PX 220 units
- 48% Recovery

- Original HPP's and motors were used
- Almost 0.8 kWh/m3 in reduction
- Performed in less than 6 months
- Payback in less than 18 months

Retrofit Case Study

- Palmachim SWRO Plant, Israel – Partial (Hybrid) Retrofit

- Original system
  - 100.800 m3/day, 6 trains 16.800 m3/day each
  - 88% efficiency on Pelton wheels.
  - Feed Booster pump to the HPP with VFD.

- Retrofitted system
  - All the HPP's, Pelton wheels and electrical motors were keep in place without any modification.
  - 120.000 m3/day, 6 trains 20.000 m3/day each
  - Added flexibility by the Isobaric ER system. Trains can increase their production up to 26.000 m3/day while maintaining the HPP close to its BEP. Additional required feed flow is supplied by the energy recovery system.
  - No additional civil works, wall-mounted installation
  - 8% reduction in SEC.

Retrofit Case Study

- Palmachim SWRO Plant, Israel – Partial (Hybrid) Retrofit

More examples

- Pembroke – Malta 40,000 m^3/day

More examples

- Dekhelia - Cyprus 60,000 m3/day

Why a retrofit?

- Undeniable energy savings → Lower cost of water produced
- Extend the life time and/or plant capacity, optimizing and modernizing the plant equipment.
- Improve environmental impact -energy saving programs and reduction of emissions, e.g. “carbon credits”
- Regain competitiveness among newer plants being built with the latest technologies.
- Increase system availability

PX™ TECHNOLOGY INSTALLATIONS

Perth, Australia —
140,000 m3/day (36.9 MGD)

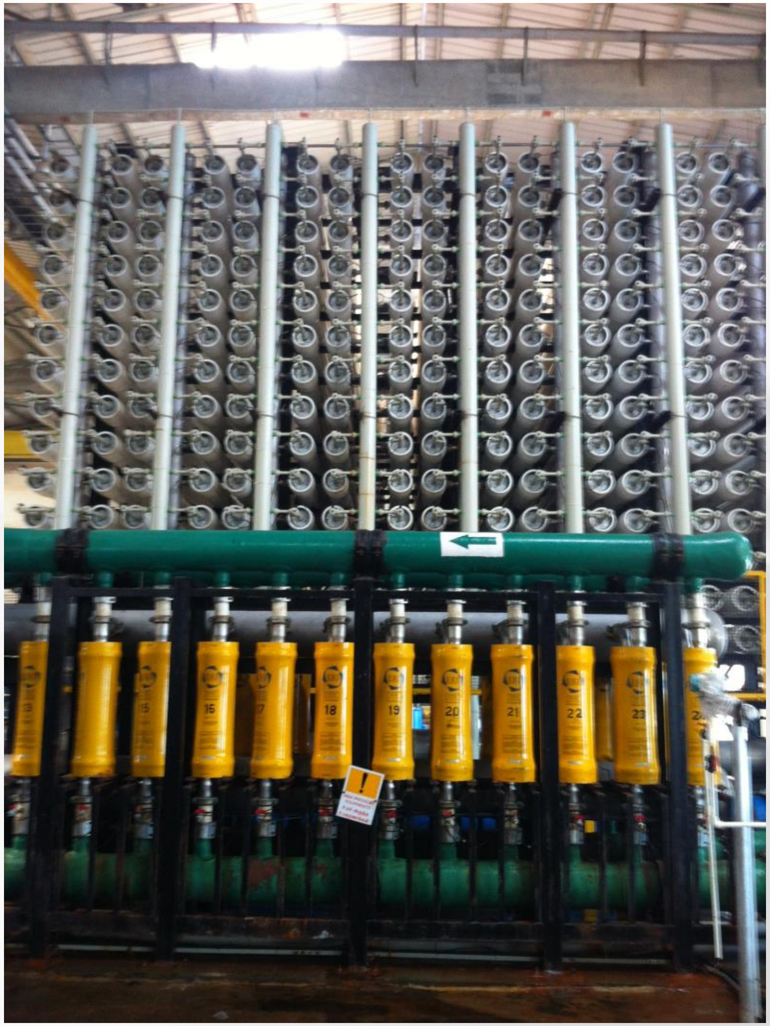
- GWI Award 2007
  Environmental Contribution of the Year

Hadera, Israel: 465,000 m3/day

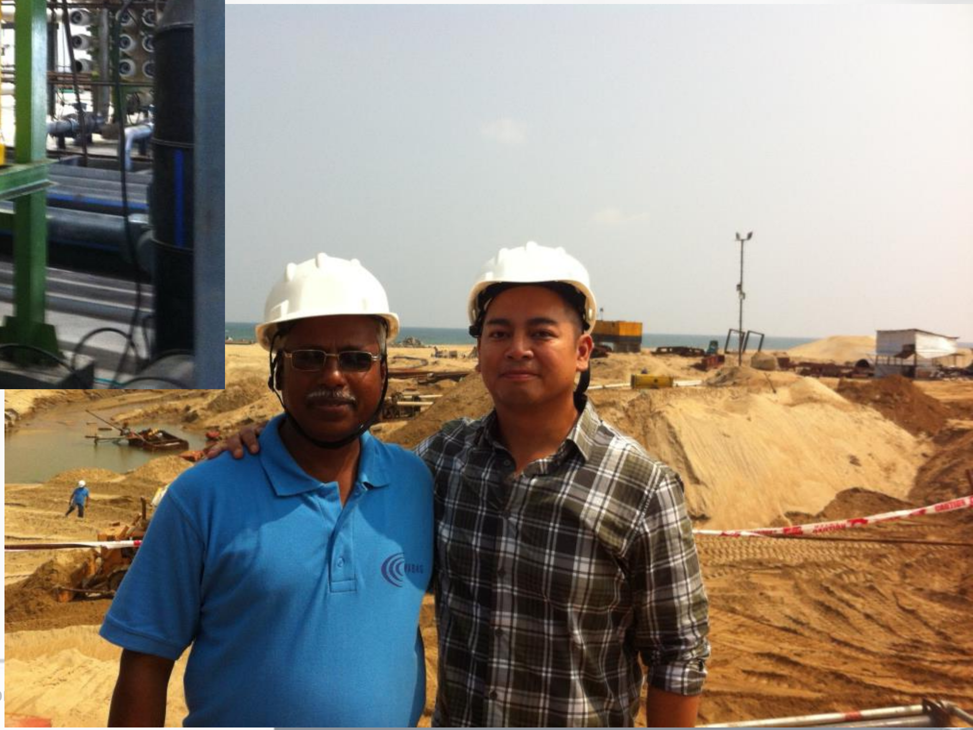
- World's Largest SWRO Plant in Operation
- 16 Trains of PX-220 devices

Minjur - Chennai, India: 100,000 m3/day

- Minjur Seawater Desalination Plant – Befesa CTA
- 5 Trains of PX devices

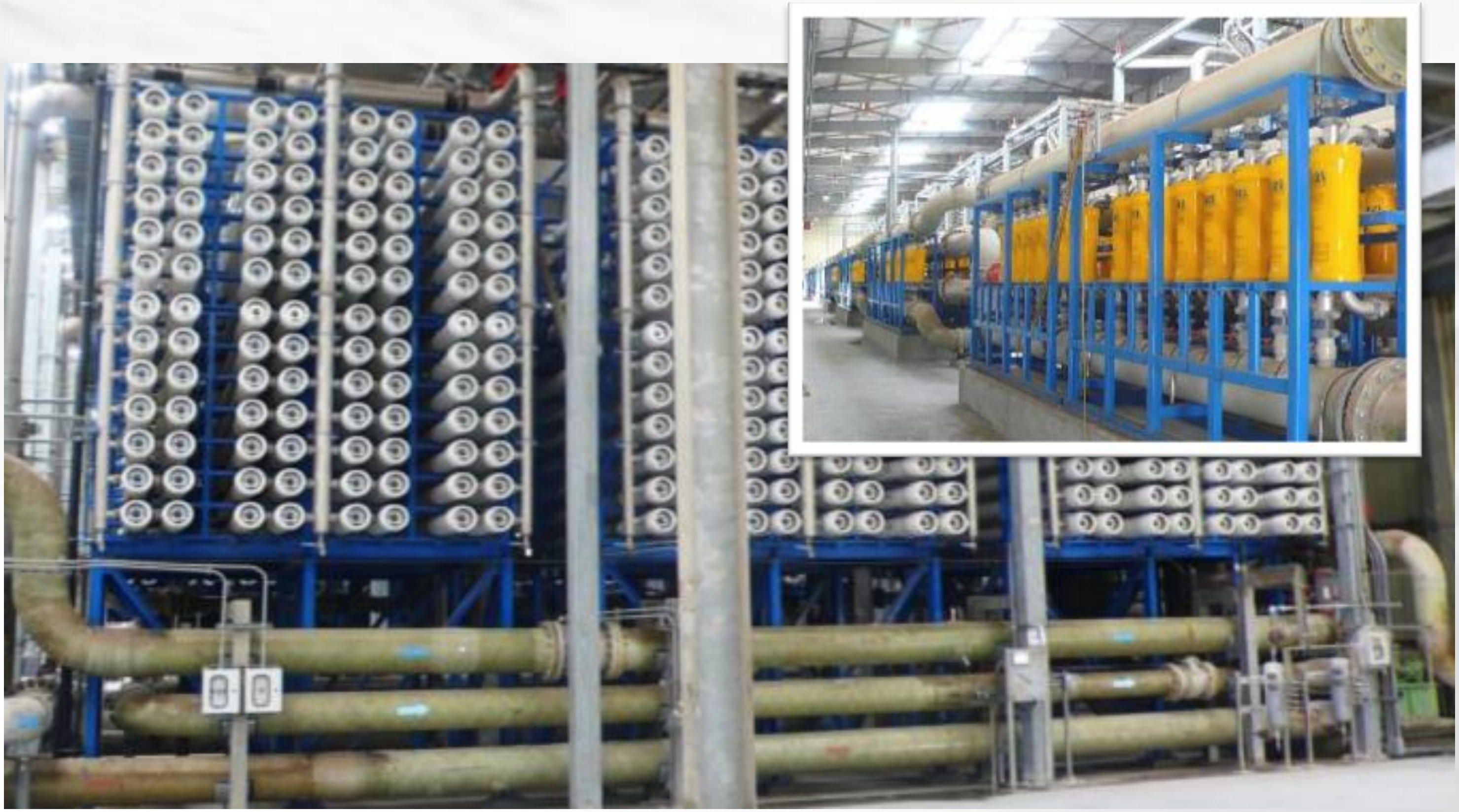


Nemmeli - India: 100,000 m3/day



Hamma, Algeria — 200,000 m3/ day (53 MGD)

- Largest membrane trains in the world
- 25,000 m3/ day



Al Shoaibah (Saudi Arabia) — 150,000 m3/ day (40 MGD)

Barcelona (Spain) 200,000 m3/ day (53 MGD)

Small to Medium Installations

MV Pacific Star
Sun Cruise Ship
(Australia)

570 m³/day

Sharm El-Sheikh
(Egypt)

6,000 m³/day

La Marina Cope
(Spain)

16,000 m³/day

14,000+ Devices Installed Globally
~ 75% Market Share

6,300,000 m^3/day

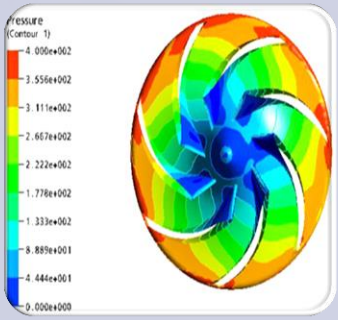
12 Billion kWh Energy per year

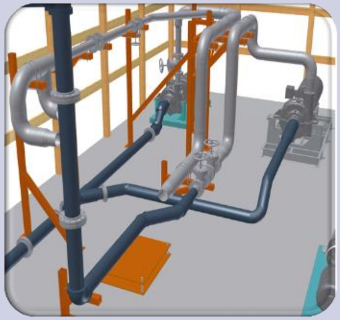
$1.2 Billion of Savings per year for our clients

Sales Offices PX™ Installations

CENTRIFUGAL PUMPS & TURBOCHARGER ERD SOLUTIONS

Core Competences





Engineering

- CFD Analysis & Simulation
- Custom Design
- Extensive R&D
- MSU Turbo Machine Lab
- PWR Co-op

Machining

- Large VTL
- CNC Lathes
- 5 Axis CNC
- Grinding
- Honing
- Dynamic Balancing

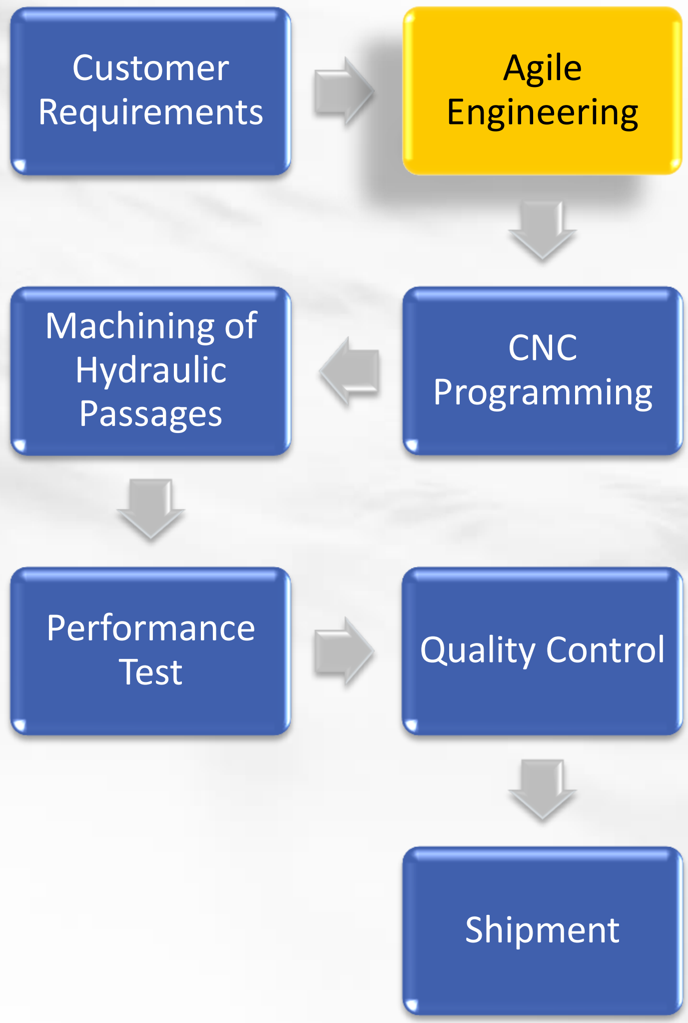
Assembly

- Prep & Polish
- QC
- Torque control
- CMM Analysis

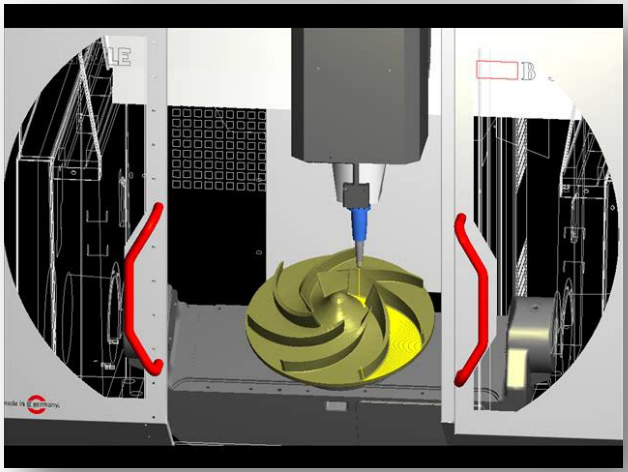
Testing

- Full Power Performance Testing
- Efficiency Validation
- Hydrostatic test
- Performance baseline

Agile Engineering



Manufacturing Capability Expansion



ERI (Centrifugal Technology) Products

Pumps

- ERI™ AquaBold™ High Pressure RO Pumps
- ERI™ AquaSpire™ Single-stage Pump

ERI AquaBold pump

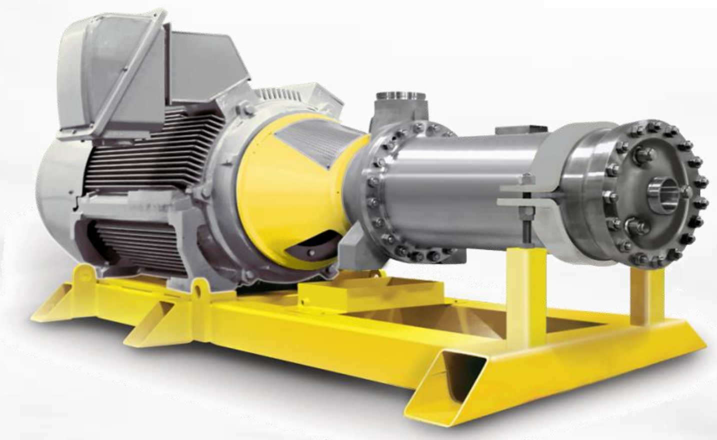
ERI AquaSpire pump

Energy Recovery Devices

- Advanced Technology TC (HTC AT)
- AT Advantages now available for the small capacity plants replacing the Turbocharger (HALO)
- Low Pressure Turbocharger (LPT)

HTC AT

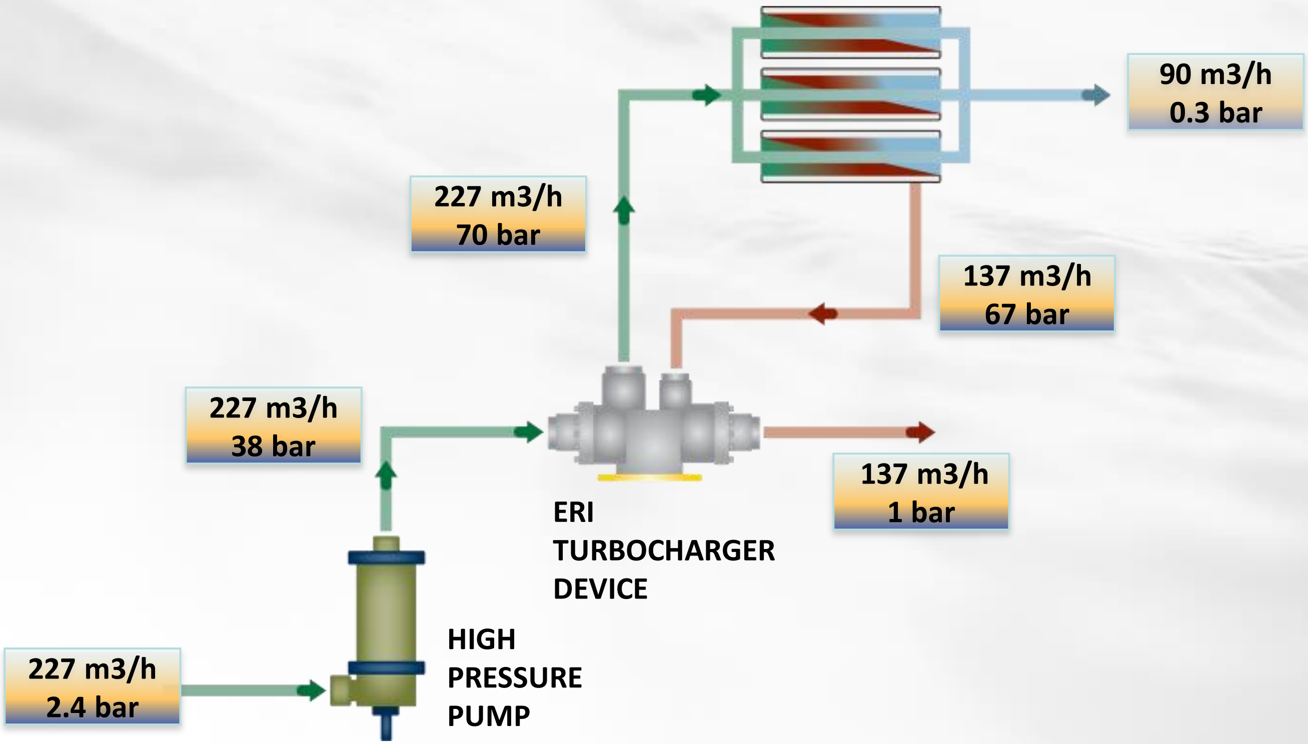
LPT



TURBOCHARGER GENERAL THEORY

SWRO Engineering Design – Single Stage

- The ERI™ TurboCharger™ device uses brine energy to boost the full feed stream to the RO, thereby reducing the required boost from the high pressure pump.



Turbo Pressure Boost – Example II.

- Large SWRO plant, Membrane feed flow 2'453 m3/h, conversion 45 %, membrane feed pressure 57.9 bar, brine pressure 57.2 bar, brine back pressure of 0.5 bar.
  What is the pressure boost???

$$dP = (Nte) \times (Rr) \times (Pbr - Pe)$$

AT-7200 = (0.82) x (0.55) x (57.2 – 0.5) = 25.6 bar boost

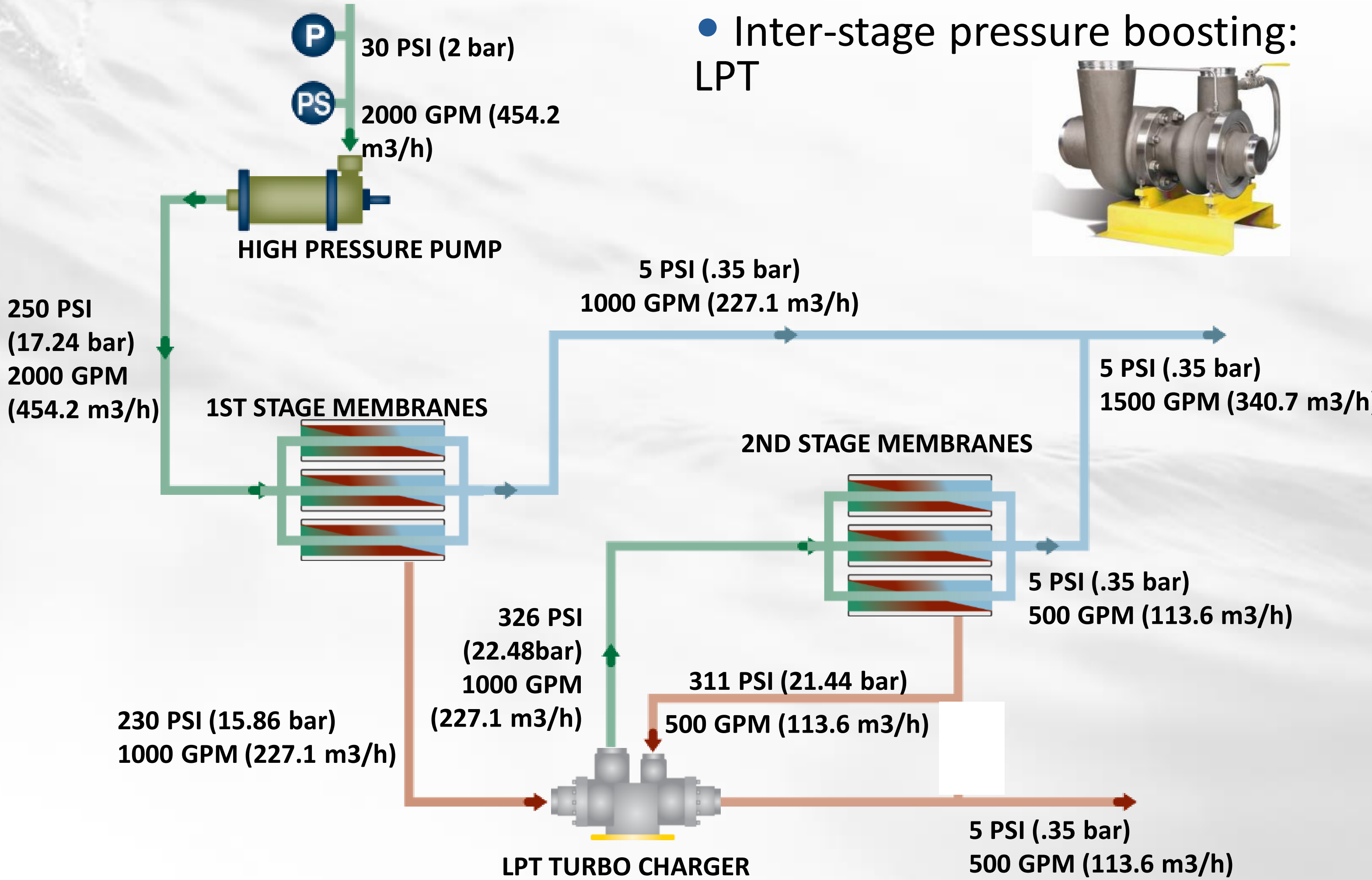
Where Rr = ratio of brine flow to feed flow

Pbr = brine pressure at turbine inlet

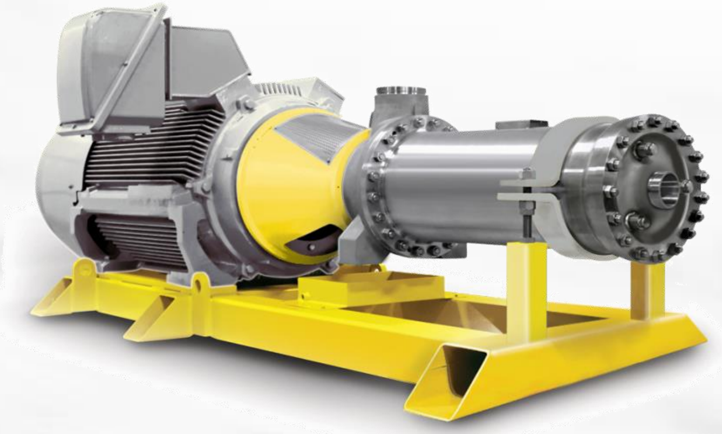
Pe = Turbo exhaust pressure

Nte = Hydraulic Energy Transfer Efficiency from Curve

LPT Process Design

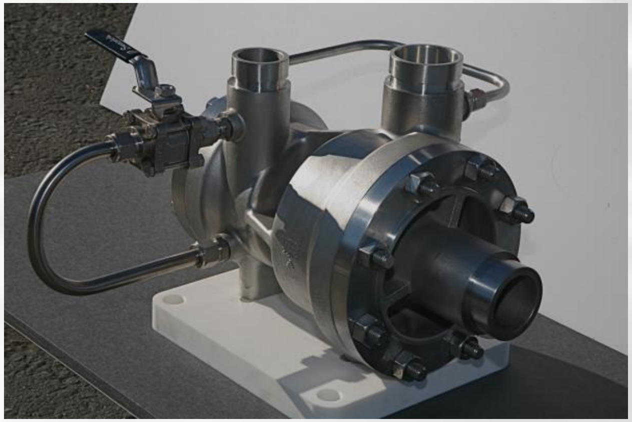


- Inter-stage pressure boosting: LPT



TURBO OPERATION

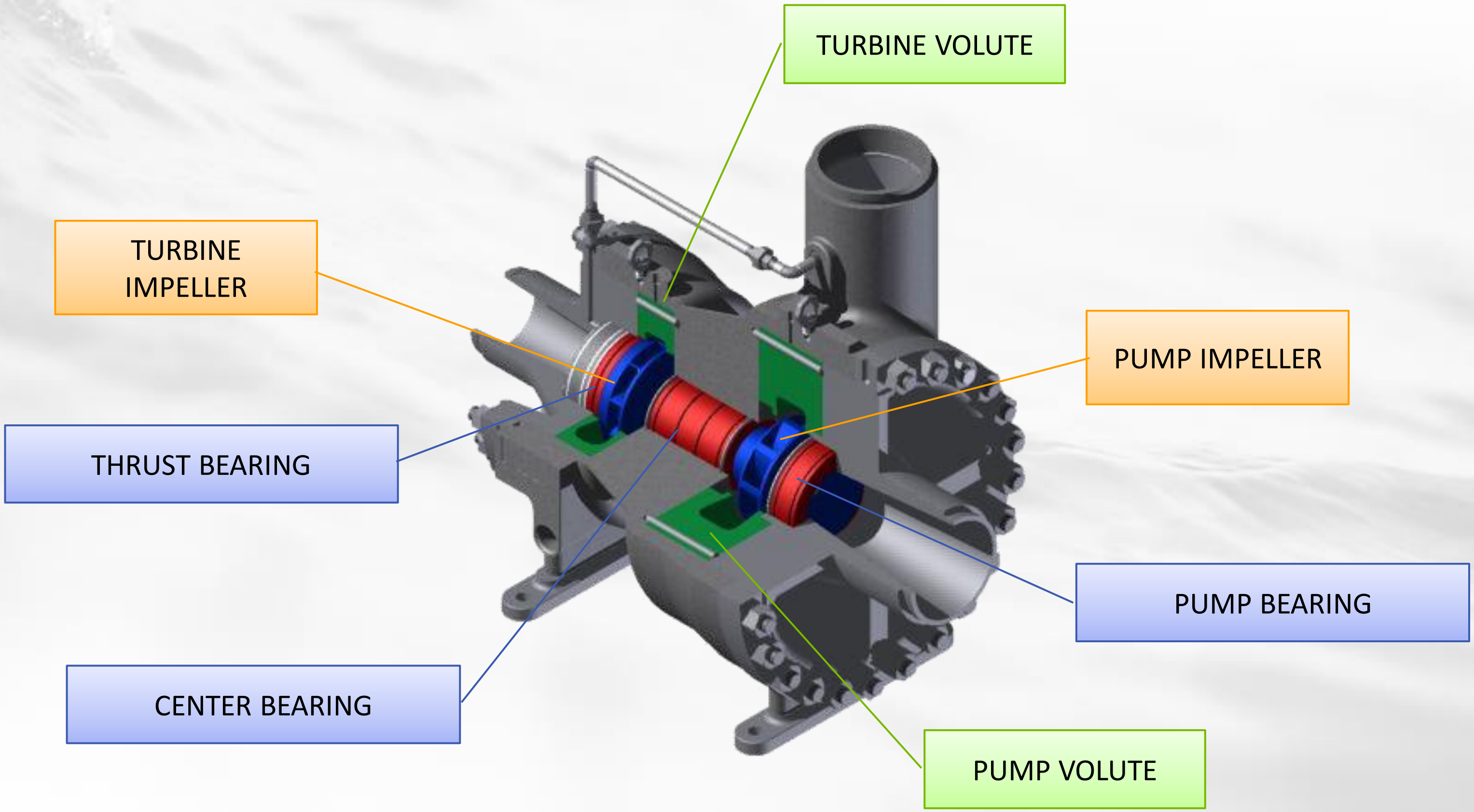
Advanced Technology (AT) Turbocharger



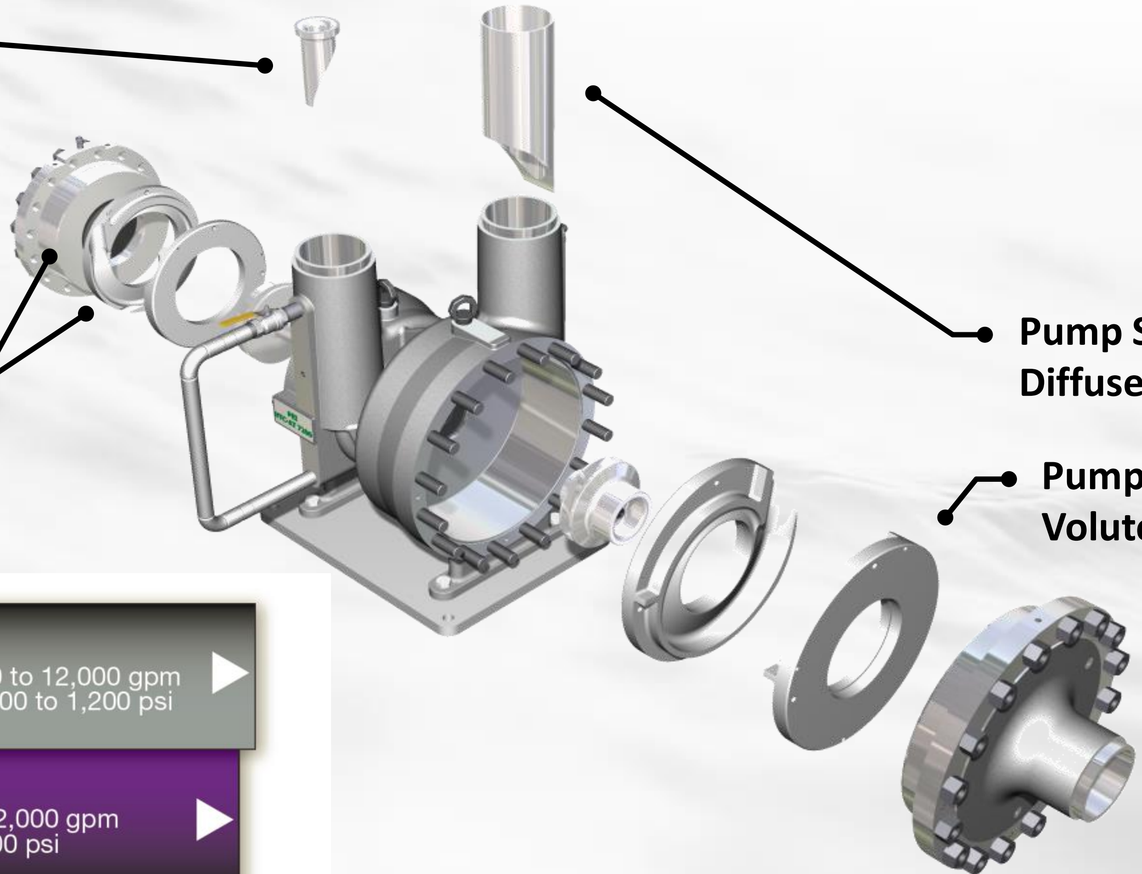
Advanced Technology (AT) Turbocharger

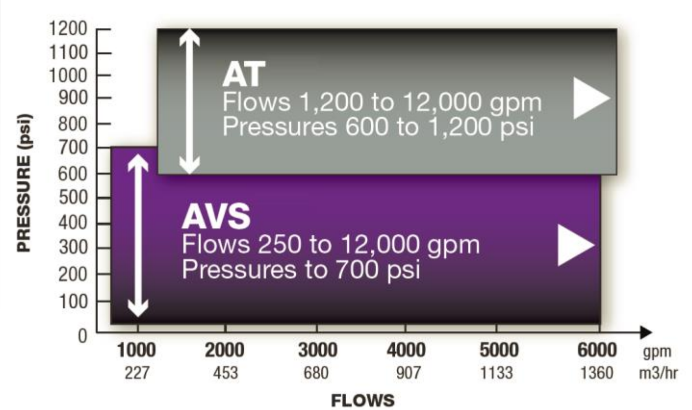
- Application
  - Medium to large scale energy recovery device for SWRO
- Advantages
  - Reliability
    - Product lubricated bearings
    - No scheduled maintenance
    - Ease of installation
  - Designed for Optimum Efficiency
    - Customized Hydraulic Design for each specific application
    - Customized 3-D geometry Impellers
  - Removable volute inserts
  - Compact design allowing for smallest foot print available
  - Feed pump size reduction

Advanced Technology (AT) Turbocharger (Cross Section)



Advanced Technology (AT) Turbocharger Con'd



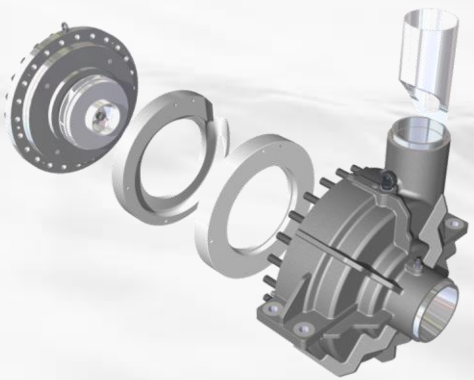


PEI Patent Pending

Volute Insert Technology

- ERI's unique ability to improve efficiency and reduce water cost over the life of the plant
- Does not require complete equipment replacement
- Simple field retrofit with virtually no downtime

HTCAT



AquaSpire

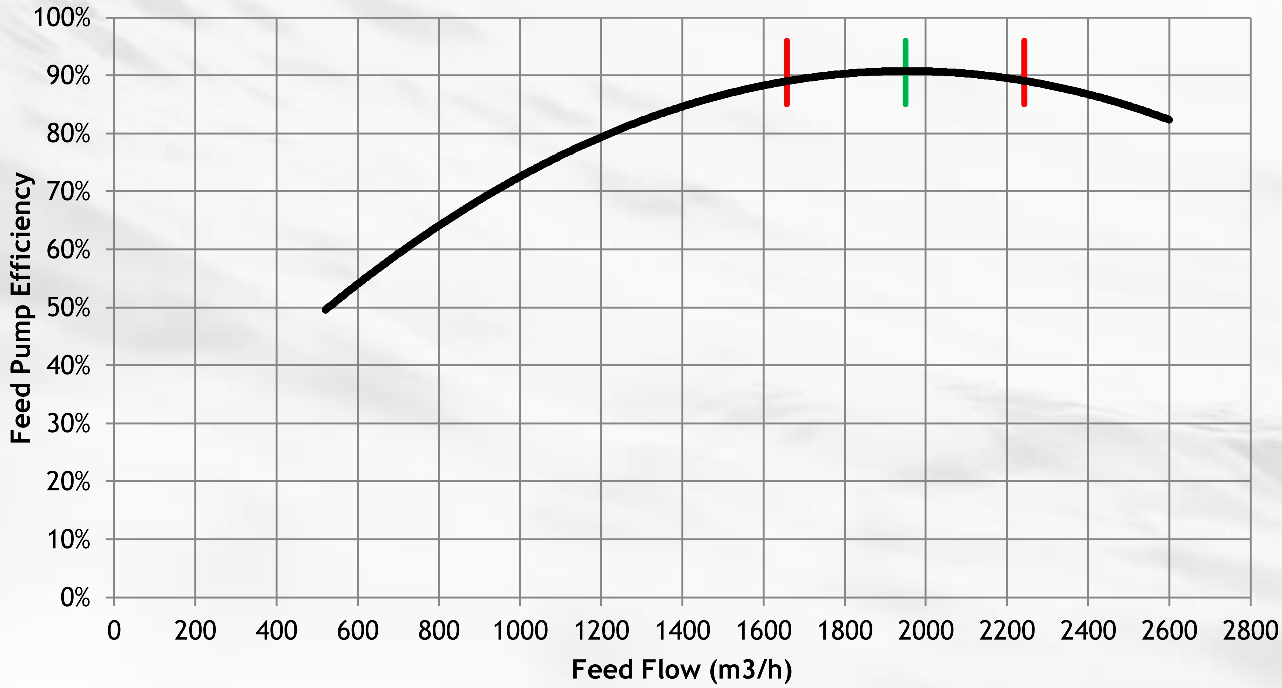
Volute Insert Technology Con'd

- Ability to adapt to improvement in desalination technology
- Enhanced membrane recovery (Impact on feed flows)
  - 10 years ago 35% recovery was industry norm
  - Now 40 – 45 % recovery is the norm
- Reduction in operating pressure
  - 10 years ago 70 -74 bar was SWRO norm
  - Now 64 -68 bar is the norm
- Improved pretreatment technology
- Ability to take advantage of desal technology improvement without negative impact on efficiency

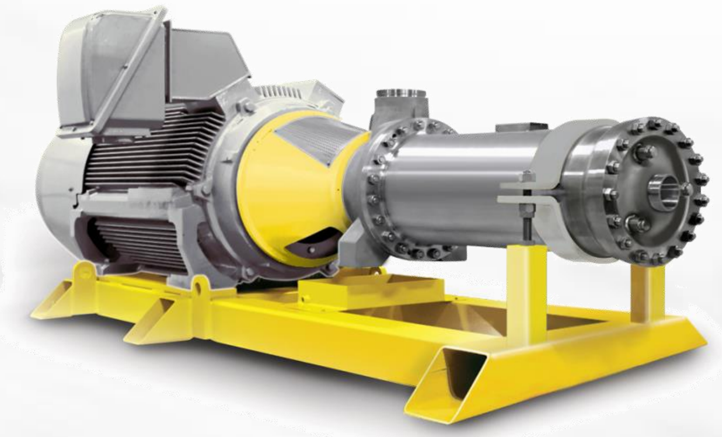
1.5% - 2% of Efficiency will save a customer Millions $ over the entire Plant Life

Volute Insert Technology Con’d

- 10% change in flow = 1.5% drop in efficiency



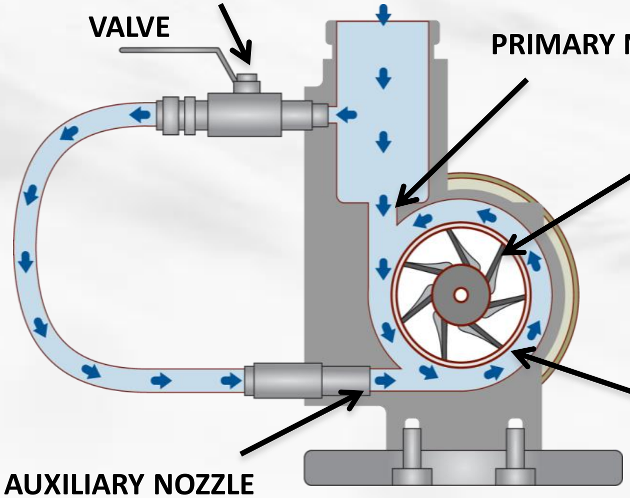
- Easily replicable volute and diffuser components allow for best efficiency point operation even when operating requirements change



SYSTEM CONTROL AND OPTIMIZATION

How does an ERI™ TurboCharger™ ERD work?

- The auxiliary nozzle valve on the turbocharger provides brine flow and pressure adjustment to accommodate typical variations in membrane requirements



- **The Main Nozzle is sized to provide a concentrate system resistance (concentrate pressure) equal to the maximum design pressure at a constant design concentrate brine flow rate. The auxiliary nozzle is sized to about 20-25% of the area of the Main Nozzle. The ANCV controls flow to the AN in the turbine casing. The ANCV will provide a 10-15% pressure range at a constant brine flow.**

System control and optimization

- To reduce brine pressure, open the auxiliary nozzle valve until the desired brine flow and pressure are obtained.
- Opening the ANCV reduces the brine pressure and consequently reduces the boost pressure. Opening the ANCV increases the total nozzle area, allowing more flow and/or a lower pressure. This is typically done during those periods of RO plant operation that require less pressure than the maximum designed membrane pressure.
- To increase brine pressure, close the auxiliary nozzle valve until the desired brine flow and pressure are obtained. The TURBO will produce the most boost pressure when the ANCV is fully closed.

- The Aux Nozzle valve can be manual (as shown) or actuated.
- If automated, the best control signal is the brine flow.

Low Pressure Turbocharger (LPT)

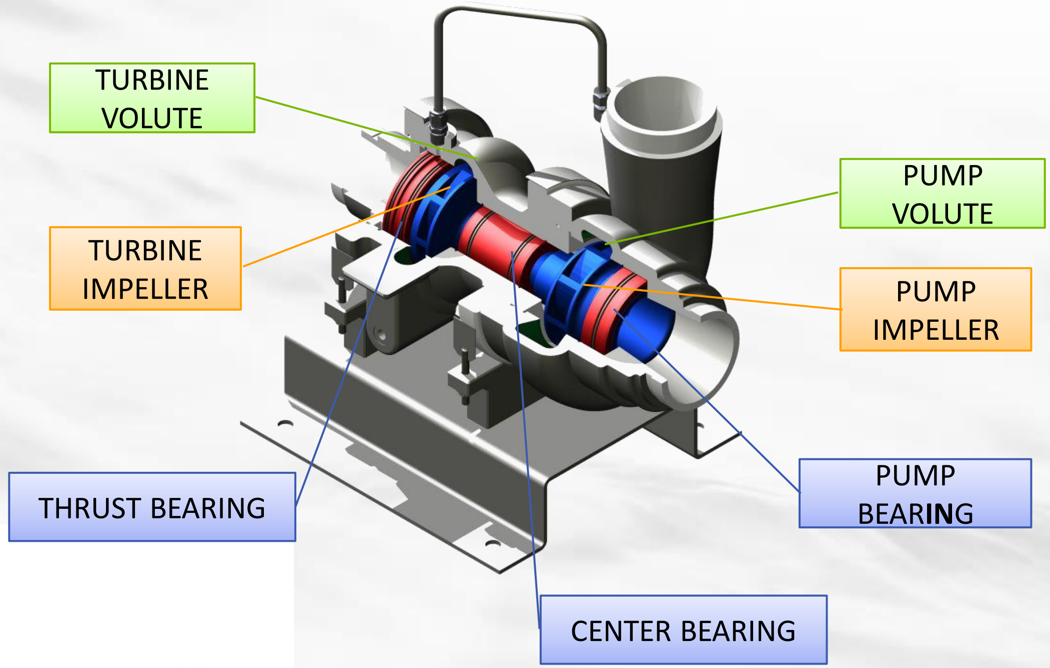
Low Pressure Turbocharger (LPT)

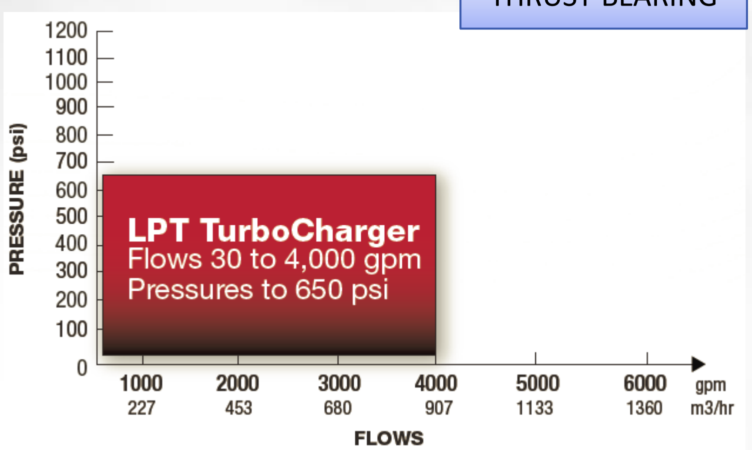
- Application
  - Designed for use in low pressure, multi-stage Brackish Water RO systems
- Advantages
  - All components made from cast parts for long life
  - Custom designed for customer specific conditions
  - Balances first and second stage flux rates
  - Eliminates interstage booster pump
  - Reduces first stage fouling potential
  - Replaces brine control valves

LPT Turbocharger Features

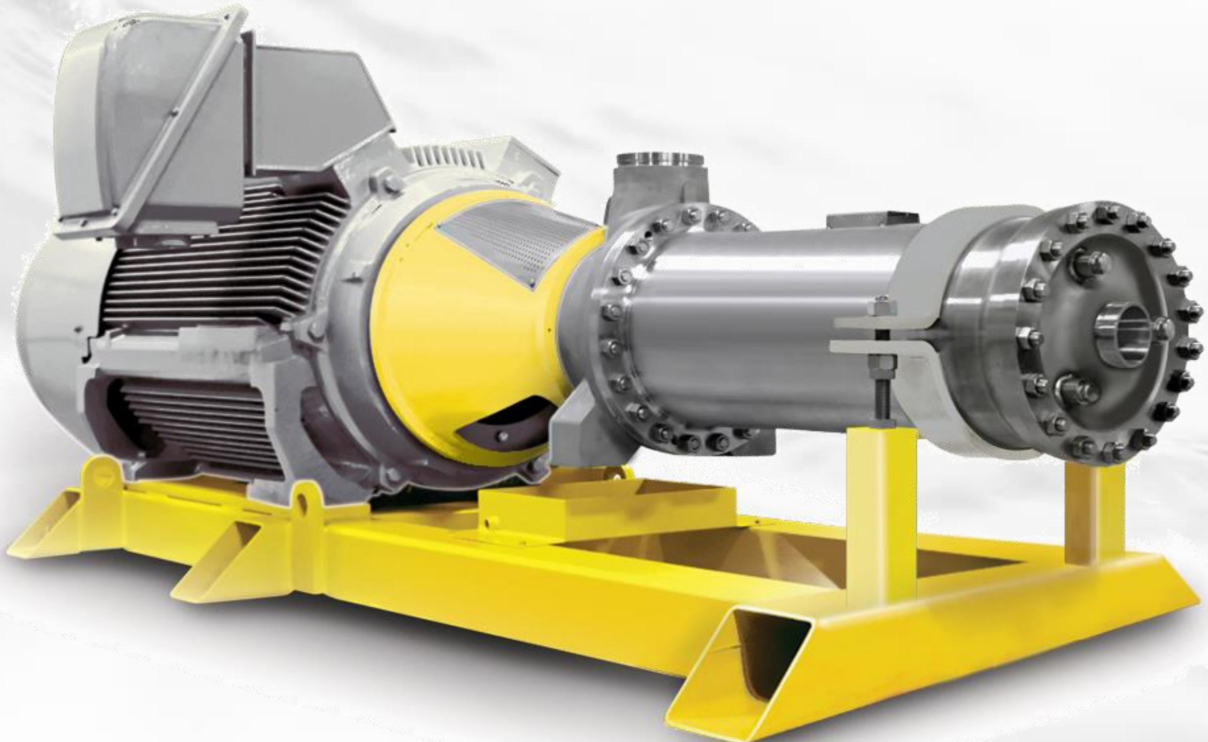
- Inter stage boost balances permeate flux rates between stages
- Turbocharger combines energy recovery turbine and interstage booster pump in single unit
- Can reduce fouling potential in 1st stage by reducing its flux.
- Entirely energized by brine pressure – no electrical components, consumption, or cost.
- Lowest Life Cycle Cost pump for interstage booster service
- No Maintenance: Water lubricated bearings
- Low Noise: Vibration-free

Low Pressure Turbocharger (LPT)





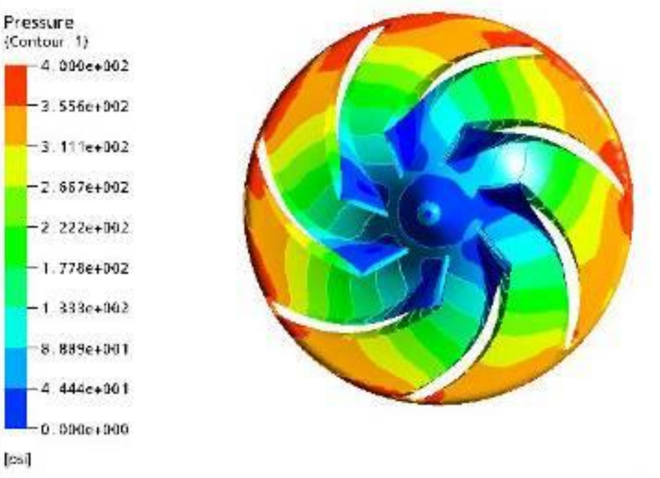
ERI™ AquaBold™ Pump Line



ERI™ AquaBold™ Pump Overview

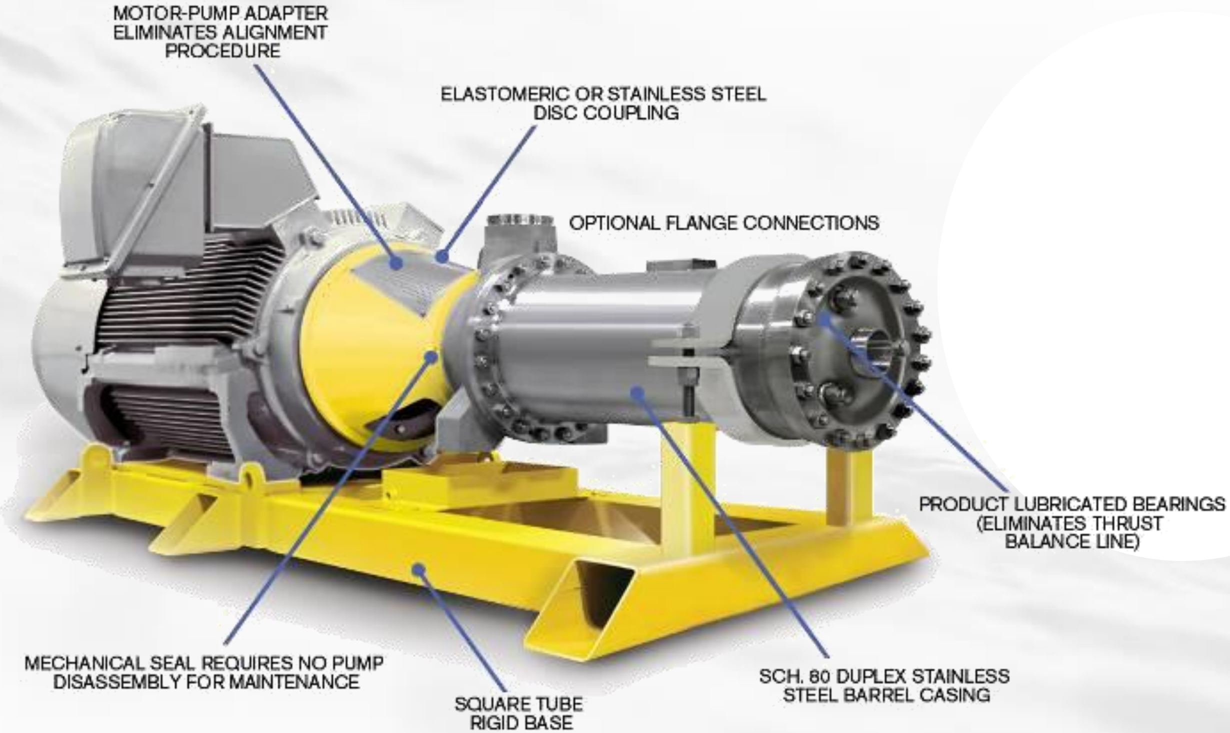
- High-Efficiency Centrifugal High Pressure RO Pump
- Uniquely designed for desalination applications
  - Custom designs for specific operating conditions allows for optimum pump efficiencies
- Quality materials & manufacturing
  - Designed for 20 year service life
- Designed for use with PX energy recovery devices
  - Highest efficiency package solution with minimal power consumption
- Available with short lead-times
- Customer service, training and support
  - Highly qualified technical field services and training programs

ERI™ AquaBold™ Pump Advantages

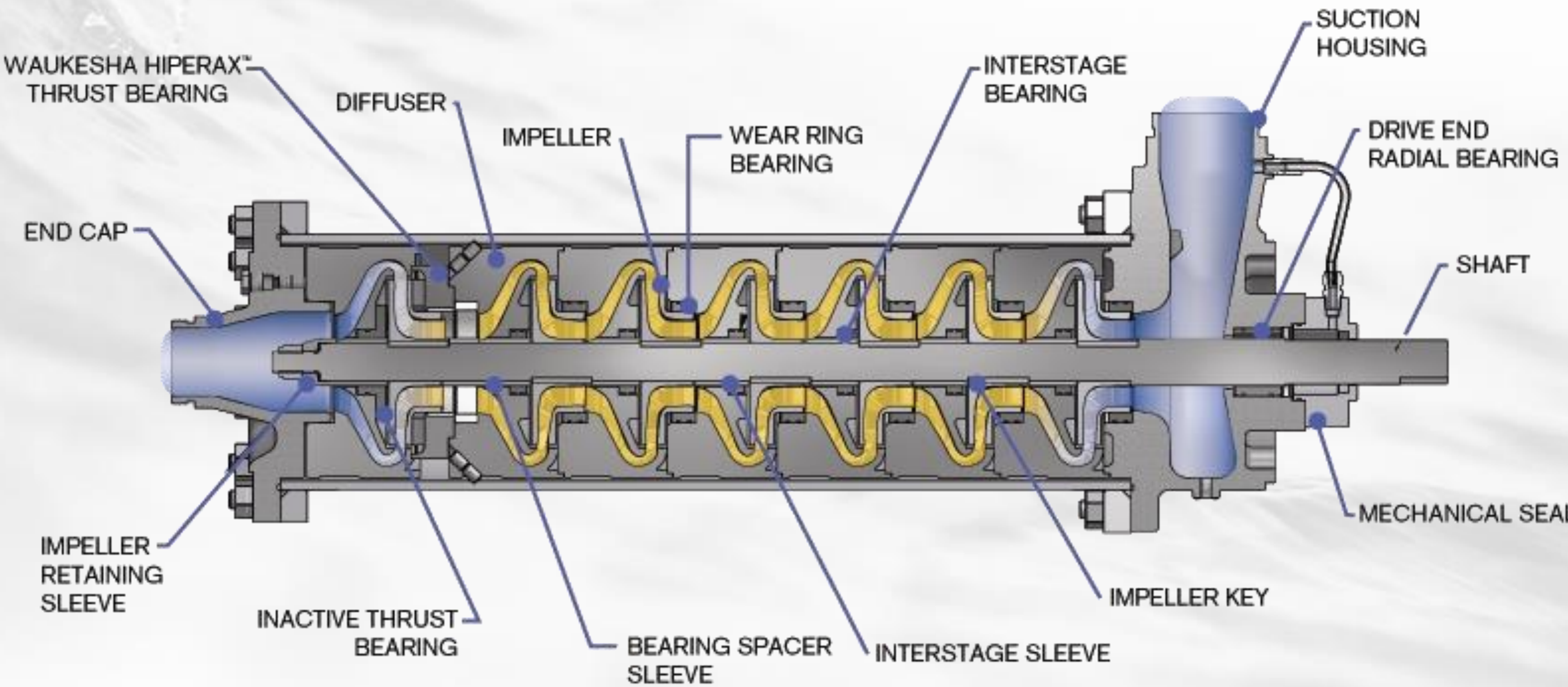


- Industry-leading high efficiencies
  - Performance-enhanced fluid modeling
  - Proprietary thrust technology eliminates losses
- State-of-the-art construction for RO industry
  - Precision machined investment-cast components
  - Standard Duplex 2205
  - Super Duplex 2507 optional
- Simple to maintain
  - No disassembly required for mechanical seal replacement
  - All product-lubricated bearings
  - Thrust bearing can be replaced without removing pump or motor

ERI™ AquaBold™ Pump - Features



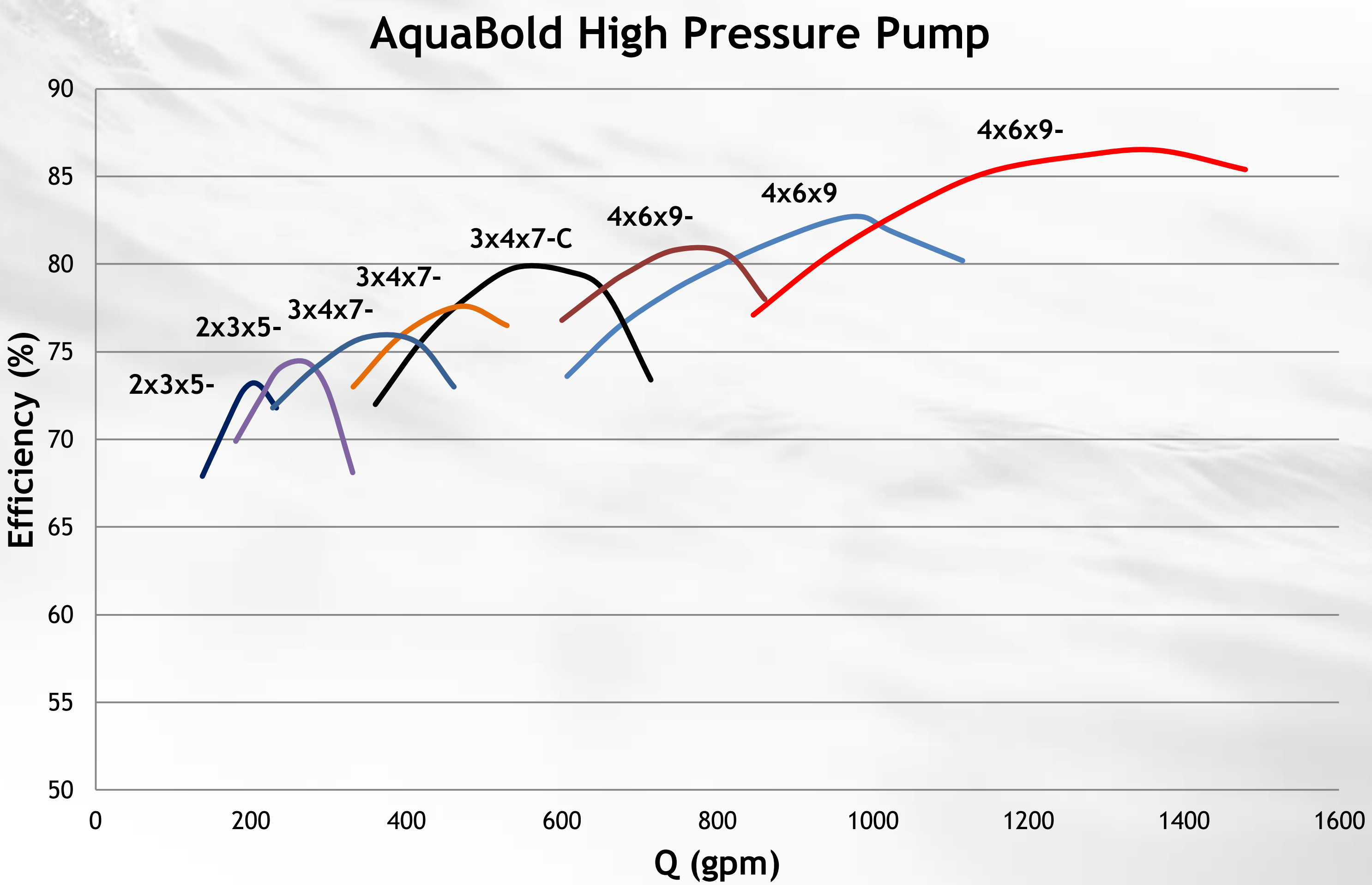
ERI™ AquaBold™ Pump (Cross Section)



Proprietary Thrust Bearing

- Product lubricated bearings – eliminates maintenance of grease bearings and auxiliary oil systems and associated seals
- Simple, efficient design – allows field retrofits without the need for bearing change
- Reduced friction provides lower power losses within the bearing system, improving overall efficiency
- Eliminates need for costly external thrust bearing system

ERI™ AquaBold™ Pump Line (Current Products)



Ancol SWRO, Jakarta, Indonesia - 1,680 m3/day

- ERI™ TurboCharger™ ERD installation
- ERI™ AquaBold™- High Pressure Pump (4x6x9-4)

Turbocharger Installation: 3,000 m3/ day

Distributor in Germany, Austria, Switzerland, Czech and Slovak Republic

ROC Components AG – 4153 Reinach, Switzerland

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ROC
Reverse Osmosis Components

EMAIL/PHONE>)