SAWEA 2007 Workshop

Breakthrough in Energy Savings in SWRO Plants: The Pressure Exchanger

Presented by:
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Making Desalination Affordable

AGENDA

ERI & PX Pressure Exchanger

Background: SWRO & Energy Consumption

How the PX Works

Implications for Design & Operations

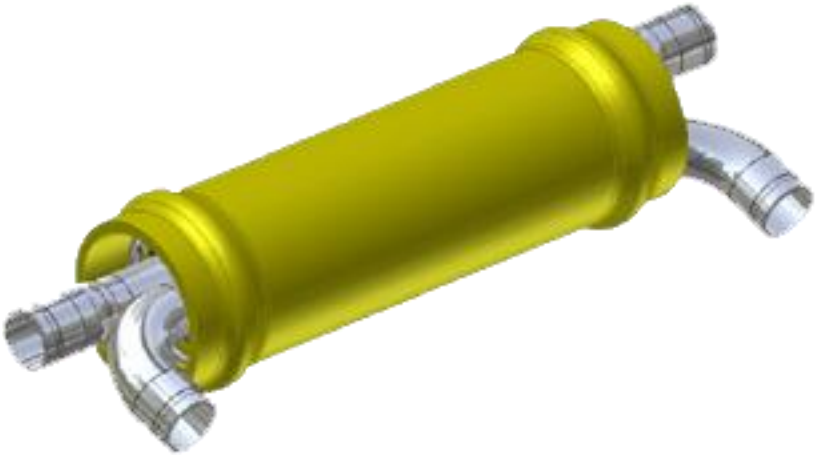
Conclusions

Energy Recovery, Inc.

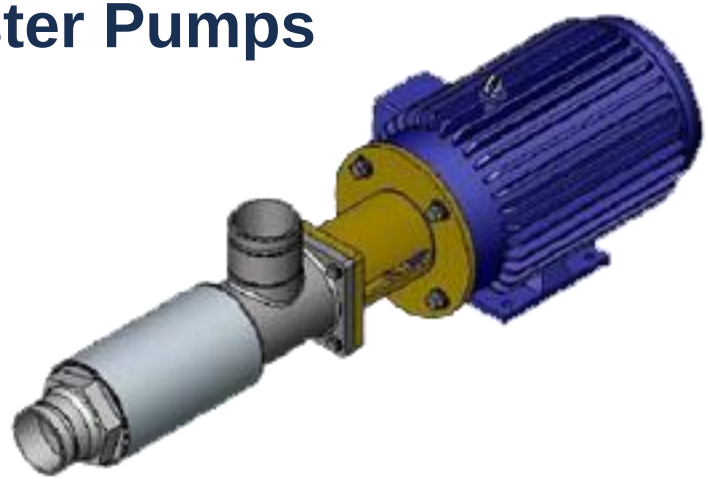
HQ Office in San Leandro (San Francisco), California USA
Regional Offices: Spain, China, Florida, UAE

PX Pressure Exchanger

Pressure Exchanger (“PX”) energy recovery devices



PX Booster Pumps

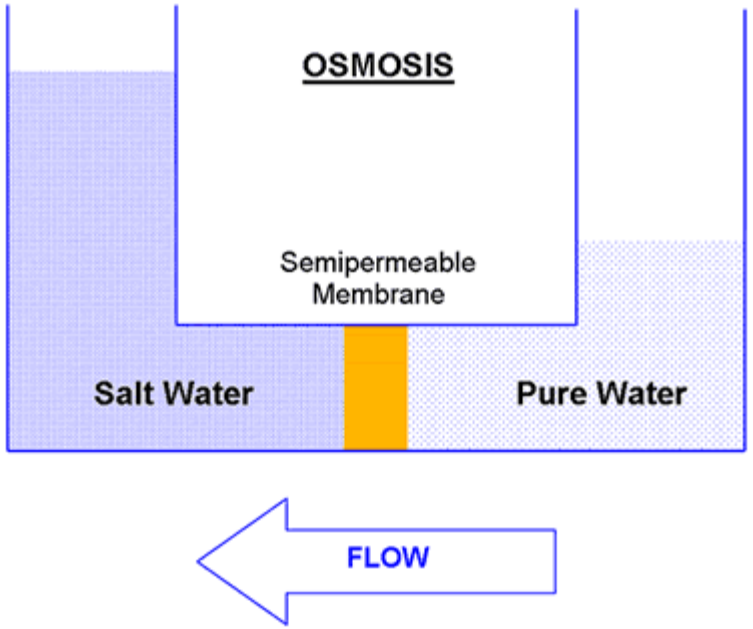


References

Country	Project/City	Size (m3/d)	Contractor
Cyprus	Dhekelia	40,000	Caramondani
Egypt	Sinai Peninsula	10,000	Intech
	Sharm El Sheikh	Multi. <1,000	Metito
UAE	Sharjah	22,700	CH2M Hill
	Zawrah	27,300	Aqua Engineering
	Qidfa	13,650	Aqua Engineering
	Ghalilah	13,650	Fisia Italimpianti
Oman	Sur	9,200	Aqua Engineering
	Sur	4,600	Aqua Engineering
Algeria	Hamma	200,000	GE Water
	Beni Saf	200,000	Geida
	Skikda	100,000	Ecoaqua Ingenieros
Saudi Arabia	Saudia / Jeddah	9,000	GE Water
	Shuaibah	150,000	Doosan

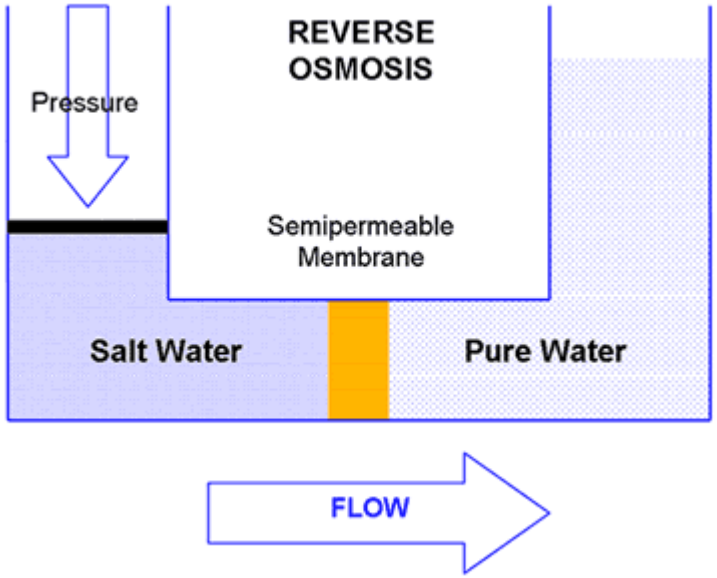
Brief Background

Osmosis

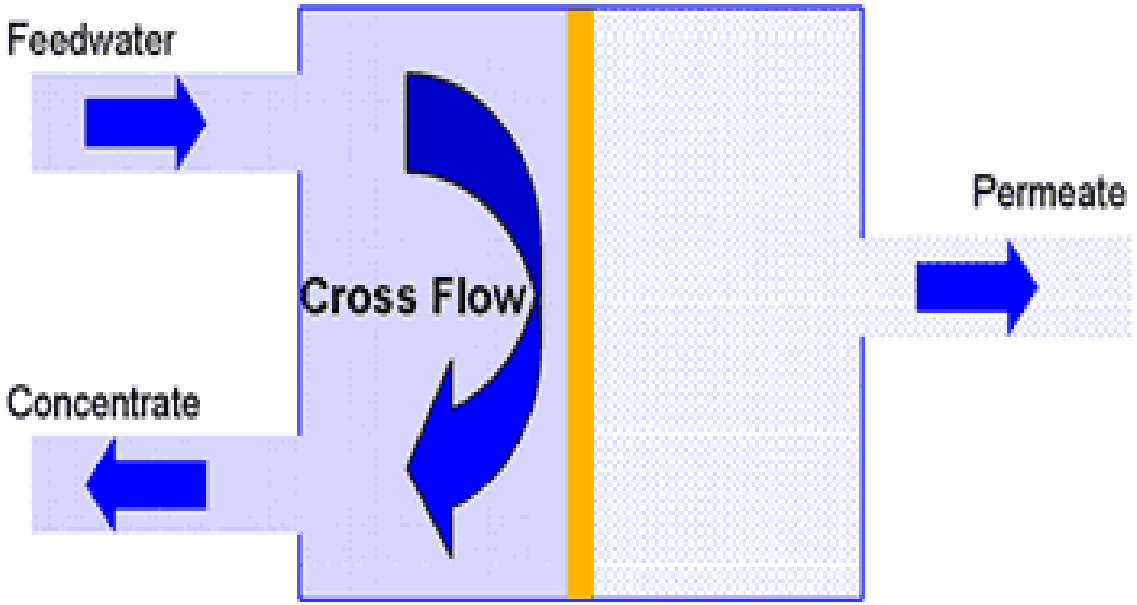


Brief Background

Reverse Osmosis

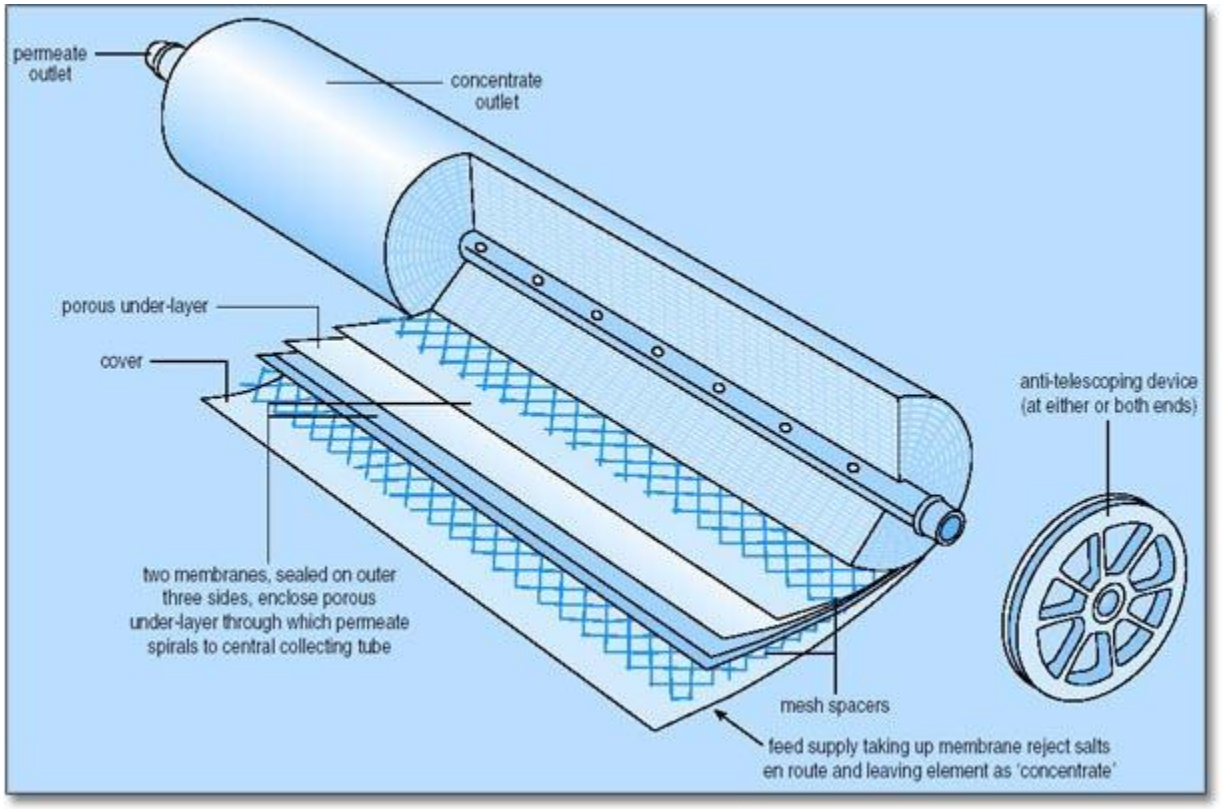


Reverse Osmosis with Cross Flow

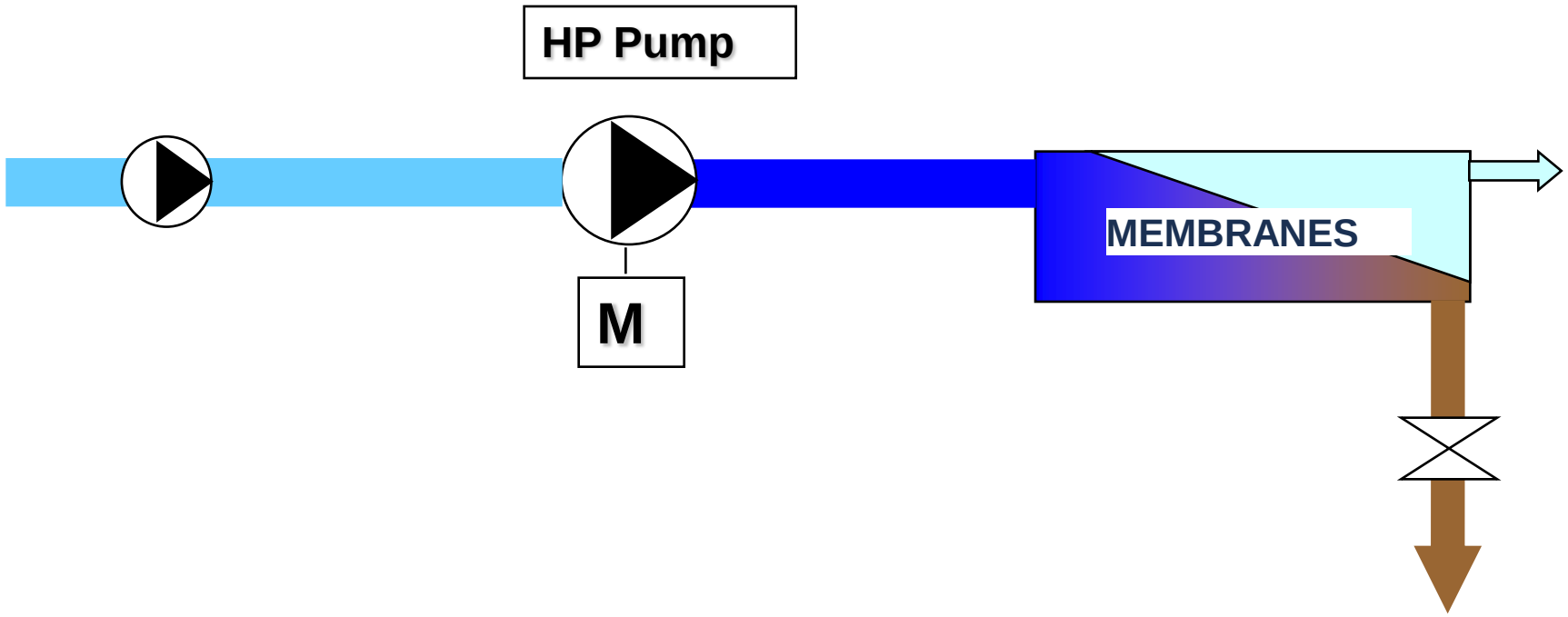


Brief Background

Spiral Wound Membrane Element



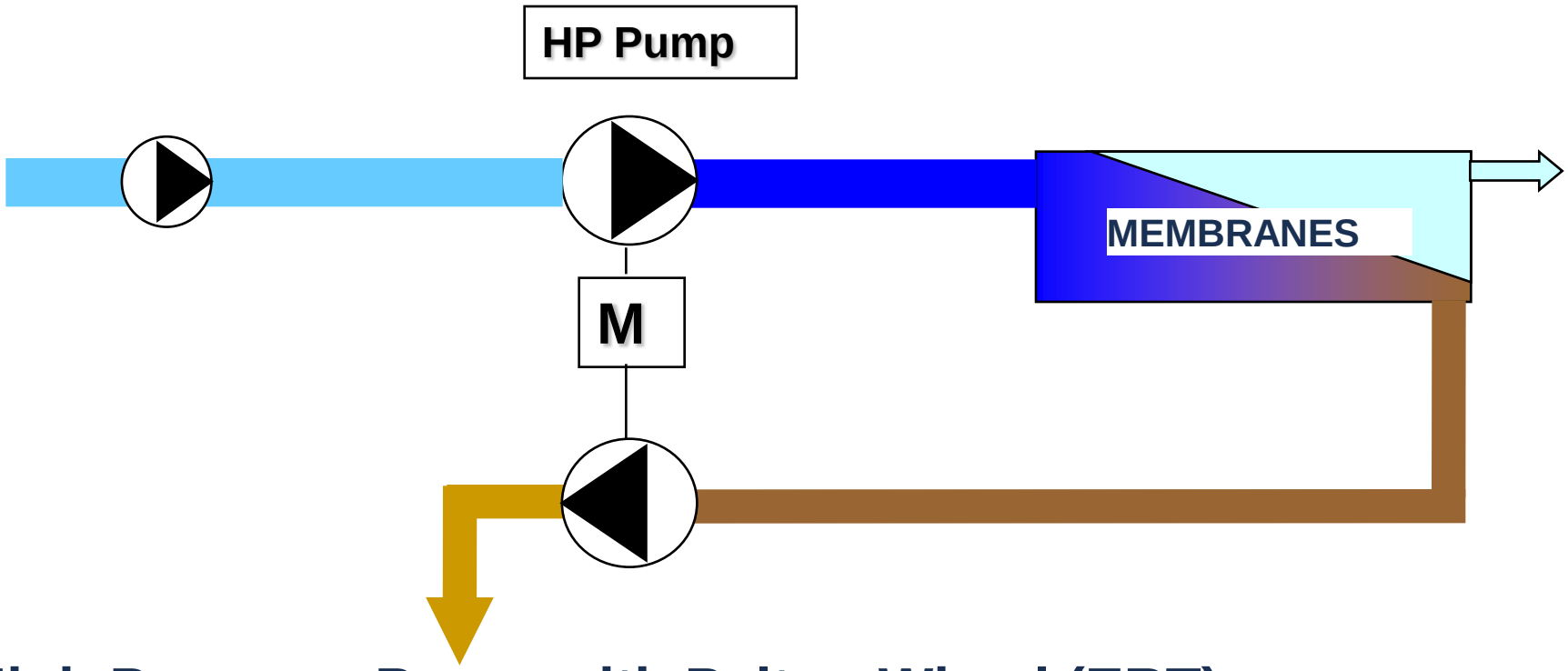
Brief Background: Not ERD



High Pressure Pump with Brine Control Valve (8 kWh/m3)

- 100% of energy into Membranes
- 60% wasted through control valve

Energy Recovery Turbine

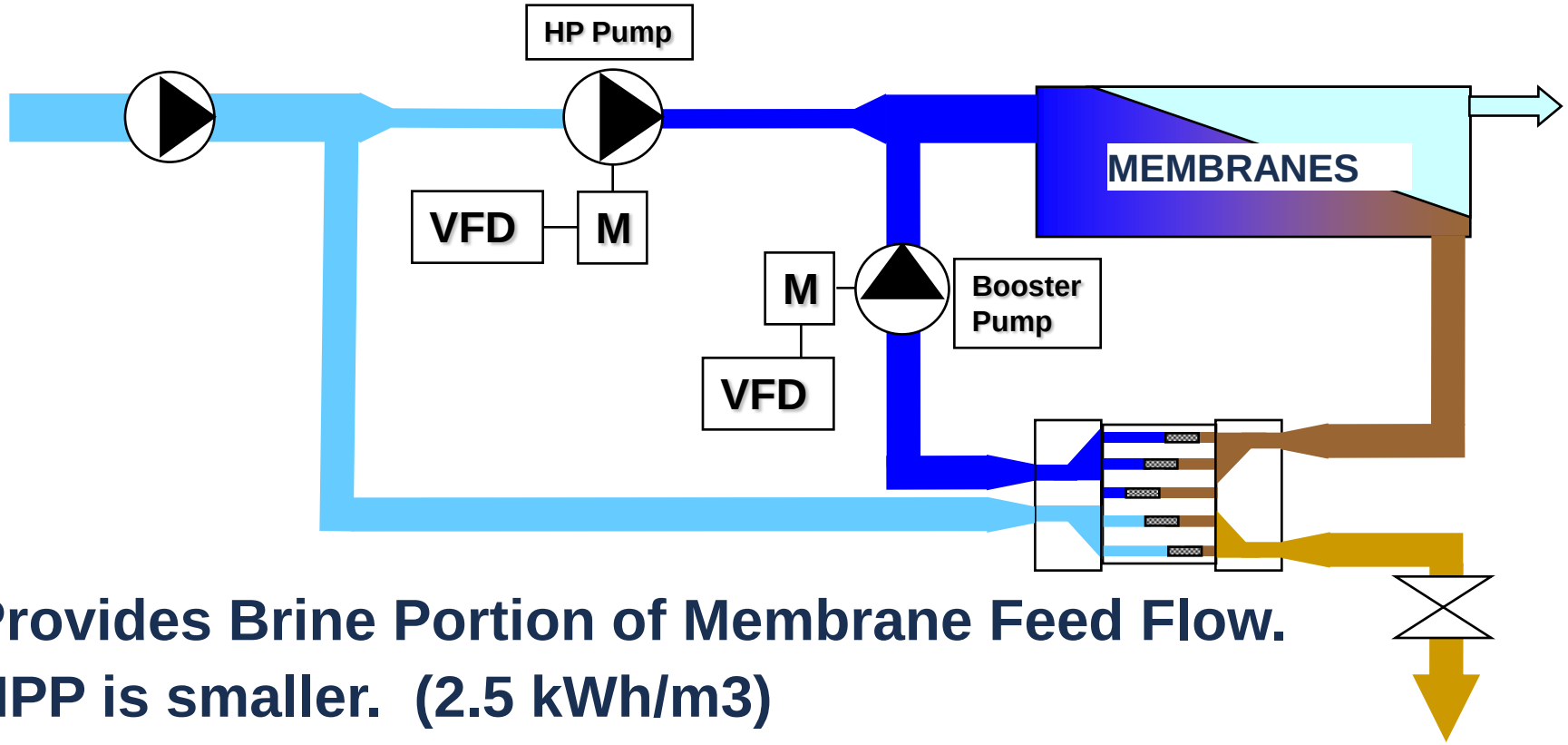


High Pressure Pump with Pelton Wheel (ERT)

ERT recovers energy and helps HPP spin (4 kWh/m3)

80% eff. ERT, 80% eff. HPP, 64% Net Energy Transfer

PX Pressure Exchanger



Provides Brine Portion of Membrane Feed Flow.

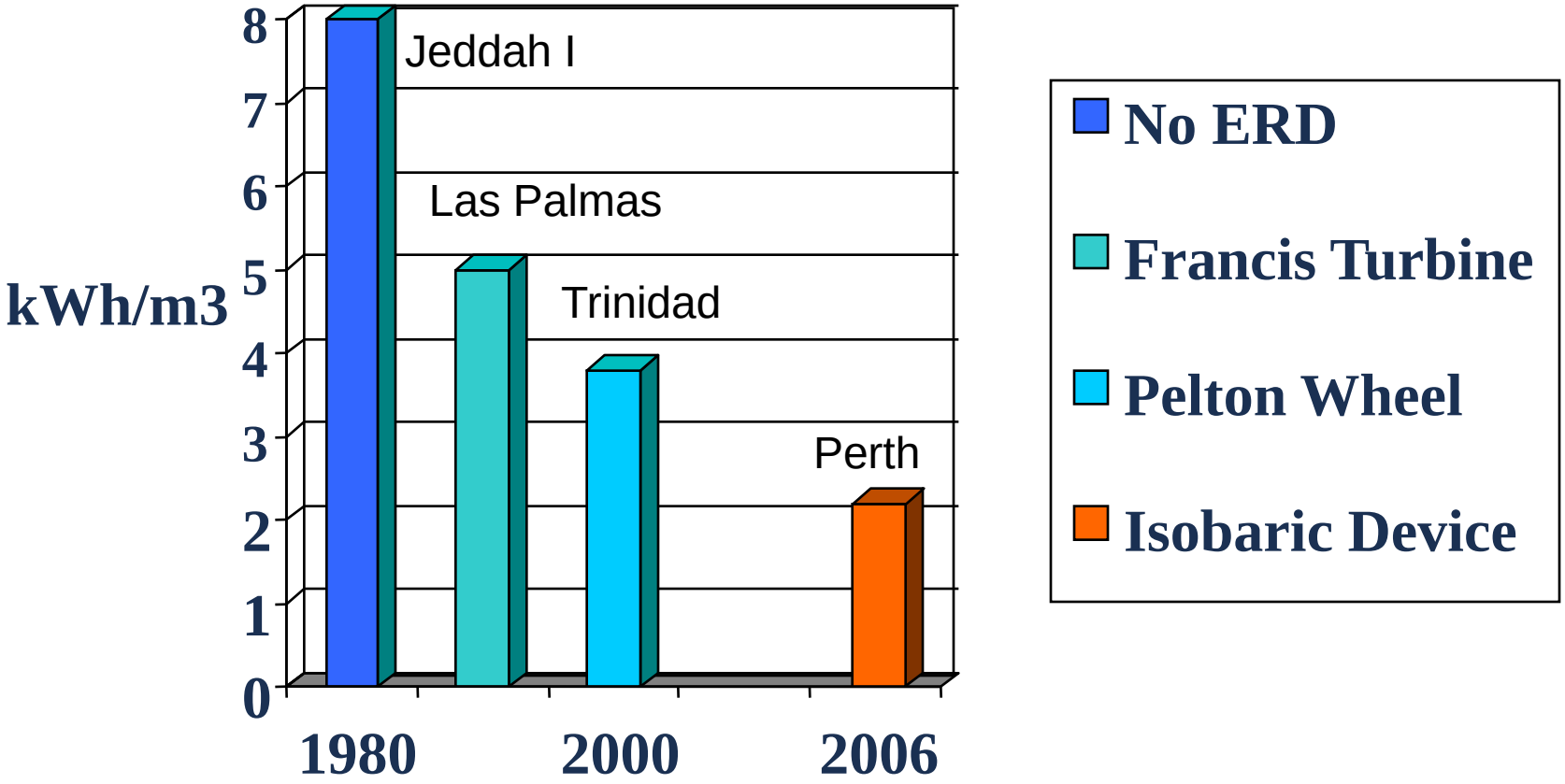
HPP is smaller. (2.5 kWh/m3)

97% Net Energy Transfer

Consumption & Costs

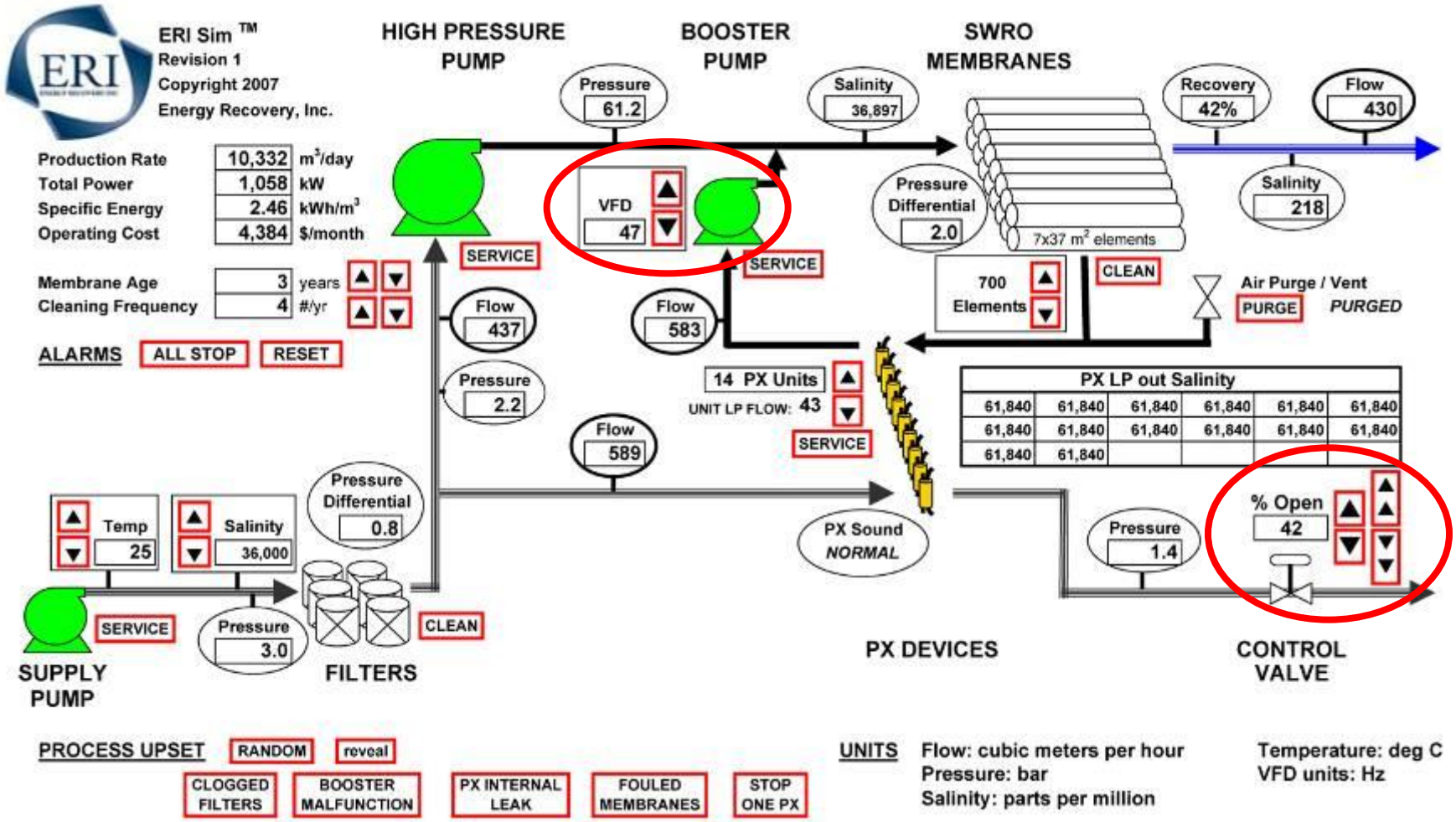
Energy Recovery Devices

Driving down the cost of Desalination



PX Animation

ERI SIM SWRO Process Simulator



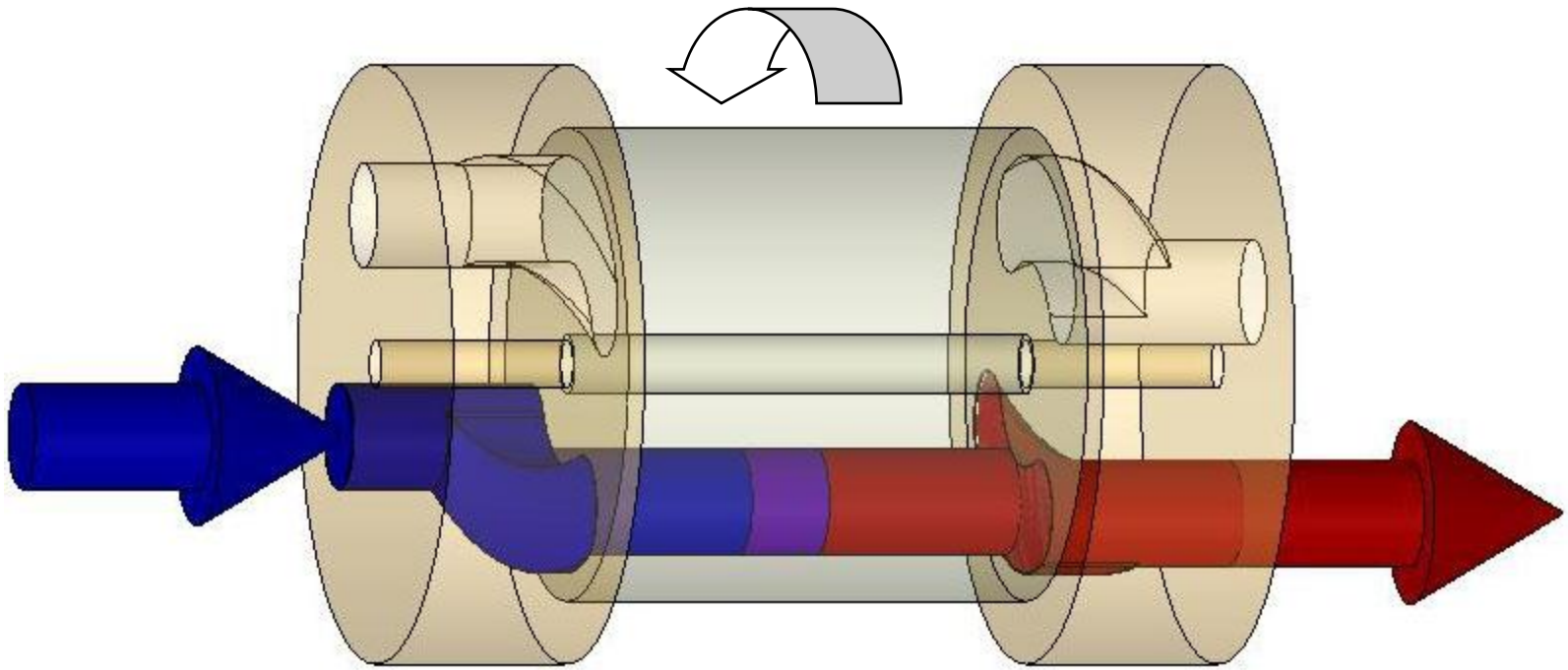
IMPLICATIONS

- **Two, independent and parallel feed flows to the membranes**
- **PX Installation Design: Power Model, P&ID, Mounting Racks**
- **Operations: ERI SIM, Training, Commissioning Assistance**

ERI
ENERGY RECOVERY INC

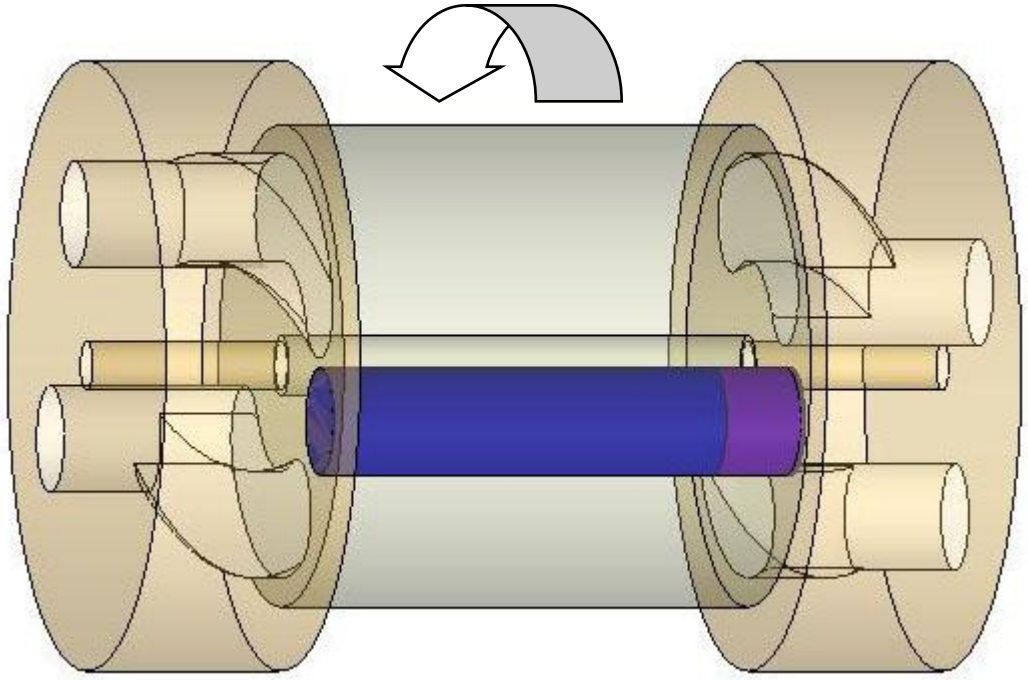
Making Desalination Affordable

Energy Recovery Systems



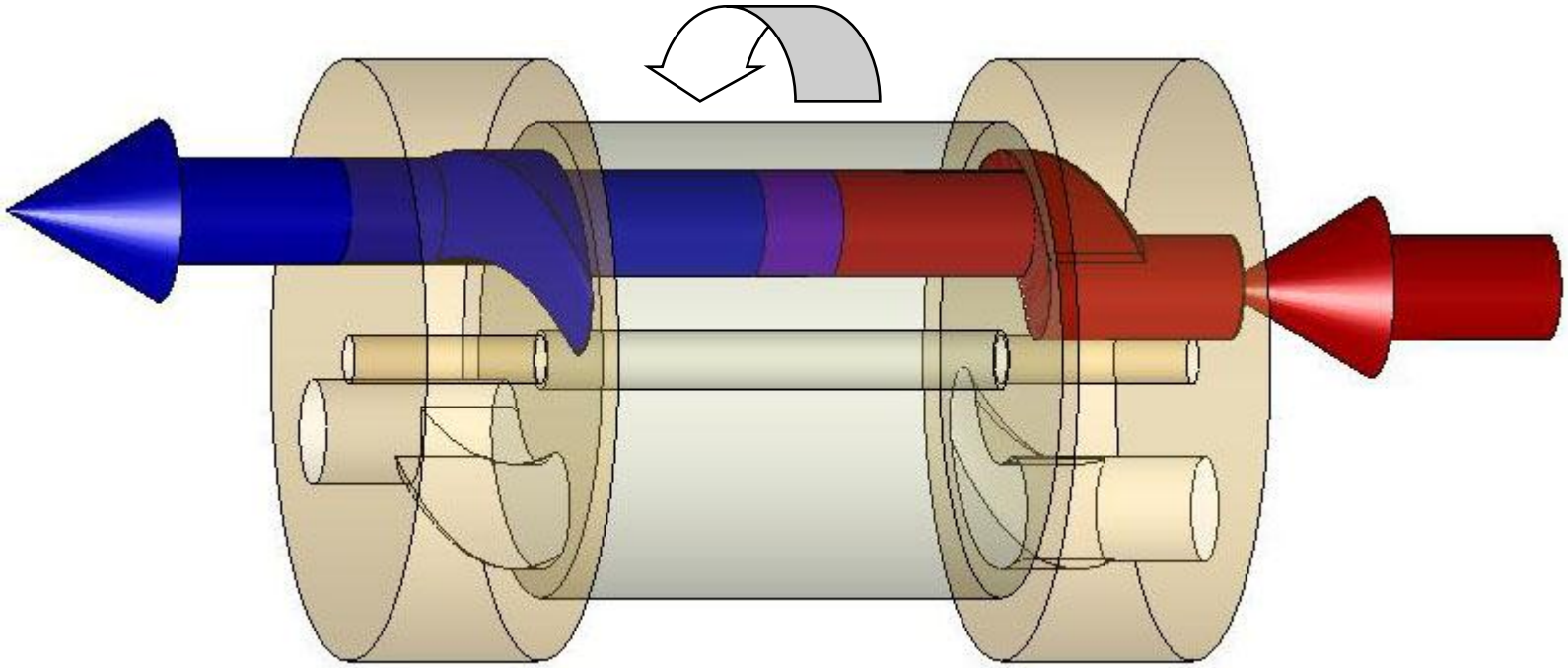
1. **Low-pressure feed water fills rotor chamber, displacing brine**

Energy Recovery Systems



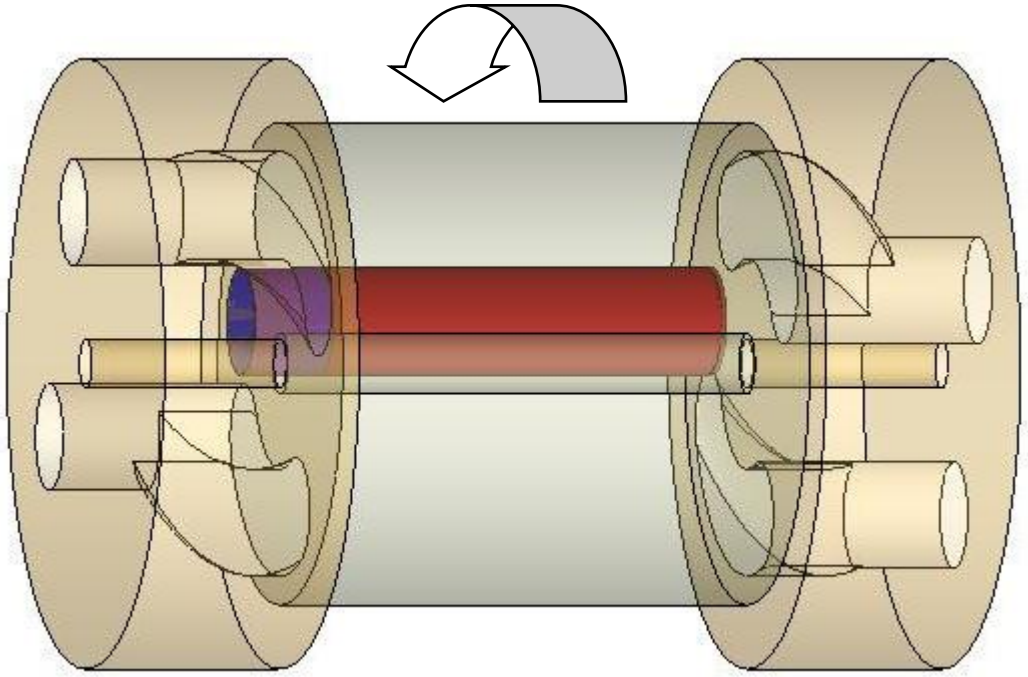
2. Rotor chamber seals, containing low-pressure feedwater

Energy Recovery Systems



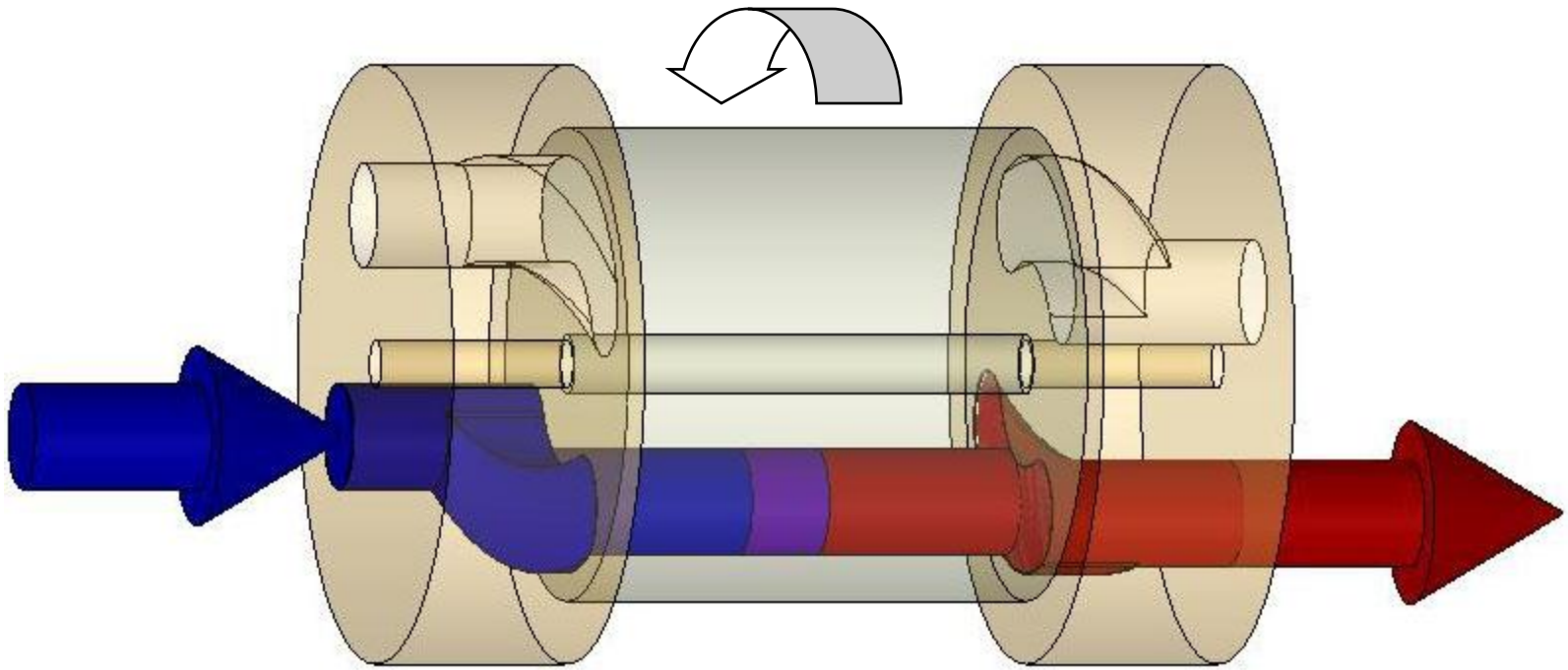
3. High-pressure brine pressurizes and displaces feedwater

Energy Recovery Systems



4. Rotor chamber seals, containing high pressure brine

Energy Recovery Systems



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