
PURE AQUA, INC.®
Global Leader in Water Treatment & Reverse Osmosis Systems
www.pureaqua.com

Seawater Reverse Osmosis Systems by Pure Aqua, Inc.

April 04, 2017

A Proven Track Record

- 10,000+ Successful System Installations
- 3,000 Satisfied Clients
- 2,500 Custom Systems in Operation
- 300+ Million Gallons of Pure Water Produced Daily World Wide

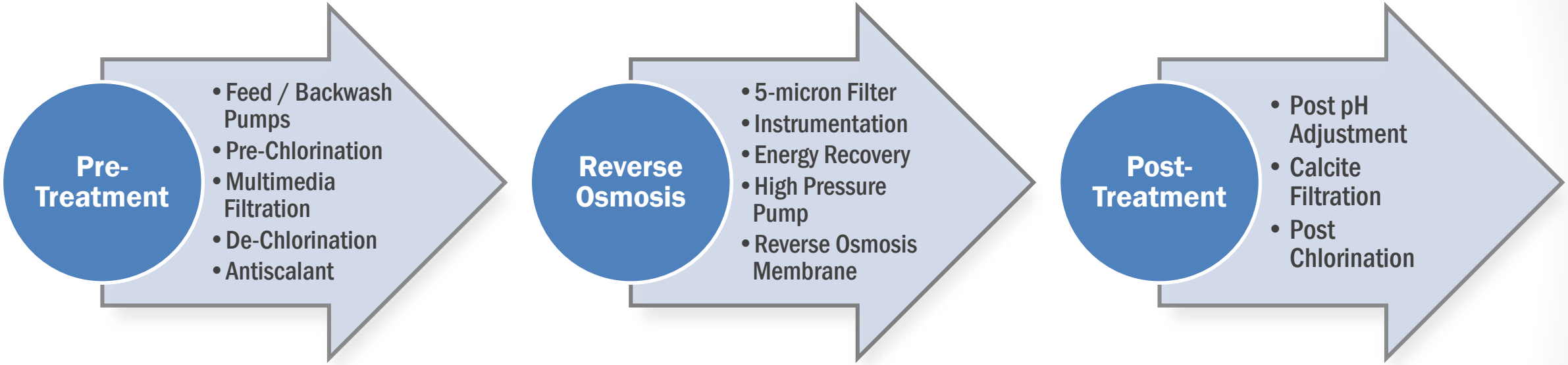
Interesting Facts

- Many regions in the world do not have easy access to fresh drinking water.
- Reverse Osmosis Desalination process completely removes salts from seawater making it drinkable.
- Seawater RO systems are usable anywhere from yachts to municipalities.
- It’s important to choose the correct materials of construction to handle seawater (which is highly corrosive). Pure Aqua uses materials such as Duplex SS 2205 and Monel to guarantee a longer operating life and less maintenance.

Characteristics of Seawater

- Total Dissolved Solids: 30,000 mg/L to 45,000 mg/L
- Total Suspended Solids: 50 mg/L to 250 mg/L
- pH: 7 – 8
- Microorganisms & Bacteria
- Small amount of heavy metals

Seawater Reverse Osmosis



Pre & Post Treatment Options Available

Media Filtration with Automatic Backwashing
Chemical Dosing Treatments and UV Sanitation

Pre-Chlorination

- Seawater typically contains microorganisms and bacteria that can form a bio-film on the membrane surface
- Killing / deactivating bacteria and microorganisms before the reverse osmosis membrane will prevent biofouling
- A continuous chlorine dose is around 3 mg/L
- Helps oxidize metals

Pre-treatment (De-Chlorination)

- Chlorinated feed must be dechlorinated to prevent oxidation of membranes
- Chlorine level before membranes is monitored by an ORP (oxygen reduction potential) sensor

Pre-treatment (Antiscalant)

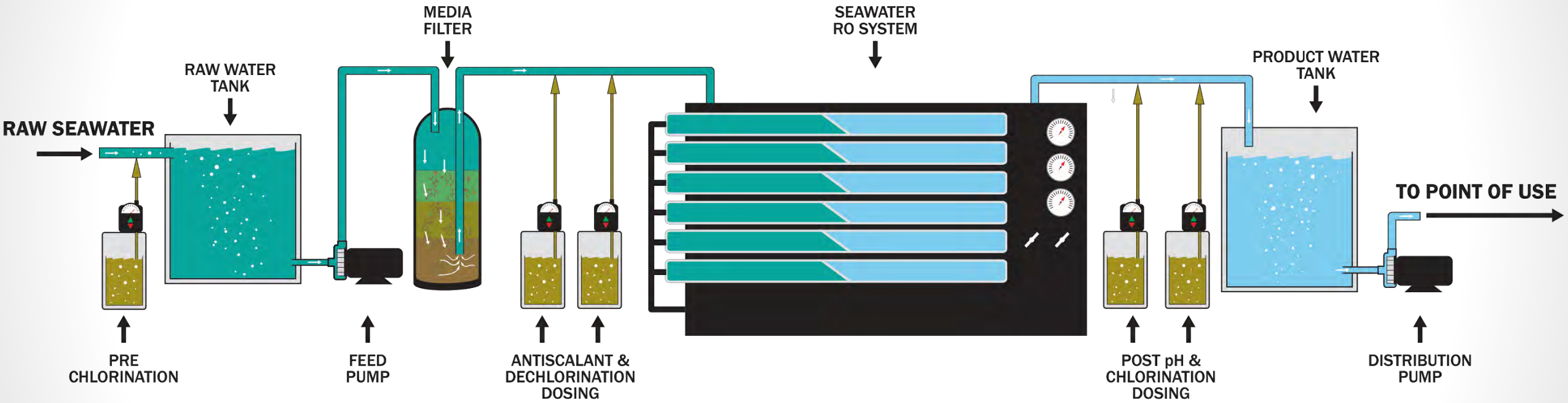
- Feed must be injected by PA0100 antiscalant to prevent scaling or fouling the membranes
- RO Antiscalant chemicals are surface-active materials that interfere with precipitation reactions in three primary ways:

  Threshold inhibition: it is the ability of an antiscalant to keep supersaturated solutions of springily soluble salts.

  Crystal modification: it is the property of an antiscalant to distort crystal shapes, resulting in soft non-adherent scale.

  Dispersion: which is the ability of some antiscalant to adsorb on crystals or colloidal particles and impart a high anionic charge, which tends to keep the crystals separated.

Typical Seawater RO System Flow Diagram

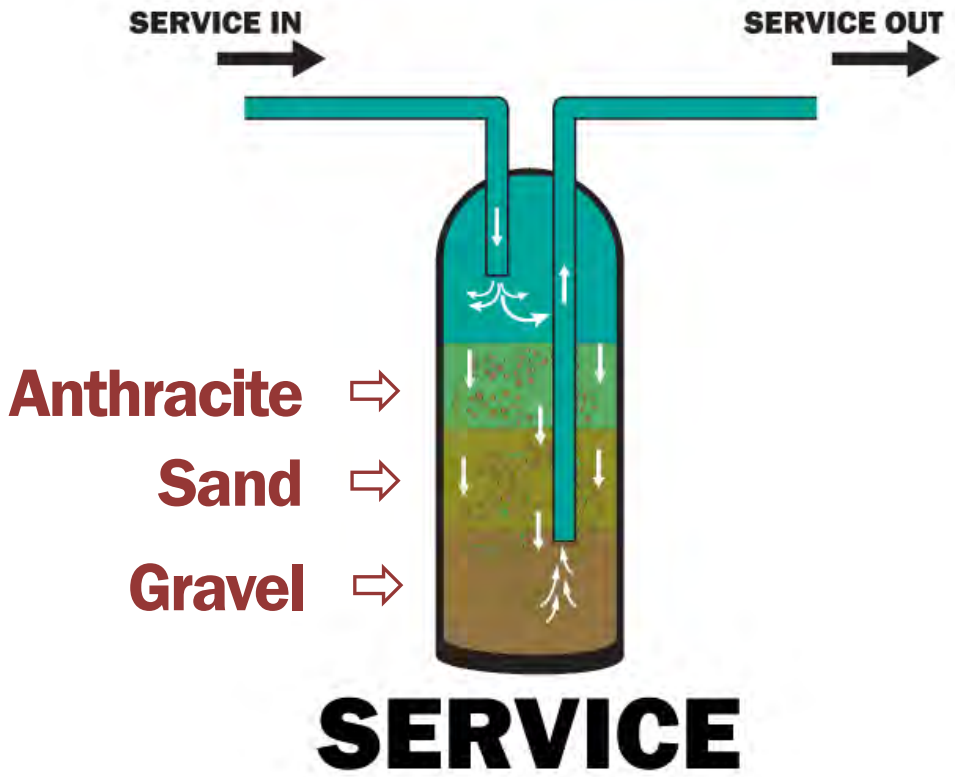


Pre-treatment (Multimedia)

- Multimedia Filtration
  - Reduces turbidity and suspended solids
  - Removes dirt, silt, and other particles (10-25 microns)
  - Three layers of media consisting of Anthracite, Sand, and Gravel
  - Largest particles are trapped near the top of the filter
  - Smaller particles are trapped deeper in the filtration bed
  - The use of both anthracite and sand allows for longer run times

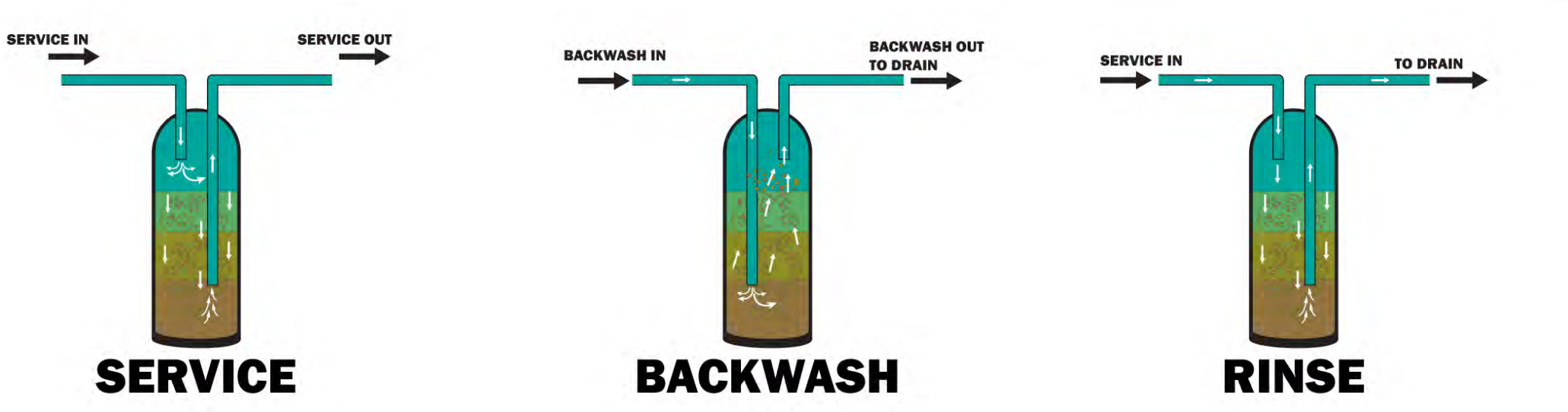
Pre-treatment (Multimedia)

- Multimedia Filtration
  - Largest particles are trapped near the top of the filter
  - Smaller particles are trapped deeper in the filtration bed
  - The use of both anthracite and sand allows for longer run times
  - Anthracite will distribute the flow to avoid turbulence and turbidity leakage



Pre-Treatment (Multimedia)

- Multimedia Filtration
  - Three main cycles
    - Service
    - Backwash
    - Settle & Rinse
  - Backwash is initiated based on a differential pressure of 10-15 psi
  - Pressure drop across a clean multimedia filter is 3-5 psi



Feed / Backwash Pumps

- Feed Pump
  - Pumps water from tank through the pre-treatment to the reverse osmosis system
- Backwash Pump
  - Reverses the flow of water through the multimedia filter
- TEFC Motors
- Centrifugal Pumps
- ***Duplex 2205*** Stainless Steel
- Corrosion resistant
- Depending on design pump redundancy is possible
- Pumps sized appropriately to save energy

Post-Treatment

- pH adjustment
  - Caustic Dosing
- Calcite Filter
  - Raises the pH
  - Self correcting and will raise pH to a non-corrosive equilibrium

Reference Projects

48,000 GPD x 2 | SWRO

Location: Belize
Application: Resort
Water Source: Seawater
System Features: Advanced PLC, Energy Recovery Turbine

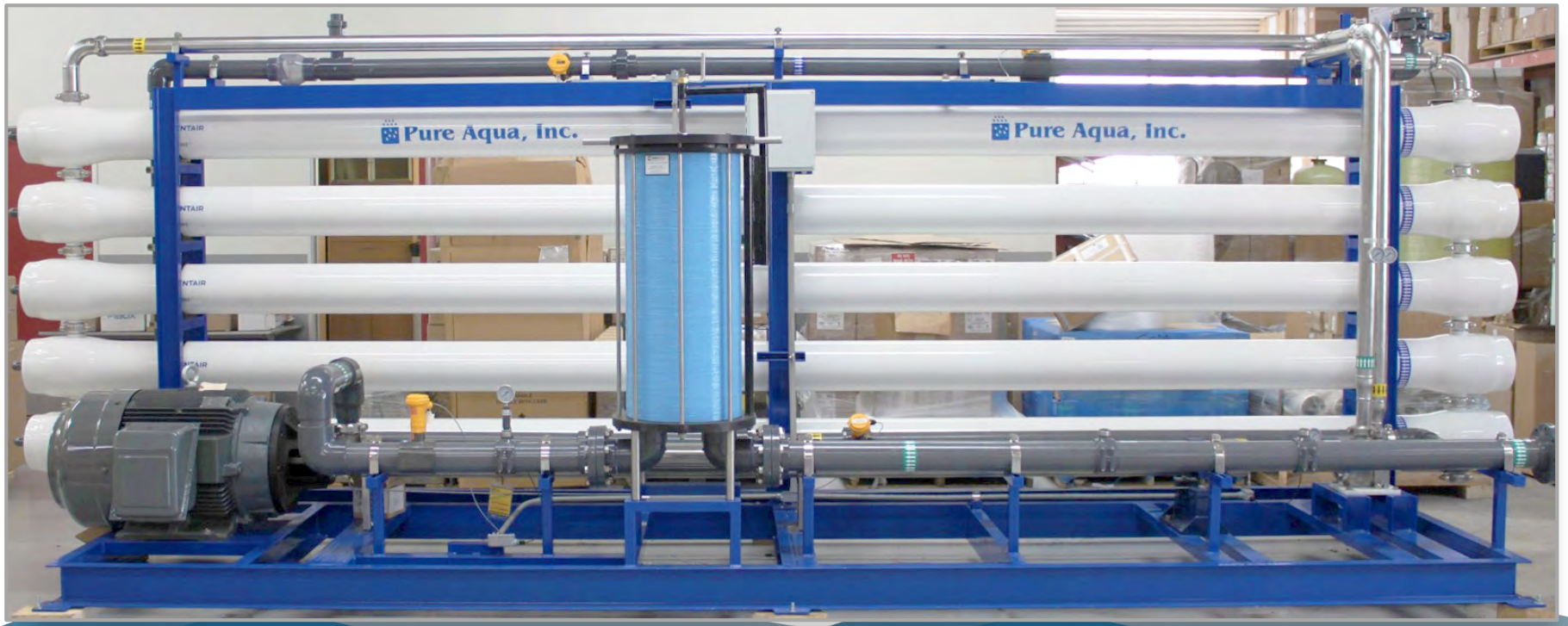
136,000 GPD | SWRO

Location: Maldives

Application: Exclusive Resort

Water Source: Seawater

System Features: Floor Mounted PLC, Energy Recovery Turbine



250,000 GPD x 3 | SWRO

Location: Pakistan
Application: Drinking Water
Water Source: Seawater
System Features: PLC, Energy Recovery Turbine, Cleaning System

126,000 GPD x 2 | SWRO

Location: Oman
Application: Ministry of Defense
Water Source: Seawater
System Features: Floor Mounted PLC, Energy Recovery PX, Ion Exchange Boron Removal System

130,000 GPD | SWRO

Location: Oman
Application: Ministry of Defense
Water Source: Seawater
System Features: Floor Mounted PLC, Energy Recovery PX, Double Pass RO System

16,000 GPD | SWRO

Location: Yemen
Application: Exclusive Resort
Water Source: Seawater
System Features: Microprocessor Control Panel

12,000 GPD | SWRO

Location: Chile
Application: Copper Mine
Water Source: Seawater
System Features: Double Pass RO with Microprocessor Control Panel

16,000 GPD | SWRO

Location: Thailand
Application: Drinking Water
Water Source: Seawater
System Features: PLC and VFD

12,000 GPD | SWRO

Location: Colombia
Application: Drinking Water
Water Source: Seawater
System Features: Microprocessor Control Panel and VFD

16,000 GPD | SWRO

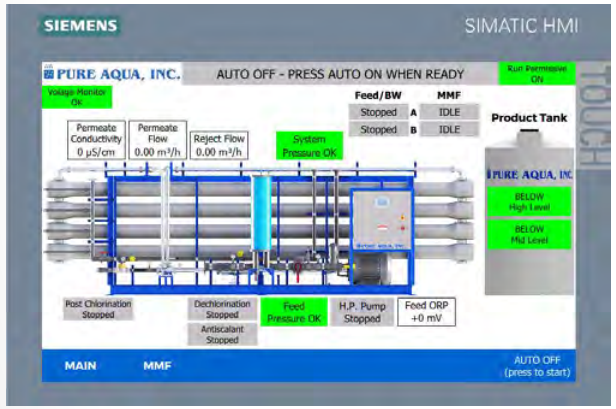
Location: Saudi Arabia
Application: Drinking Water
Water Source: Seawater
System Features: Microprocessor Control Panel and VFD

12,000 GPD | SWRO

Location: Indonesia
Application: Oil & Gas
Water Source: Seawater
Features: Explosion Proof, PLC Control Panel, Skid Mounted Pre and Post Treatment

100,000 GPD | SWRO

Location: Venezuela
Application: Drinking Water
Water Source: Seawater
System Features: Containerized SWRO, PLC, Energy Recovery Turbine



6,000 GPD | SWRO

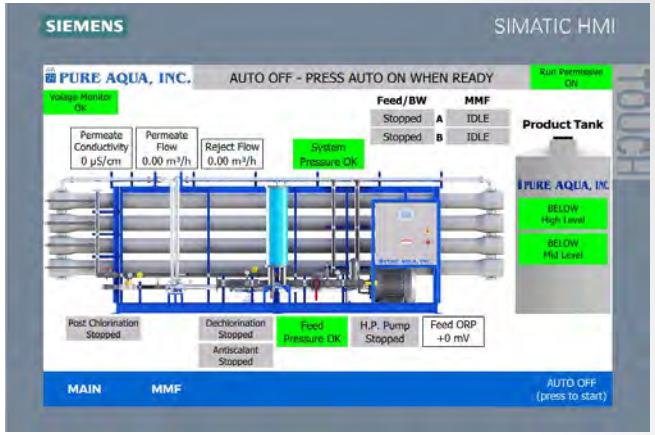
Location: Abu Dhabi-UAE
Application: Drinking Water
Water Source: Seawater
System Features: Microprocessor SWRO

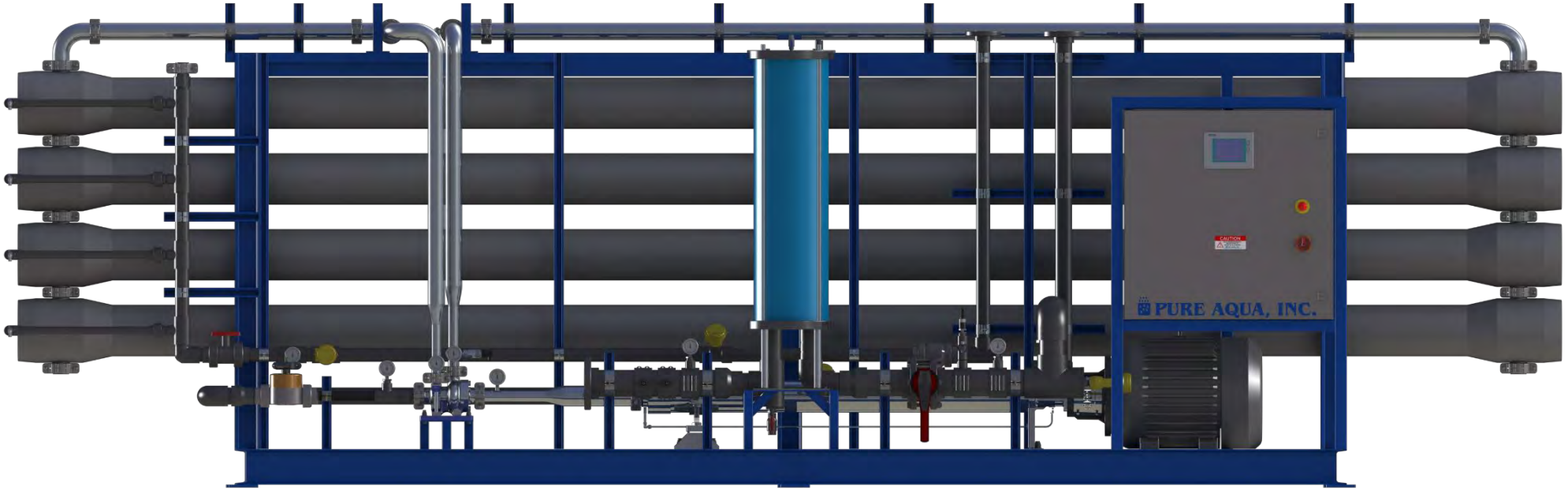
5,600 GPD | SWRO

Location: Peru
Application: Drinking Water
Water Source: Seawater
System Features: Microprocessor SWRO

96,000 GPD | SWRO

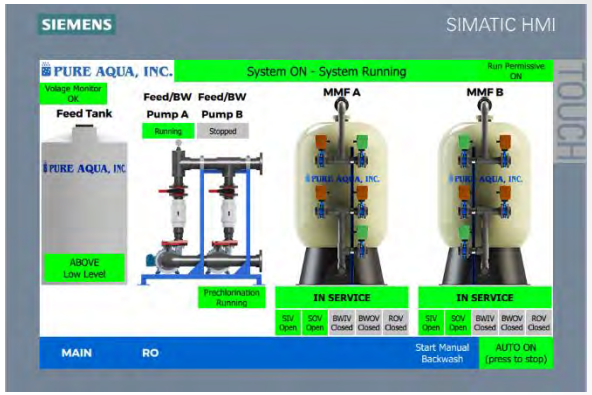
Location: Maldives
Application: Resort
Water Source: Seawater
System Features: PLC Control Panel, Energy Recovery Turbine





48,000 GPD | SWRO

Location: Maldives
Application: Resort
Water Source: Seawater
System Features: PLC Control Panel, Energy Recovery Turbine



THANK YOU

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