

RO WATER PURIFICATION

TURNKEY SYSTEM DESIGN, ASSEMBLY, INSTALL AND TECHNICAL SUPPORT



INNOSEP
New Generation Liquid Separation Systems

When do you need it?

Reverse Osmosis Systems are typically used as roughing demineralizers to remove Total Dissolved Solids (TDS) and supplement Ion Exchange.

Other applications for RO Systems include:

- Total Oxidizable Carbon (TOC) reduction.
- Where TDS of raw water is high.
- Where there is a wide variation in feedwater quality.
- To reduce chemical consumption.

Where single-pass reverse osmosis cannot achieve an acceptable water quality, double-pass systems may be used.

What is it?

Reverse Osmosis Units are a series of pressure vessels called " housings " with a number of membranes installed. Water chemistry and hydraulics determines the number of housings and membranes required.

High-pressure pumps are used to process water through the membranes.

RO membranes are not intended to operate as physical filters. Suspended matter must be removed upstream of the RO System.

Two types of Reverse Osmosis Systems are available:

- Single Pass
- Double Pass

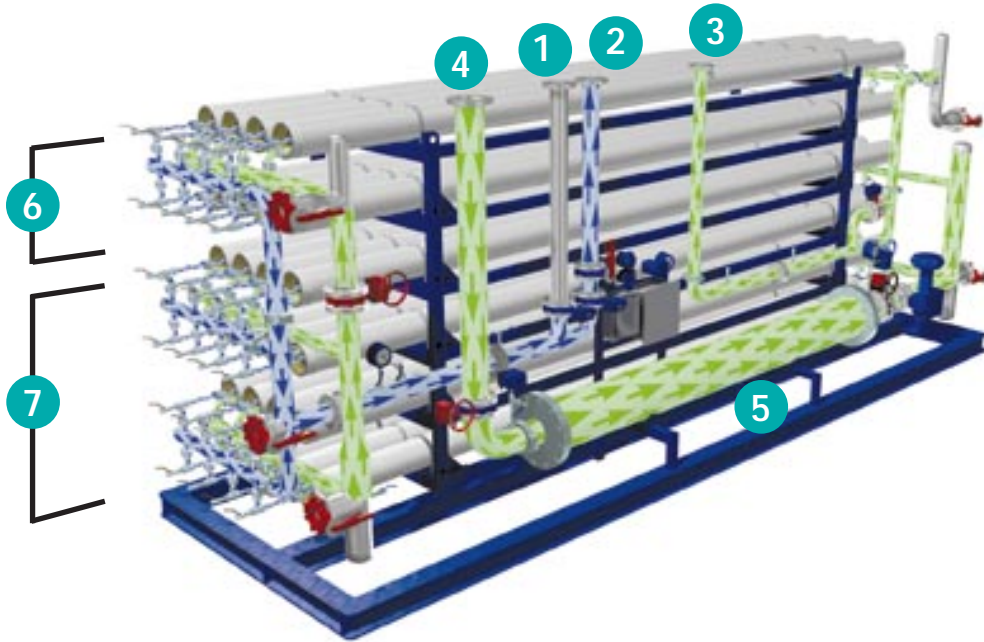
Single Pass means that the permeate has passed through one membrane. Double Pass indicates that it has passed through two membranes.

How does it work?

Osmosis separates impurities from water by passing it through a semi-permeable membrane. The semi-permeable membrane allows only very small atoms and groups of atoms (such as water molecules, small organic molecules and gases) to pass through it. Hydrated ions – ions that have been dissolved and are therefore surrounded by water molecules – cannot pass through the membrane.

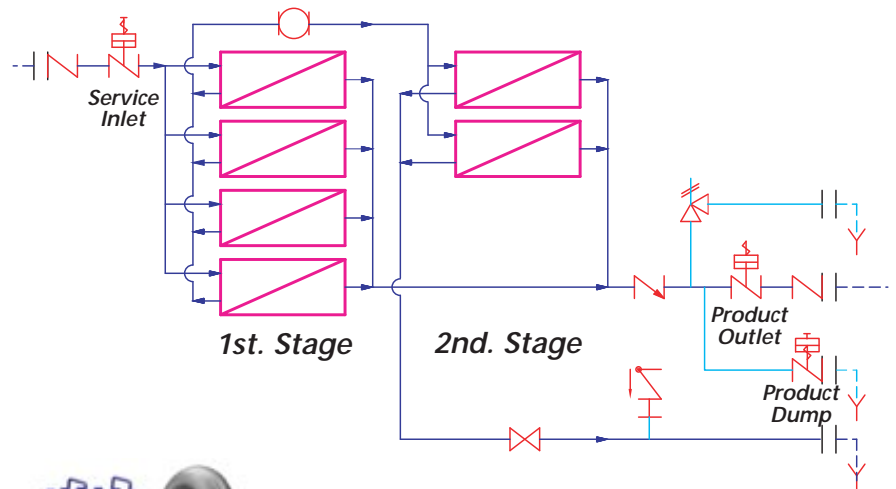
Reverse Osmosis (RO) effectively takes advantage of the osmosis process. By applying pressure to the feed stream, one can reverse the natural osmotic effect, resulting in removal of contaminants from the fluid.

Operation

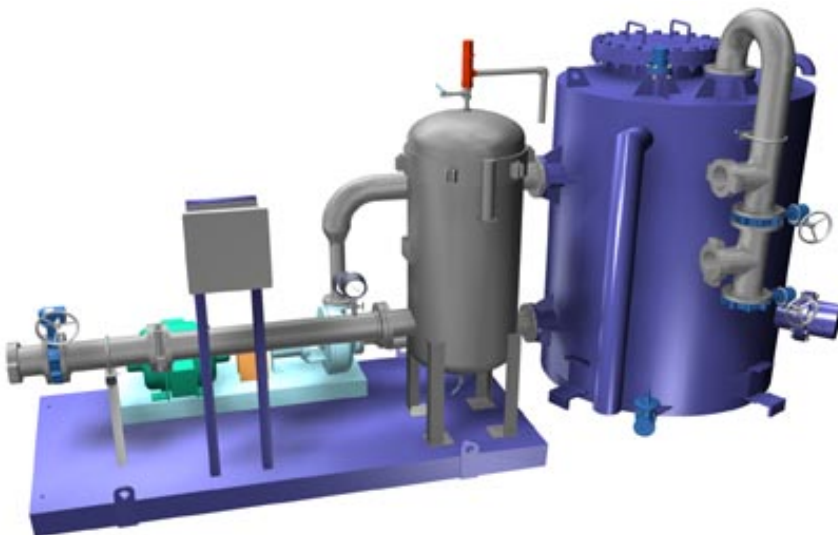


- 1 PERMEATE PUMP
- 2 PERMEATE OUTLET
- 3 REJECT
- 4 FEED
- 5 SUBMERSIBLE PUMP
- 6 2nd STAGE HEADER OUTLET
- 7 1st STAGE OUTLET HEADERS

Reverse Osmosis System

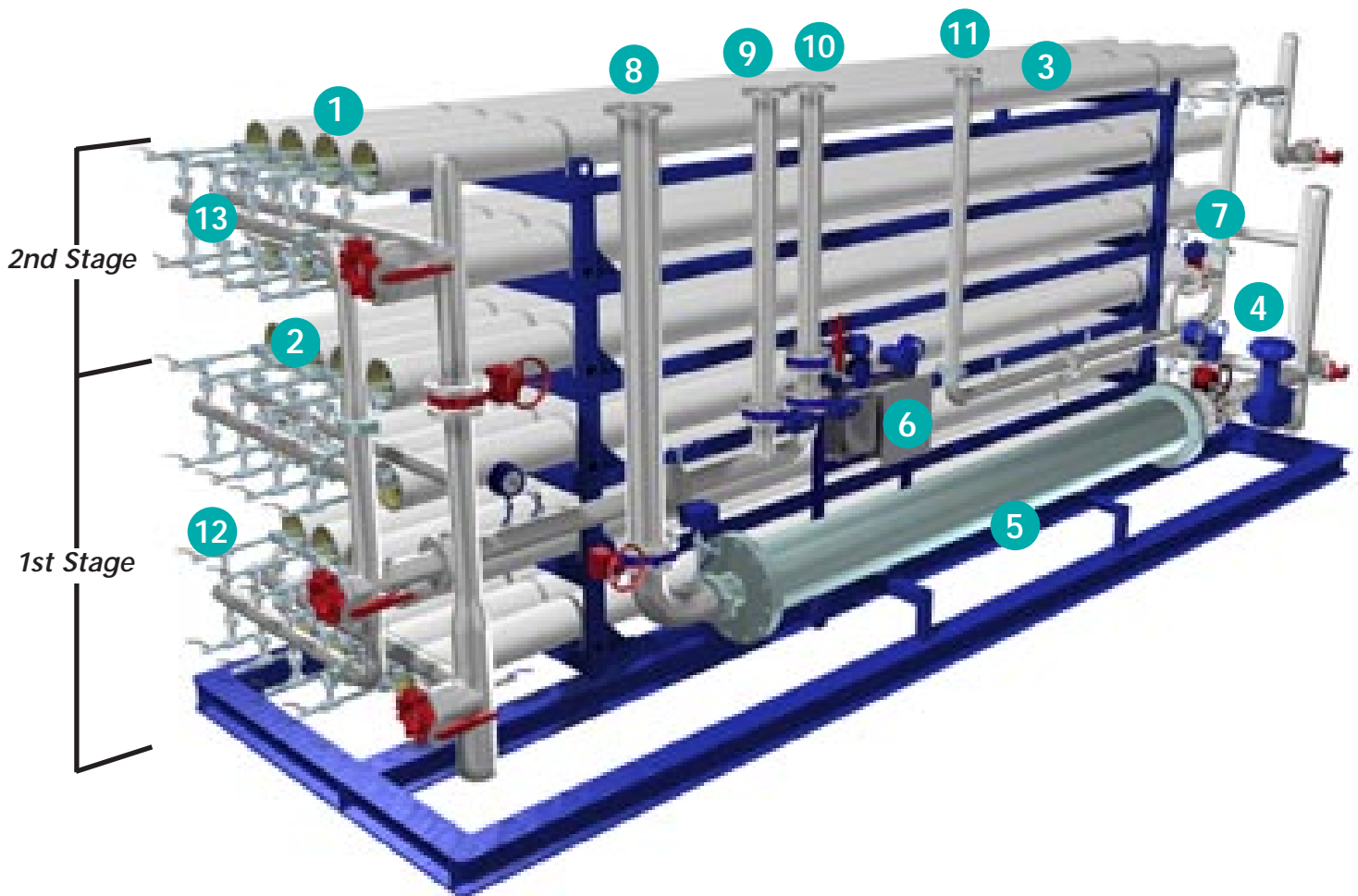


Clean in Place Equipment



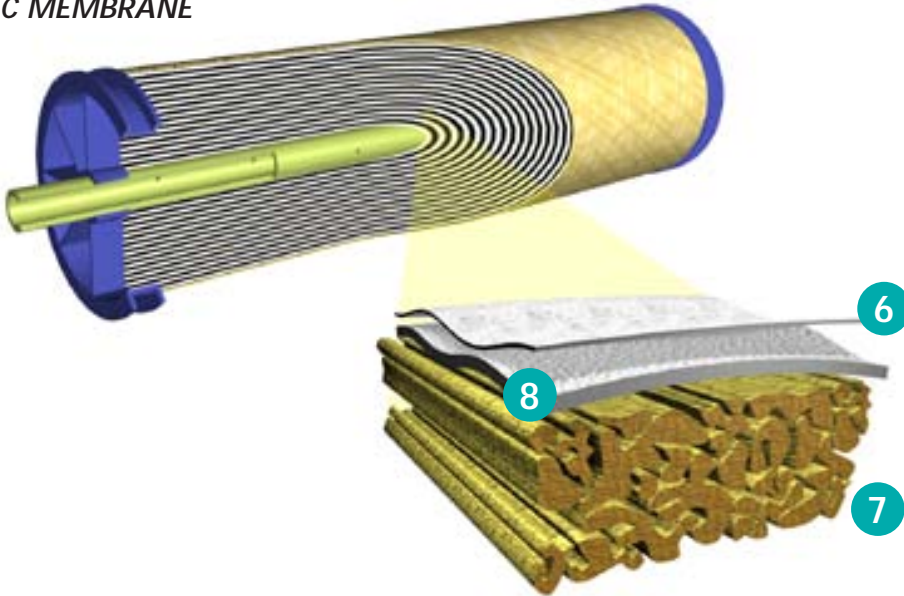
Key Components

- 1 HOUSING
- 2 COMMON DISCHARGE PIPE
- 3 ARRAY
- 4 REJECT VALVE
- 5 SKID MOUNTED PUMP
- 6 SOLENOID / JUNCTION BOX
- 7 FLUSH VALVE
- 8 FEED INLET
- 9 PERMEATE PUMP
- 10 PERMEATE OUTLET
- 11 REJECT VALVE
- 12 1st STAGE PERMEATE
- 13 2nd STAGE PERMEATE FLUSH VALVE



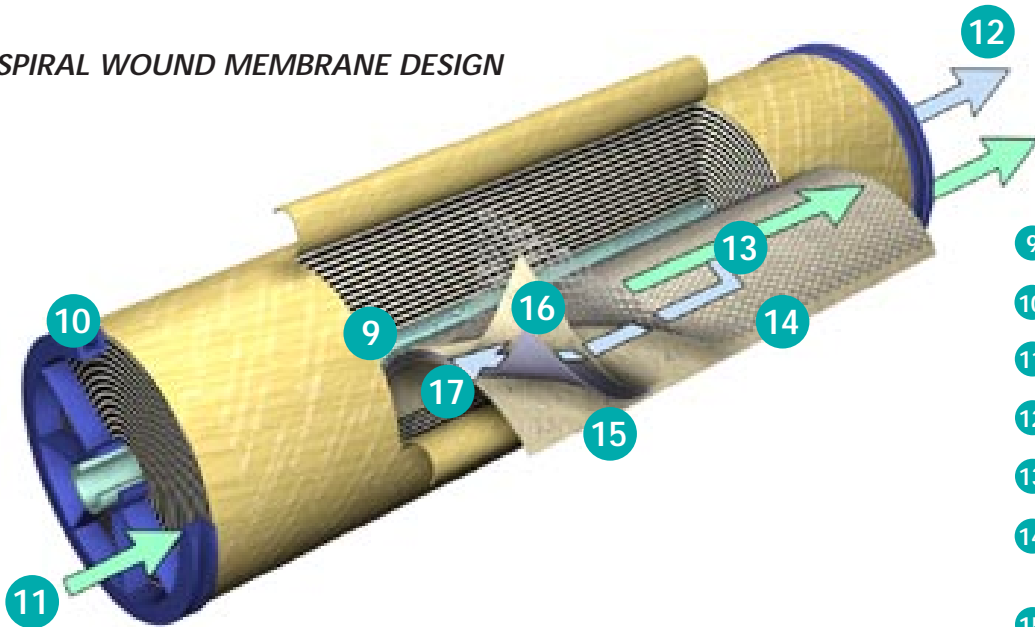
Key Components

TFC MEMBRANE

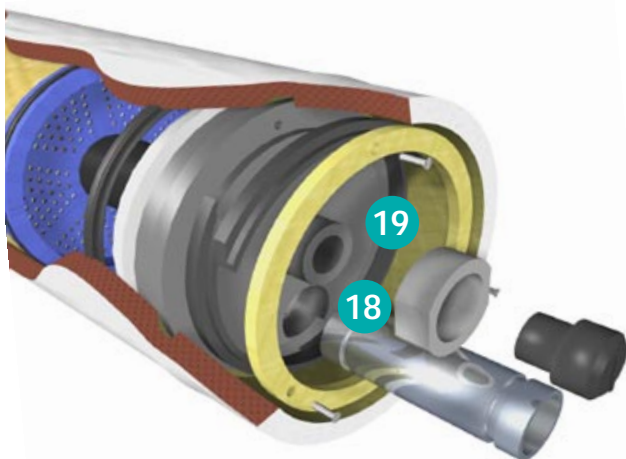


- 6 ULTRA-THIN MEMBRANE
- 7 NON-WOVEN WEB
- 8 POLYSULFONE LAYER

SPIRAL WOUND MEMBRANE DESIGN



- 9 PERFORATED PRODUCT TUBE
- 10 ANTI-TELESCOPIC CAPS
- 11 FEED SOLUTION
- 12 PERMEATE
- 13 FEED WATER CARRIER
- 14 SEALED (GLUED) EDGE OF PERMEATE ENVELOPE
- 15 SEMI-PERMEABLE MEMBRANE
- 16 PERMEATE CARRIER MATERIAL
- 17 PERMEATE FLOW
- 18 PERMEATE PORT
- 19 FEED CONCENTRATE PORT



Reverse Osmosis

Components	Features	Benefits
Reverse Osmosis Housings	Standard ASME code designed, FRP construction.	Assures safety and ensures insurance compliance. Pressure ratings to suit your specific system requirements. High corrosion resistance.
	Option: Pressure rating ASME stamped.	Additional safety and insurance compliance.
	End port feed connection.	Industry standard design.
	Option: Side port feed connection.	Free access to the housing end caps for easier membrane replacement during servicing.
Pumps	Designed to handle even coldest temperatures, fouled condition water in the third year.	Full capability for three-year membrane warranty period.
	Centrifugal pumps.	Can be serviced by in-plant maintenance staff.
	Single-stage or Multi-stage pump.	Meets ANSI standard. Higher pressure capability.
	Option: Submersible pumps with automatic air bleed.	Extremely quiet operation. Air bleed protects pump from cavitation damage.
Flush Systems	Feedwater flush, uses normal service water for flushing.	Displaces antiscalent whenever the bank is removed from service and placed in standby.
	Option: Permeate flush.	Enhances flush effectiveness in difficult waters
	Outlet flush valve.	Allows flushing of membranes at low pressure.
	Dump valve.	Diverts out-of-spec water and/or depressurizes system to prevent membrane damage from backpressure.
	Sampling valves available on each housing.	Operators can track individual housing performance. Speeds troubleshooting – operator can pin point which housing has a problem.
Paint	All carbon steel surfaces are primed with a two component primer, and epoxy-polyamide paint finish coat. Standard paint color is A181 blue.	No on-site painting required. More durable.
	Option: Paint systems suitable for outdoor service and resistant to corrosion from coastal environments.	Increased durability.
Piping	High pressure (>100psi): 316L Stainless Steel Low pressure(<100 psi): PVC.	Strength and corrosion resistance. Low pressure does not require the strength of stainless steel.
	Option: 316L SS low-pressure piping.	
Valves	Butterfly valves for reliable, automatic on/off control. One-piece body and a one-piece shaft, with mechanical position indicators.	More durable, longer life. Compact, simple and durable construction reduces potential for failure. Visual indication of valve position.
	Option: Valve proximity or microswitch type switches.	Provides positive feedback on valve positions to control center.

Reverse Osmosis

Components	Features	Benefits
Instrumentation	Flow-indicating transmitters for permeate and reject provide local readout and send signals to PLC.	Monitors appropriate product flow and recovery rate. Aids trouble shooting.
	Conductivity indicating transmitter in permeate provides local readout and sends signals to PLC.	Monitors system performance and aids trouble shooting.
	Pressure switches on suction and discharge of feed pump.	Low-pressure switch protects against pump cavitation and avoids pump damage. Discharge switch protects against overpressurization and membrane or housing damage.
	Pressure gauge manifolded across the permeate and reject of each stage.	System diagnostics from a single high-accuracy pressure gauge for each stage.
	Option: pH analyzer in feed line	Monitors track pH to keep it within acceptable range.
	Option: Temperature indicating switch in feed line.	Provides for manual collection of data. This facilitates "normalization calculation" to determine system performance.
	Option: Temperature indicating transmitter in feed line.	Permits automatic collection of data.
	Option: Oxidant Reduction Potential (ORP) Analyzer or Chlorine analyzer.	Monitors oxidants in RO feedwater to avoid membrane damage.
Clean in Place System	Cartridge Filter catches contaminants removed from membranes during CIP process.	Assures continuous clean supply of cleaning solution.
	Reverse Osmosis Cleaning.	Facilitates cleaning of each stage individually
	Separate cleaning pump dedicated to cleaning system.	Pump size appropriate to specific cleaning needs.
	Cleaning solution heater.	Warms cleaning solution for optimum performance.
	Internal tank piping. Return lines empty at bottom of tank	Minimizes foaming.
	Sloped bottom tank.	Provides complete drainage, and prevents sludge accumulation.
	Permeate fill valve.	Provides a connection to easily-fill cleaning system with RO permeate.
	Flexible hose to connect cleaning skid to RO skid.	Low capital cost alternative.
	Option: Solid PVC or 316L stainless piping from cleaning skid to RO skid.	Minimizes operator activity, reduces cleaning time, improves housekeeping.