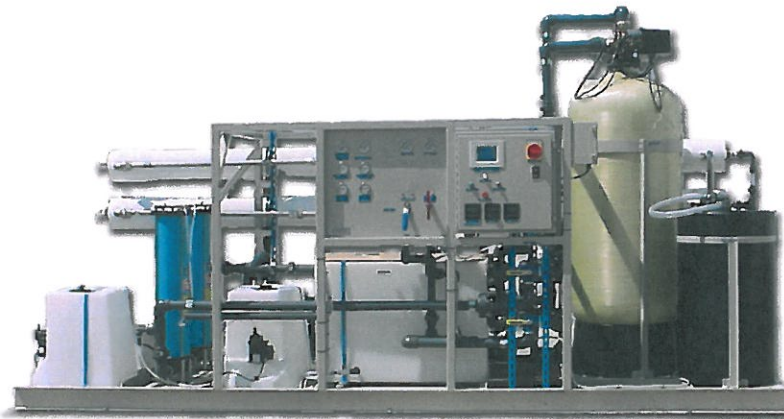


Product Description / Equipment Specifications Brackish Water - Reverse Osmosis Units 10,000 Gallons/Day – 264,000 Gallons/Day

General Description:

Lifestream BW Series reverse osmosis units are designed and manufactured for industrial applications. They are horizontal configurations utilizing vertical pumps. They are pre-engineered, pre-assembled units that minimize installation and start-up costs. They are fully tested at the factory and require simple utility connections and, with minor set up and adjustment, are ready for immediate on-line service. Their designs maximize reliability of the Reverse Osmosis unit.

Each unit is a single pass RO system mounted on a urethane coated structural steel frame. The RO skid includes a cartridge filter, high pressure feed pump, FRP, side entry pressure vessels, spiral wound thin film composite RO membranes, PVC low pressure feed and reject piping, stainless steel high pressure piping, and PVC product piping. The systems are controlled by a programmable logic controller (PLC) with a touch screen Human-Machine Interface (HMI). The system also utilizes an integrated Clean in Place (CIP) function.



Mechanical Description:

The components of the BW Series reverse osmosis units are supported by the urethane coated carbon steel frame and designed in such a way to provide easy access for servicing, maintenance, and monitoring system performance.

The feed, low-pressure reject, and product piping is schedule 80 PVC. The high-pressure piping is constructed of welded Sch10 316 stainless steel. The inlet and outlet piping connections to the unit are class 150 PVC flanges. A single 316 stainless steel locking valve is used for pump discharge pressure control on the Economy and Plus RO units. Two 316 stainless steel globe valves are used to control the reject and recycle flow rates. Sample valves are provided for the RO feed upstream and downstream of the cartridge filter, membrane feed, reject, and combined product water.

A sample valve is also located on the product port of each pressure vessel for analyzing individual vessel performance. Cleaning connections are provided at each stage of the RO to clean the membranes. The unit features an “on-board” integrated cleaning system. The RO cartridge filter and pump are used for CIP along with the factory supplies valves, hoses, and a chemical tank (placed adjacent to the skid). The CIP operation is initiated through the HMI. pH and ORP are available as an option for all models.

Electrical Description:

The units are controlled by a PLC. The model has a motor starter and PLC housed in a single NEMA 4 enclosure. All systems require only a single power drop for operation. These controls monitor and protect the system from damage to itself or nearby equipment systems and/or personnel.

Operational Description:

BW Series Reverse Osmosis units operate continuously and are monitored by the instruments and PLC. The PLC will alarm on non-critical conditions such as poor quality or shut down the RO system on critical conditions such as low suction pressure or high discharge pressure. All alarm and shut down conditions are indicated on the control interface. Dry contact inputs are provided for chemical feed failure, pretreatment interlock, tank high and low level, plus feed and pump discharge pressure switches. The pretreatment interlock or tank high input will put the RO into “Standby” mode. During the standby mode, the RO will periodically flush with feed water (the high pressure pump is not running) to maintain optimal system performance.

Design Parameters:

Configuration	Multi-Stage, Single Pass
Inlet Pressure Requirements	30-60 PSIG
Feed Water Temperature	65°F (18.3°C)
Feed Water Source	Well or Softened
Pre-Filtration	5 μ nominal
Feed Water Fouling Index	Silt Density Index (SDI) < 3
System Recovery (Nominal)	75%
Product Pressure Available	10 PSIG
Membrane Salt Rejection	99% nominal – Based on 500ppm NaCl, 65°F, 99.4% ionic rejection, and recovery as required by projections.
Performance Basis	A specific computer projection must be run for each individual application.

General Specifications:

Frame	
Materials	Structural Carbon Steel
Paint	Urethane Primer (Zinc + Rich) Top Coat, Smooth Finish
Color	White
Cartridge Filter Housing	
Materials	316 SS, Passivated
Filter Rating / Material	5 Micron Nom. DOE, Polypropylene
Size	4Rx3H (30, 45 gpm units), 7Rx3H (60, 75, 100 gpm units)
Pump	
Manufacturer	GOULDS SSV series, grooved or flanged connections
Materials	316 Stainless Steel Housing
Motor	TEFC
Membranes	
Manufacturer	Hydranautics or Equivalent
Model	ESPA-4
Materials	Thin Film Composite (TFC)
Type	Spiral Wound
Pressure Vessels	
Manufacturer	Protec or Equivalent
Model	8" Diameter, PRO-8-300 Series
Materials	Fiberglass reinforced plastic (FRP)
Rating	600 PSIG ASME Code
Process Connections	Grooved side entry feed/concentrate
Piping Systems	
Feed Piping	PVC, Schedule 80
High Pressure Piping	316 SS, Schedule 10
Product Piping	PVC, Schedule 80
Cleaning Connections	Flanged/Grooved - Feed & High Pressure
Automatic Process Valves	
Inlet Valve	Actuated butterfly valve, fail-to-close
Auto Flush Valve	Actuated ball valve, 316 SS, fail-to-close
Manual Valves	
Pump Throttling Valve	316 SS locking ball valve, flanged, manual
Reject Valve	316 SS globe valve, manual
Reject Recycle Valve	316 SS globe valve, manual
Sample Valves (feed)	1/4" 316 SS Valve
Sample Valves (high pressure)	1/4" 316 SS Ball Valve
Sample Valves (product)	1/4" 316 SS Valve (one for each RO vessel and one common)
Product Divert Kit (Option)	
Product Isolation	1.5" PVC ball valve, 2" & 3" EPDM lined CS butterfly valve, all fail-to-close
Product to Drain	1.5" PVC ball valve, 2" & 3" EPDM lined CS butterfly valve, all fail-to-open
Product Relief Valve	100 psig ASME code stamped, carbon steel body with stainless steel trim
Pneumatic Speed Control	Nickel plated brass, 1/4" tube fittings

Instrumentation Specifications:

Pressure	
Indicators	316 SS, 2 1/2" dial, glycerin filled, 1/4" NPT
Low Feed Switch	United Electric 10 Series, 316 SS / Buna-N, 120VAC, 4-50 PSIG, 1/8" MNPT
High Discharge Switch	United Electric 10 Series, 316 SS / Buna-N, 120VAC, 30-5600 PSIG, 1/8" MNPT
Quality	
Conductivity Monitor	Signet 8900 Series Multi-Parameter
Conductivity Sensors	Signet 2850 Series
Flow	
Flow Sensors – feed/reject	Signet 2536
Flow Indicator – reject/recycle	Polysulfone Rotameter

Controls Specifications for PLC packages (Plus and Deluxe models):

Main Control Panel	Steel enclosure, frame mounted, ANSI 61 gray
Programmable Logic Controller (PLC)	Siemens S7/200 CPU224XP
PLC Input/Output	Discrete 24 point (14 input and 10 output) (Expandable)
HMI - Touch Screen	Siemens TP177A
Shutdown Alarms	Low Quality Product Low feed pressure Low reject flow High product flow High pump discharge pressure High feed water temperature ORP alarm (optional) Emergency Stop CIP low flow
HMI Status Indicator / Value	Feed flow, rejection flow, product flow, % recovery Total run time RO operating mode Pump status Inlet, reject, product to tank, product to drain valve status Pretreatment lockout Storage tank full (Standby – no call for water)
HMI Switches / Pushbuttons	RO Selector Man / Auto RO selector Start / Stop Auto flush selector On / Off Alarm Silence / Alarm Reset / CIP Start (Deluxe model only)
Miscellaneous Controls	Alarm horn and alarm pilot light Chemical injection pump terminals Auxiliary contacts for pump running & fault

Interface Communication Specifications:

Pretreatment System	Activation of this signal confirms that the pretreatment Equipment is available to deliver water to the RO unit (Dry Contacts)
Call-For-Water-Signal	Activation of this signal confirms that the post treatment Equipment (storage tank or other equipment) is requesting RO product water (Dry contacts)

Operating Limits:

Feed Temperature*	65 - 80 °F
Feed Pressure	30 – 60 PSIG

Feed Water Requirements:

Maximum SDI Rating	3
Maximum Turbidity	1 NTU
Maximum Free Chlorine and/or Chloramines	< 0.1 PPM
Maximum TDS	8000 PPM

Factory Procedures:

Assembly	Fully assembled at the factory
Wiring	Fully wired at the factory
Testing	Hydrostatic pressure test, Electrical integrity test, Factory functional test
Membrane Elements	Membrane elements are shipped in their original packaging For installation on site at time of start-up
Membrane Shipping Condition	Dry, shipped uninstalled
Shipping Preparation	Shrink protection (some components may be removed for protection prior to shipment)

Regulations and Standards:

Stainless Steel Pipe Finish	Interior: Mill - Exterior: Bead Blast
Frame Welding	AWS D1.1
Electrical and Controls	Underwriters' Laboratory (UL), National Electrical Code (NEC), Canadian Standards Association (CSA)
Panel NEMA Rating	NEMA 4
Seismic Rating	Seismic Zone 4 anchorage (based on CA, USA requirements). Optional anchorage wet stamp available.

Documentation Package:

Documents	Installation procedures, start-up procedures, operation procedures, controls write-up, specifications, spare parts list, technical service and support services
Drawings	Process and Instrument diagram (P&ID), equipment specification drawing, electrical schematics
Software	Installed at factory prior to testing
Quality Documents	Quality Assurance data reports

Flow Rate Specifications:

Model Number	264K	144K	108K	86K	65K	43K	28K	10K
Product (GPM)	185	100	75	60	45	30	19	7
Feed (GPM)	265	143	107	86	65	43	28	10
Reject (GPM)	80	43	32	26	20	13	9	3
Recycle (GPM)	8	4	3	3	2	2	2	1

Configuration Specifications:

Model Number	264K	144K	108K	86K	65K	43K	28K	10K
Vessel Array Staging	4:2	3:2:1	2:2:1	2:1:1	1:1:1	2(8"):2(4")	2(8"):2(4")	1(8"):1(4")
Membranes / Vessel	6	3	3	3	3	3	2	3
Membrane Quantity	36	18	15	12	9	12	8	6
Vessel Quantity	6	6	5	4	3	4	4	2

Cleaning Connection Specifications:

Model Number	264K	144K	108K	86K	65K	43K	28K	10K
Feed (Grooved) Deluxe	6"	3"	2"	2 ½"	2"	1 ½"	1 ½"	1 ½"
Interstage (Grooved)	4"	2"	2"	2"	1 ½"	1 ½"	1 ½"	1"
Reject (Grooved)*	4"	1" or 2"	1 ½"	1 ½"	1 ½"	1"	1"	1"
Product (Flanged)	4"	2"	1 ½"	1 ½"	1 ½"	1 ½"	1 ½"	1"

**Port size is dependent on connection location - 2" on vessel port and 1" on pipe manifold

Customer Connection Specifications*:

Model Number	264K	144K	108K	86K	65K	43K	28K	10K
Feed	6"	3"	3"	2 1/2"	2"	1 1/2"	2"	1 ½"
Product	4"	3"	2"	2 1/2"	2"	1 1/2"	1 ½"	1 ½"
Reject	4"	1.5"	2"	1 1/2"	1 1/2"	1 1/2"	1 ½"	1

**All connections are 150# ANSI flanges

Utility Requirements*:

Model Number	264K	144K	108K	86K	65K	43K	28K	10K
High Voltage Service	480 VAC / 60 HZ / 3 PHASE							
High Voltage FLA (480)	80	42	36	36	29	16	16	12
Motor HP (ref.)	75	30	25	20	20	10	7 ½	5
Waste Drain - Max. GPM	90	45	35	30	25	15	10	7

**A floor drain (in addition to a waste drain) should be supplied for general maintenance purposes

Physical Dimension Specifications:

Model Number	264K	144K	108K	86K	65K	43K	28K	10K
Length (in)	310	168	168	168	168	168	120	110
Width (in)	72	32	32	32	32	32	32	32
Height (in)	89	89	89	89	72	72	68	68
Est. Shipping Weight (lbs)	5900	3500	3200	3200	2400	2200	1800	1100