

FLOW REVERSAL DESALINATION TECHNOLOGY

Novel RO process for Ultra-High Recovery
Desalination for drinking and process water



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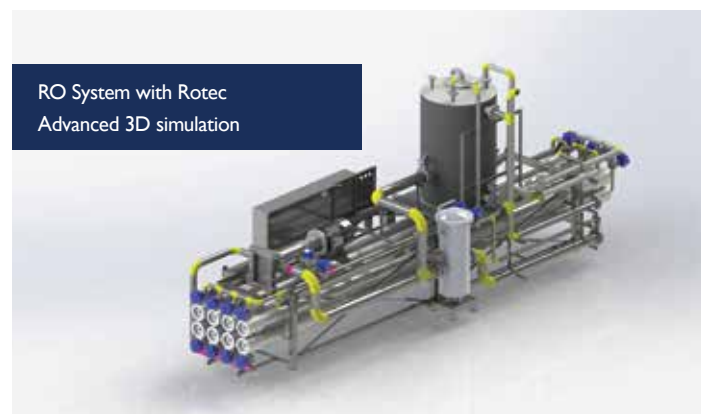
ROTEC FLOW REVERSAL TECHNOLOGY

High Efficiency Water Desalination Treatment

ROTEC's propriety and world-wide patent Flow Reversal technology is designed to be implemented in existing and new Reverse Osmosis desalination facilities for brackish water, water purification and other industrial applications, enabling significant system performance improvements, leading to higher profitability, reduced operating costs and environmental impact associated with desalination.

Technology principle ROTEC's unique solution (Flow Reversal technology) is designed to inhibit and prevent mineral scaling, common phenomena in membrane-based desalination process. Mineral scaling leads to membrane plugging, which limits recovery rates, increases cleaning frequency, and reduces the membrane's life span. ROTEC's solution allows plants to operate at higher recoveries without being exposed to the hazard of mineral scaling and its negative effect on system performances.

Advantages ROTEC's solution substantially improves system performance compared to standard Reverse Osmosis desalination systems in several ways: a) increasing process recovery by 10% to 20% or alternatively enables similar decrease in feed water consumption, b) dramatically reducing brine volumes required for disposal by up to 60%, c) minimizing or eliminating anti-scalant chemical consumption, d) energy savings.



WORLD WIDE ACKNOWLEDGEMENT

Industrial validation & implementation The Flow Reversal technology has been successfully validated by international cooperation's e.g. Mekorot (Israeli National Water Company), GE Water, SUEZ, Vitens, PUB and was recently approved by Coca-Cola. ROTEC's solution has been successfully applied in Israel, Europe, South America, Singapore and China.

Available products Flow Reversal technology can be introduced to RO installations via system retrofit (upgrade) of an existing RO installation, or via grassroots design of new RO installation at the design stage or via a combination of both. ROTEC provide 2 lines of products which apply or enable the application of Flow Reversal technology in desalination systems:

Super-High recovery RO desalination system

ROTEC provide RO systems based on Flow Reversal technology from UFLE series, in a wide range of capacities applicable to a large variety of industrial sectors. The capacities range of available systems and technical scope of supply are fully elaborated in table below for standard ROTEC units.

Larger Flow Reversal based RO system are also available on demand.

Supplied system will also include all the required pre-treatment and product treatment auxiliary systems (as an option).

AST use only standard off-the-shelf reverse osmosis

membranes and components, configured in a smart new way that gives the operator direct control of recovery rate, cross flow and flux.



CUSTOMIZED TAILOR SOLUTIONS

Customized retrofit package for existing RO systems

ROTEC provide a "customized retrofit package" for existing RO desalination systems which includes all the required engineering services, necessary equipment and on-site construction to enable the incorporation of Flow Reversal technology in already existing operational desalination facilities for the purpose of improving their recovery, operational performance and profitability.

ROTEC offer a unique solution which allow easily upgrade of existing RO systems that operate at low recoveries and efficiency. ROTEC Add on Retrofit package can improve your old system performance today, no need to wait and build new facility.

Summary Available products based on Flow Reversal technology are ideal for extracting purified water from industrial, brackish and wastewater sources. Flexible operation and resistance to scaling and fouling greatly improve the reliability of The Flow reversal Desalination systems.

This allows a better usage of existing resources, optimize process performance and minimize brine costs. In combination with High quality Pre - treatment, this process provide long term performance.



unique patented control unit



High efficiency plug & play
Minimal foot print

HIGH QUALITY ALL ADVANTAGES ONE PACKAGE

Standard Features

- Maximum Recovery - Guaranteed.
- Patented high recovery, low fouling/scaling,
- High recovery – up to 96%.
- Premium brackish water RO membranes.
- Programmable logic controller with remote monitoring and control functionality.
- Chemical dosing systems.
- NSF-certified components.

Optional Features

- Ultra-filtration or multi-media filtration.
- Clean-in-Place (CIP) and flushing systems.
- Mixed-bed \EDI permeate polishing.
- Transfer pumps, storage tanks.

Operating Parameters

- Adjustable Recovery: 80-96%
- Rejection: 96.0-99.5%
- Adjustable Flux: 6-25 gfd (10-32 l/mh)
- Feed TDS 100-10,000 mg/L
- Temperature: 36-113F (4-45C)
Optional high Temp ~80C
- Max Pressure: 450 psi (31 bar)
- Inlet Pressure: 10-60 psi (0.8-4.0 bar)

Materials of Construction

- High-pressure piping –PEX\PP or 316SS Sch.10
- Low-pressure piping - PVC Sch.80, PP, SS316
- Frame – SS or Epoxy painted carbon steel
- Enclosure - Nema 4
- Clamps/Braces – PE\Galvanized steel or SS
- Membrane Elements - TFC

Membrane Options

- 400 ft² or 365 ft²
- 28 mil feed spacer (std) or 34 mil
- Low energy or high rejection
- Housings FRP, 316SS ports
- Sanitary Version for food industry application

For more information, please visit:

HIGH QUALITY ALL ADVANTAGES ONE PACKAGE

MODEL	ROTEC LE 30	ROTEC LE 60	ROTEC LE 90	ROTEC LE 120	ROTEC LE 150
Average Permeate Flow	30 m ³ /h	60 m ³ /h	90 m ³ /h	120 m ³ /h	150 m ³ /h
Maximum Permeate Flow	32 m ³ /h	64 m ³ /h	96 m ³ /h	128 m ³ /h	160 m ³ /h
Recovery rate range	up to 94%				
Housing & Membrane Elements					
Element Qty	32	64	96	128	160
Element Size	8" elements				
Housing Qty	4	8	12	16	20
Housing Size	8"- 8 M (STD)				
RO Configuration	2 stage				
ROTEC blocks:	4 rotating FR blocks				
Approximate Overall Dimensions & Weight (pressure vessel with valves manifolds)					
Height	~0.7m	~1.5 m	~2.1	~2.7	~3.2
Length	~9.7 m				
Width	~2.2 m				
Pumps					
Feed pump (SS) (optionally added if not directly fed from client)					
Power	7.5 KW	15 KW	18.5 KW	22 KW	30 KW
Flow & pressure	36-44 m ³ /hr @ 4	66-75 m ³ /hr @ 4 bar	99-112 m ³ /hr @ 4 bar	132-150 m ³ /hr @ 4 bar	165-187 m ³ /hr @ 4 bar
High pressure pump (VSD controlled)					
Power	22 KW	37 KW	55 KW	75 KW	90 KW
Flow & pressure	up to 40 m ³ /hr @ 15 bar	up to 70 m ³ /hr @ 15 bar	105 m ³ /hr @ 15 bar	140 m ³ /hr @ 15 bar	170 m ³ /hr @ 15 bar
Booster Pump (VSD controlled) (if required)					
Power	1.5 KW	3 KW	5.5 KW	7.5 KW	7.5 KW
Flow & pressure	10 m ³ /hr @ 4 bar	21 m ³ /hr @ 4 bar	32 m ³ /hr @ 4 bar	42 m ³ /hr @ 4 bar	51 m ³ /hr @ 4 bar

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Cartridge micron filter	1 high flow filters (60" cartridge)	2 high flow filters (60" cartridge)	3 high flow filters (60" cartridge)	4 high flow filters (60" cartridge)	5 high flow filters (60" cartridge)
Other					
Instrumentation	Streams pressure & flow measurement. pH, ORP as required. Feed temperature & conductivity, product conductivity. Others (Turbidity, other streams EC... optional)				
Control	Siemens/Unitronics PLC with 9" touchscreen				
ROTEC flow reversal valves	13 valves for Permeate throttle systems, 17 valves for 2nd stage booster pump systems				
Flow controls	Via VSD on pumps or flow control on brine proportional valve				
Dosing	SMBS, acid, antiscalants, all tailored to customer's needs				
Interfaces					
Main feed connection	4"	6"	6"	8"	8"
Product connection	3"	4"	6"	6"	8"
Discharge line	2"	4"	6"	6"	8"
Hydraulic command pressurized air	@ 5.5 bar				
Electrical supply (maximum power)	32 KW	57 KW	81KW	106 KW	129 KW
Outside scope (optional supply)					
RO feed tank	min 0.5 hr work reservoir				
Product reservoir	min 0.5 hr work reservoir				
Discharge reservoir	min 0.5 hr work reservoir				
RO Flush tank reservoir	storage for 2 flush cycles				
Additional analytics + dosing	As required / requested				
Containerized system- system can be fitted in standard high form containers with additional costs					