



SEAMAXX™

The Low-Energy Solution

The Seawater Reverse Osmosis membrane with the highest permeability in the industry

Dow.com



An element at
one with the sea.

Introducing SEAMAXX™ line of RO elements.
The low-energy seawater RO membranes.

SEAMAXX™ - The Low-Energy Solution

Positioning

Case studies

Performance

Tools



A solution for all

End User

Having the lowest energy consumption in the industry **SEAMAXX™** minimizes your operating cost and maximizes your asset's efficiency.

System Builder

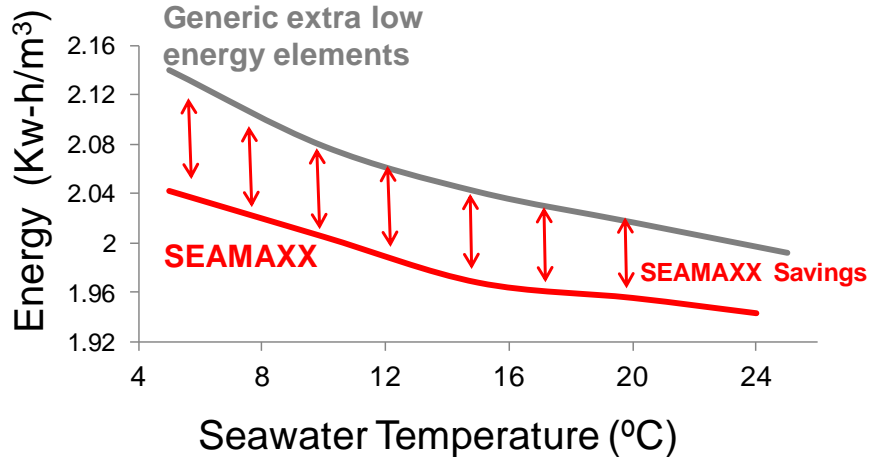
SEAMAXX™, the low energy seawater RO membrane minimizes both capital and operational cost, thus being the guarantor for your and your customer's success.



SEAMAXX™ – The *lowest* energy solution

Lowest energy consumption – industry wide

17,000 gpd*: The optimized membrane chemistry minimizes pressure and energy consumption below any other existing SWRO product



Based on 41,000 mg/L TDS, 14.5 L/m²h average flux and 45% recovery



Water quality you need

99.70%*: Provides reliable long term permeate quality for single, double pass and interstaged systems

Optimized module design

The combination of **28 mil feed spacer, 440ft² active membrane surface and iLEC™** interlocking technology maximizes the productivity of your system at low differential pressure, low cleaning frequency and high cleaning efficiency.”



When is SEAMAXX™ the ideal choice?

1- Seawater installations with high energy cost

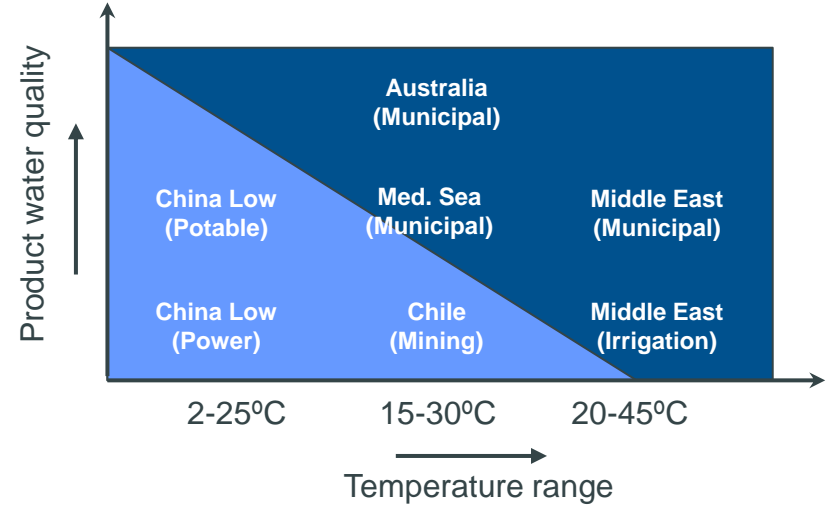
- High energy consumption, i.e., low temperature
- High electricity cost (> \$0.15/kWh)
- No or low efficiency energy recovery systems

2- Applications with medium to high product TDS

3- Replacements/retrofits of all installations

4- Brine treatment

5- High salinity brackish water



Case Studies

1. High Electricity Cost (Caribbean)
2. Low temperature & industrial quality (Chile)
3. Medium to high temperature & potable (Mediterranean)
4. China (Bohai Sea) - Potable
5. Field experience Canary Island



Scenario – Medium temperature, potable (Spain)

SPAIN Single Pass ¹⁾		Base Case	Reduce Energy ²⁾	Increase Production ³⁾
		Standard products	SEAMAXX™	SEAMAXX™
Total Output	m ³ /d	124,540 (68.7bar)	124,540 (66.5bar)	127,500 (67.1bar)
Energy consumption ⁴⁾	kWh/m ³	2.45	2.38	2.39
Product TDS / Boron	mg/L	143 / 0.67	194 / 0.79	190 / 0.78
Configuration		1,100 vessels with: 7x SW30HRLE-440i	1,100 vessels with: 5x SW30XHR-440i+ 2x SEAMAXX	1,100 vessels with: 3x SW30XLE-440i+ 4x SEAMAXX
Payback period ⁵⁾	years	n.a.	1.1	0.4
Total savings in 5 years	\$	n.a.	\$1,954,000	\$5,865,000⁶⁾

1) Feed TDS: 39,200mg/L; Temperature: 20 degC (14-26C)

2) Reduce Energy – same total water

3) Increase Production – same total energy

4) Based on pressure exchanger

5) SEAMAXX™: \$750/ea; Standard: \$500/ea; Electricity: \$0.15/kWh; No cost for system modifications considered

6) Based on \$1.2/m³ water price



Field Experience demonstrates real savings

Hotel Palacio de Isora

- Location: South of Tenerife Island
- Product water application: Drinking water
- Beach Well Intake, conventional pretreatment



Production increase of 40%
Specific energy reduction of 57%

**Operation since May
2013**

Original plant with SW30HR-380

- Plant production capacity: 400 m³/d
- Configuration: 4 pv, 7 elements each
- Nominal feed pressure: 61 bar
- Specific energy consumption: 4.9 kWh/m³
- Product water TDS ≈ 400 ppm
- Boron < 1 ppm

Revamp of the installation:

- New HP Pump
- Energy Recovery
- New Membranes

Currently SW30XHR-440i + SEAMAXX

- Capacity increased to 550 m³/d
- Same number of elements
- Feed pressure decreased to 50 bar
- Energy consumption decreased to 2.1 kWh/m³
- Better product quality

SEAMAXX™ stable long term performance

Tarragona DW&PS research center

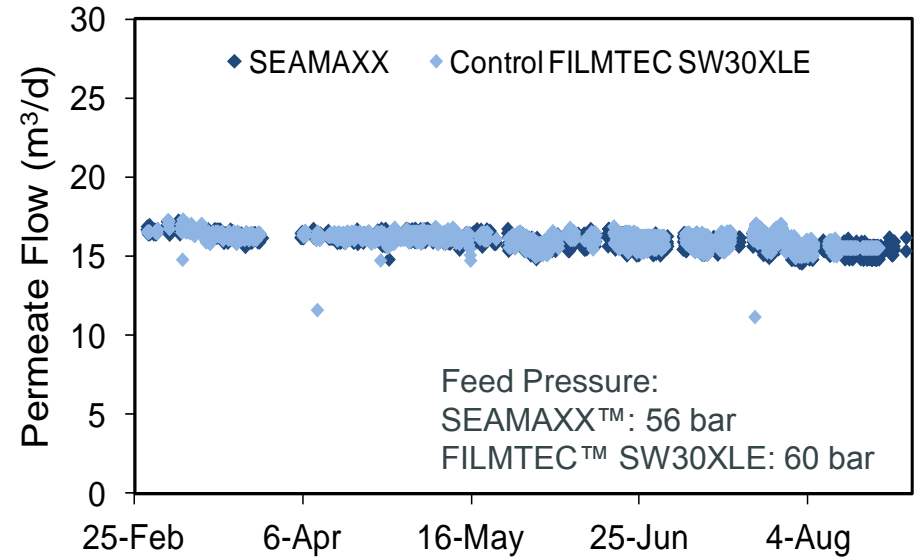
- Side by side operation vs FILMTEC™ SW30XLE
- Two lines in parallel, each 6 elements in series
- Feed salinity: 41,000 mg/L
- Pretreatment: DOW™ Ultrafiltration
- More than 7 months in operation

Strategy

- Feed pressure maintained with time
- Average flux: 14.5 L/m²h
- Recovery: 45%

Key take away

SEAMAXX™ performance compared to control as per specification



SEAMAXX™ demonstrates superior performance

- Stable long term performance
- Less fouling at high operating flux
- Good correspondence with predictions (ROSA)
- Up to 10% lower energy consumption compared to generic low energy elements

Tools

Product presentation

2 page sell sheet

ROSA file

→ only for the selected customers, not on internet

Product data sheet

Calculation/Savings Engine

NO Internet presence

→ selected customers


→ selected projects



Water Classification: Seawater with conventional pretreatment

Stage	Element	#PV	#Ele	Feed (m)
1	SWOXYLE 140i	100	2	2444
2	SEAMAXX	100	5	2117

Product Data Sheet



DOW FILMTEC™ Membranes
DOW FILMTEC™ SEAMAXX™ Seawater Reverse Osmosis Element with *i*LECT™ Interlocking Endcaps

Introduction

Dow offers various premium seawater reverse osmosis (SWRO) elements designed to reduce capital and operation cost of desalination systems. DOW FILMTEC™ Membranes combine premium membrane quality with automated precision fabrication facilitating outstanding performance, reliability and robustness.

DOW FILMTEC™ SEAMAXX™ Element is an excellent choice for seawater systems operating at low to medium levels of salinity and temperature, as well as for brackish water with relatively high salinity. The element's flow rate is significantly above flow rates of any other SWRO element currently available in the market. This extraordinary high element productivity leads to notable savings – primarily in energy consumption when compared to conventional low energy SWRO products. In addition, SEAMAXX™ includes the typical DOW FILMTEC™ product features:

- The 28 mil feed spacer combines low differential pressure with low cleaning frequency and high cleaning efficiency.
- The patented *i*LECT™ interlocking endcaps help reduce system operating costs and the risk of o-ring leaks.



SEAMAXX savings tool

- Self explanatory
- Good for any RO design software
- Immediate response how much value SEAMAXX adds

Key parameters required for savings calculation incl 2nd pass option

Comparison:

- Left column – with SEAMAXX and optional an interstaged design using partially standard products
- Right Column – with standard products only

Output based on a 5 year operational period

Conversion tool	
input	output
700 psi	48.3 bar
1,000 gpd	3.8 m3/d
1 Euro	1.30 \$
95.0 deg F	35.0 deg C

Case: With Pressure Exchanger (PX)

Required input	SEAMAXX	Standard product
1st pass		
Number of standard elements #	200	700
Price of Standard elements \$	500	500
Number of SEAMAXX elements #	500	-
Price of SEAMAXX elements \$	750	-
Feed pressure at vessel bar	47.7	50.3
Product Flow (Permeate) m3/d	11,000	11,000
Recovery %	45%	45%
HP pump efficiency %	85%	85%
HP pump motor efficiency %	97%	97%
PX booster pump pressure bar	3.0	3.0
PX booster pump efficiency %	80%	80%
PX booster pump motor efficiency %	97%	97%
PX booster pump VFD efficiency %	98%	98%
2nd pass		
Number of elements	-	-
Price of elements \$	500	500
Feed pressure at vessel bar	-	-
Product Flow (Permeate) m3/d	-	-
Recovery %	90%	90%
Booster pump efficiency %	85%	85%
Booster pump motor efficiency %	97%	97%
General input		
Energy price \$/kWh	0.10	0.10
CAPEX else (except RO modules) \$	-	-
Additional info (not considered in output)		
Feed quality (TDS) mg/L	33000	33000
Product quality (TDS)	215.4	201.8
Temperature degC	2	2
Average membrane age years	2.5	2.5
Boron (product) mg/l	0.91	0.88
Additional other		
Output		
Energy consumption (1st pass) kWh/m3	1.74	1.83
Energy consumption (2nd pass) kWh/m3	-	-
Energy cost / year \$	699,268	733,761
CAPEX (RO modules, first fill and \$)	475,000	350,000
OPEX (5 years, only energy) \$	3,496,341	3,668,807
Savings per SEAMAXX element* \$	95	
Total savings* \$	47,466	
Total savings* %	1.2%	
Payback period for SEAMAXX years	3.6	

Three cases:

- Without energy recovery
- With Energy Recovery Turbine (e.g. Pelton Wheel)
- With Pressure Exchanger (e.g. ERI, DWEER)

Option to include extra CAPEX per case

Additional info (as per users choice)

- Savings total, per purchased SEAMAXX element
- Payback period.
- Comparison against standard products.

* 5 Years, no replacement



 Thank you!



DOW RESTRICTED

