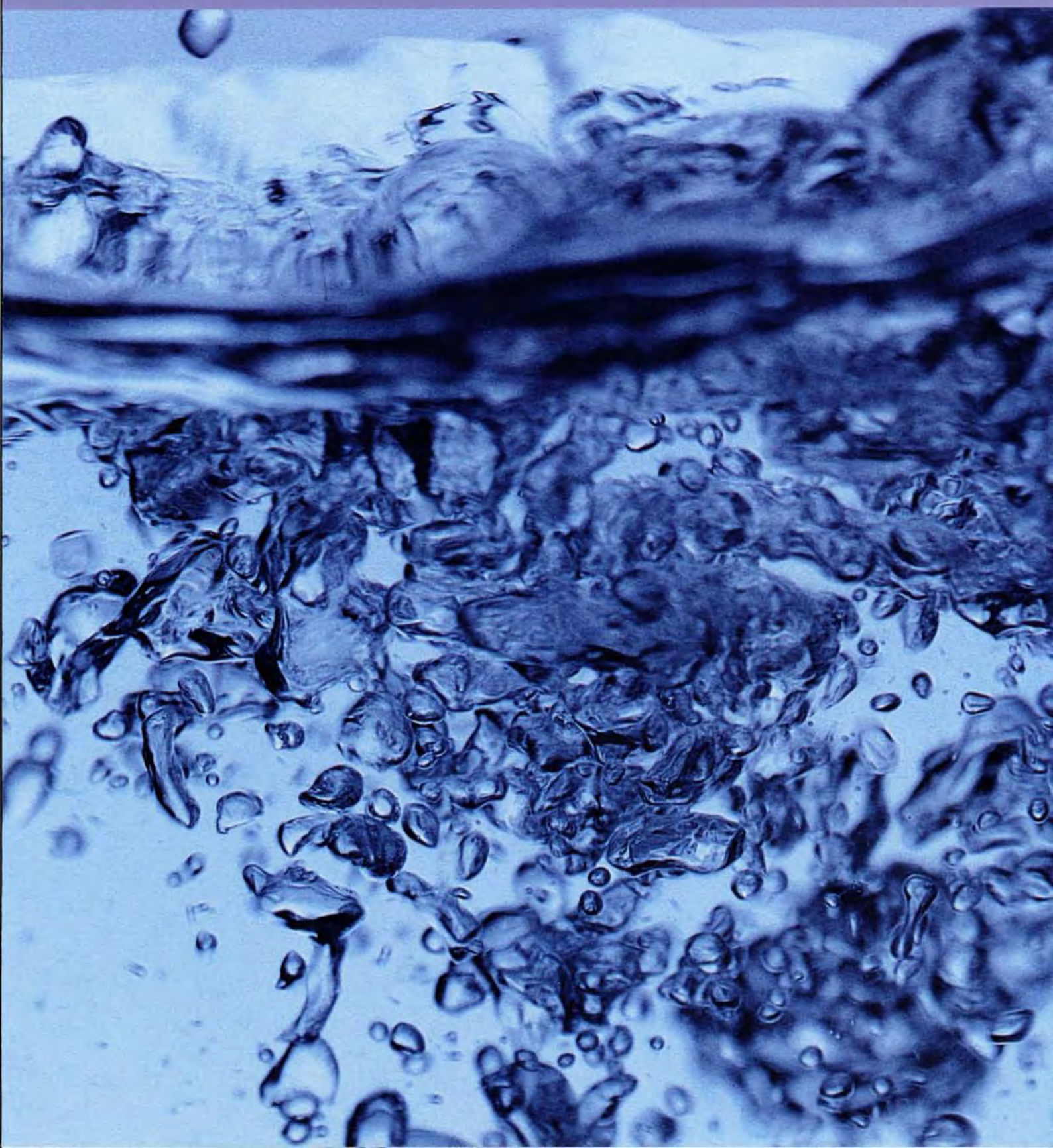


'TORAY'

Toray Reverse Osmosis Membrane Elements



New Century of Water Created by Toray Reverse Osmosis Elements

Efficient use of water resources is an important challenge in the 21st century. A global shortage of water resources is expected. Consideration of the earth's environment has become more important in recent years, giving rise to a growing demand for reverse osmosis membranes.

Demonstrating excellent quality and high performance, Toray RO elements are functional membrane elements that were developed through the polymer engineering of Toray, the first Japanese manufacturer of reverse osmosis membranes.

Toray RO element technology grew from Toray's abundant business experience. This experience has generated a broad product line spanning many fields of application: ultra pure water production for semiconductor and other industries, desalination of seawater, waste water treatment, and recovery of valuable process materials in the food processing industry.

The experience, technology and expertise of Toray are being actively applied to all water-related needs around the world through the global operation of overseas affiliates and sales agents.



Features of Reverse Osmosis

1. Removal of dissolved salts

Reverse osmosis can stably and effectively remove dissolved salts, dissolved organic substances (trihalomethane, its precursors, agricultural chemicals, etc.), and microfine particles (living and dead bacteria and many other microfine particles) from water.

Thus it is ideal for a wide array of applications ranging from production of ultra pure water to desalination of seawater.

2. Energy-saving separation technique

Since reverse osmosis does not require the evaporation of water, it consumes less energy than separation processes that use evaporation.

3. Utilizable as a concentration and recovery method

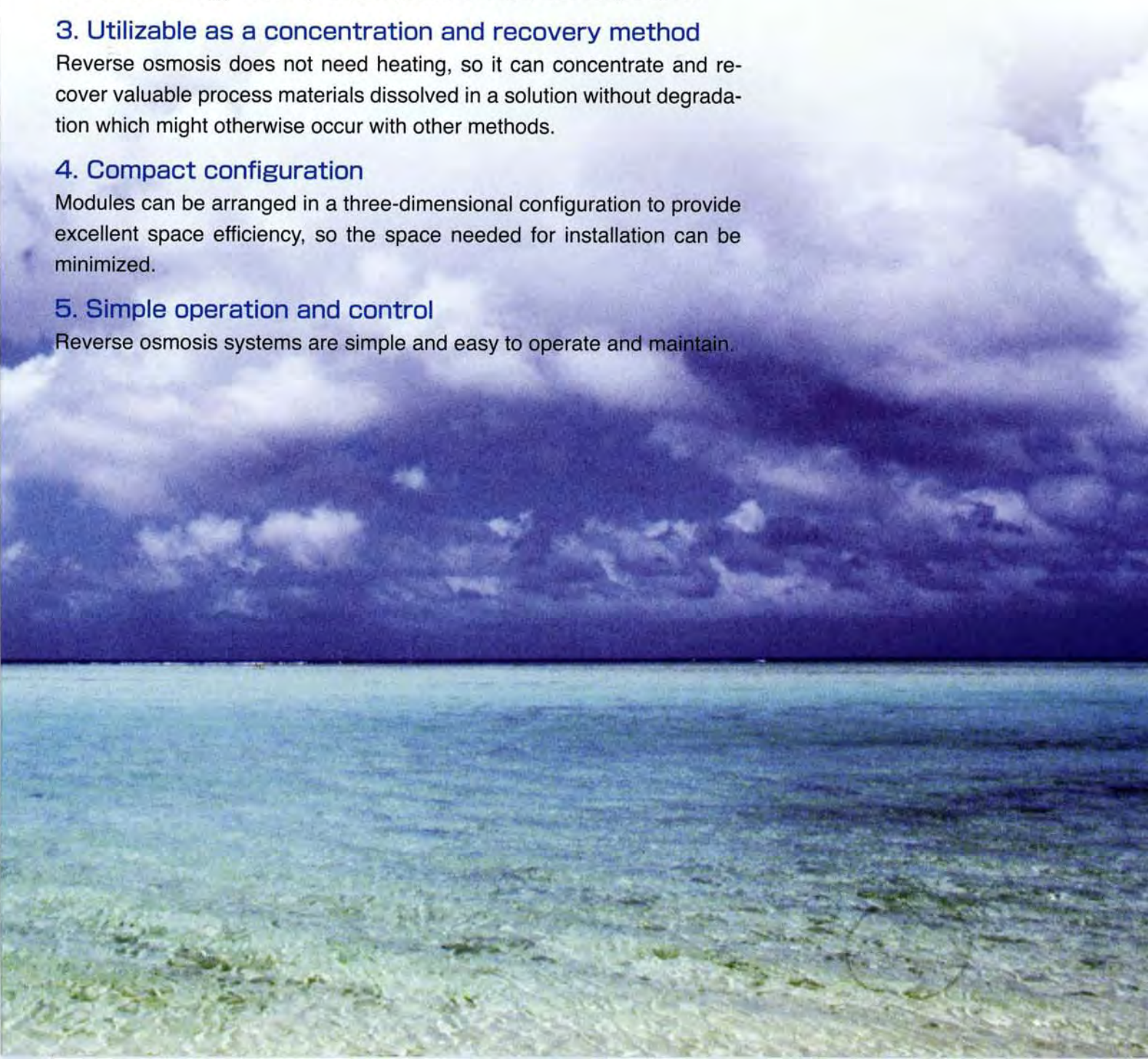
Reverse osmosis does not need heating, so it can concentrate and recover valuable process materials dissolved in a solution without degradation which might otherwise occur with other methods.

4. Compact configuration

Modules can be arranged in a three-dimensional configuration to provide excellent space efficiency, so the space needed for installation can be minimized.

5. Simple operation and control

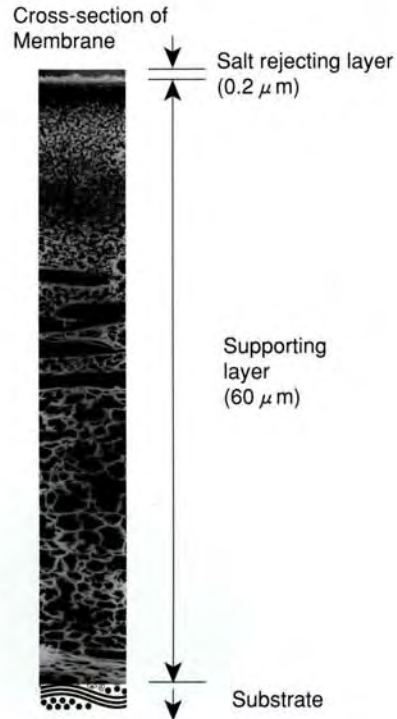
Reverse osmosis systems are simple and easy to operate and maintain.



Reliable Technology for Water Production

Cross-Linked Polyamide Composite Membrane

- Electric power costs can be reduced to a great extent since this membrane operates at low pressures.
- The membrane has excellent properties for removing dissolved salts, TOC, and silica, demonstrating superb performance in the production of ultra pure water and the desalination of seawater.



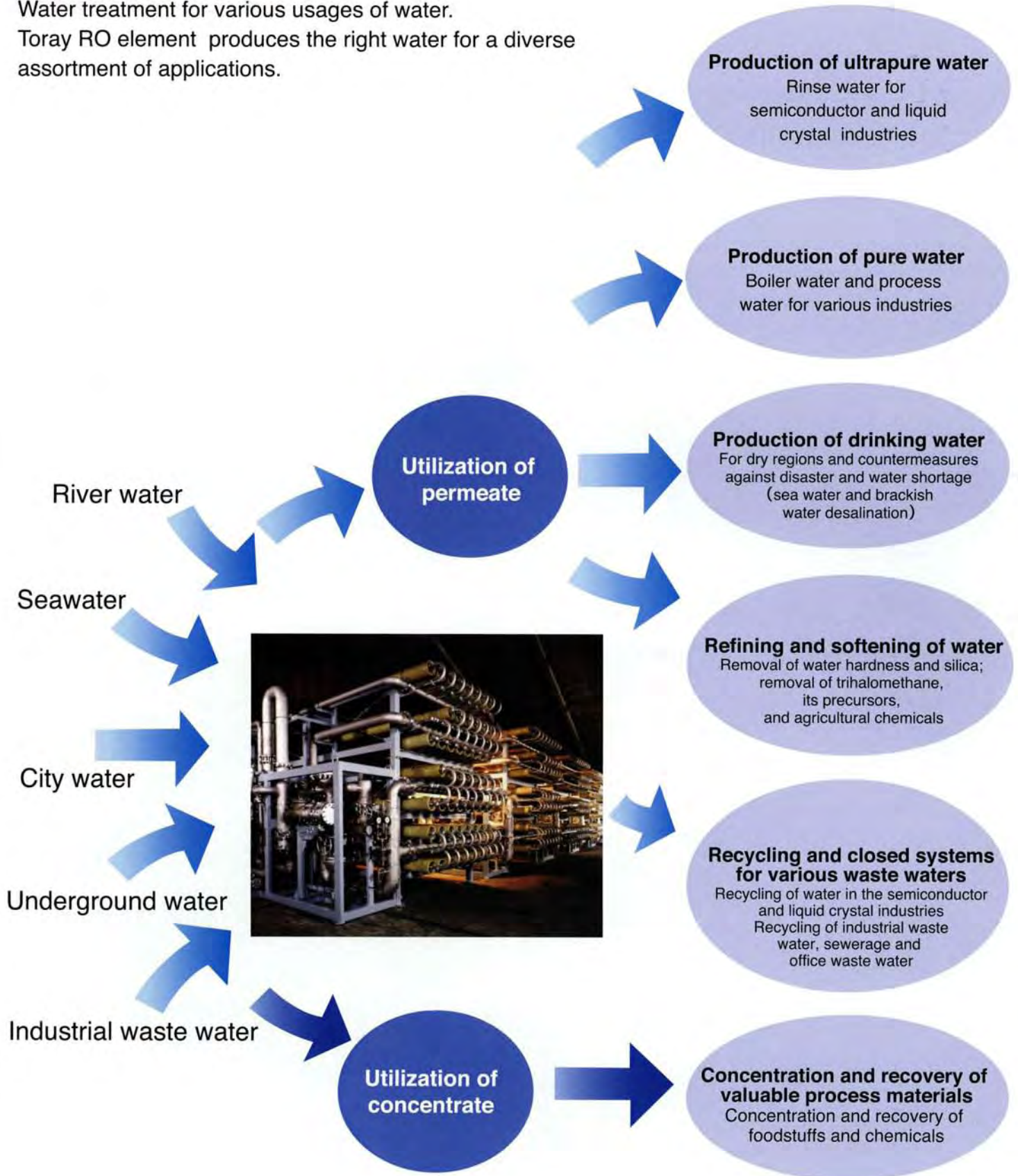
Cross-Linked Polyamide Composite Membrane Element

- Spiral wound reverse osmosis element.
- Little elution occurs from the materials that form the element. This allows the specific resistance and TOC rise time to be reduced in ultra pure water.
- Rich line of products for a wide range of water treatment applications.



Applications

Water treatment for various usages of water.
Toray RO element produces the right water for a diverse assortment of applications.



Toray TM-series Reverse Osmosis Element Product List

Membrane Application	Pressure Rejection Range	Diameter	Model	Performance		Test Conditions				
				Salt Rejection	Product Flow Rate	Operating Pressure	Feed Concentration	Temperature	pH	Recovery
		inch		%	gpd (m3/d)	psi (MPa)	mg/l NaCl	F (C)		%
Cross Linked Fully Aromatic Polyamide										
Brackish Water and Industrial Water										
Standard	High	8	TM720	-370	99.7	9,500 (36)	2,000	77 (25)	7	15
				-400	99.7	10,200 (39)	2,000	77 (25)	7	15
Low	Medium	4	TM710	-430	99.7	11,000 (42)	2,000	77 (25)	7	15
				-430	99.7	2,200 (8.3)	2,000	77 (25)	7	15
			TMG20	-400	99.5	10,200 (39)	500	77 (25)	7	15
UltraLow	Medium	4	TMG10	-430	99.5	11,000 (42)	500	77 (25)	7	15
			TMH20	-370	99.4	2,000 (7.6)	500	77 (25)	7	15
Low Fouling	High	8		-400	99.4	12,000 (45)	500	77 (25)	7	15
				-400	99.4	13,000 (49)	500	77 (25)	7	15
				-430	99.4	14,000 (53)	500	77 (25)	7	15
		4	TMH10		99.4	2,800 (10.5)	500	77 (25)	7	15
Low Fouling										
Standard	High	8	TML20	-370	99.7	9,500 (36)	2,000	77 (25)	7	15
				-400	99.7	10,200 (39)	2,000	77 (25)	7	15
Seawater										
SW Standard	High	8	TM820	-370	99.75	6,000 (23)	32,000	77 (25)	7	8
				-400	99.75	6,500 (25)	32,000	77 (25)	7	8
SW High	High	4	TM810		99.75	1,200 (4.5)	32,000	77 (25)	7	8
			TM810L		99.70	1,600 (6.0)	32,000	77 (25)	7	8
		8	TM820H	-370	99.75	5,600 (21)	32,000	77 (25)	7	8

Toray SU-series & SC-series Reverse Osmosis Element Product List

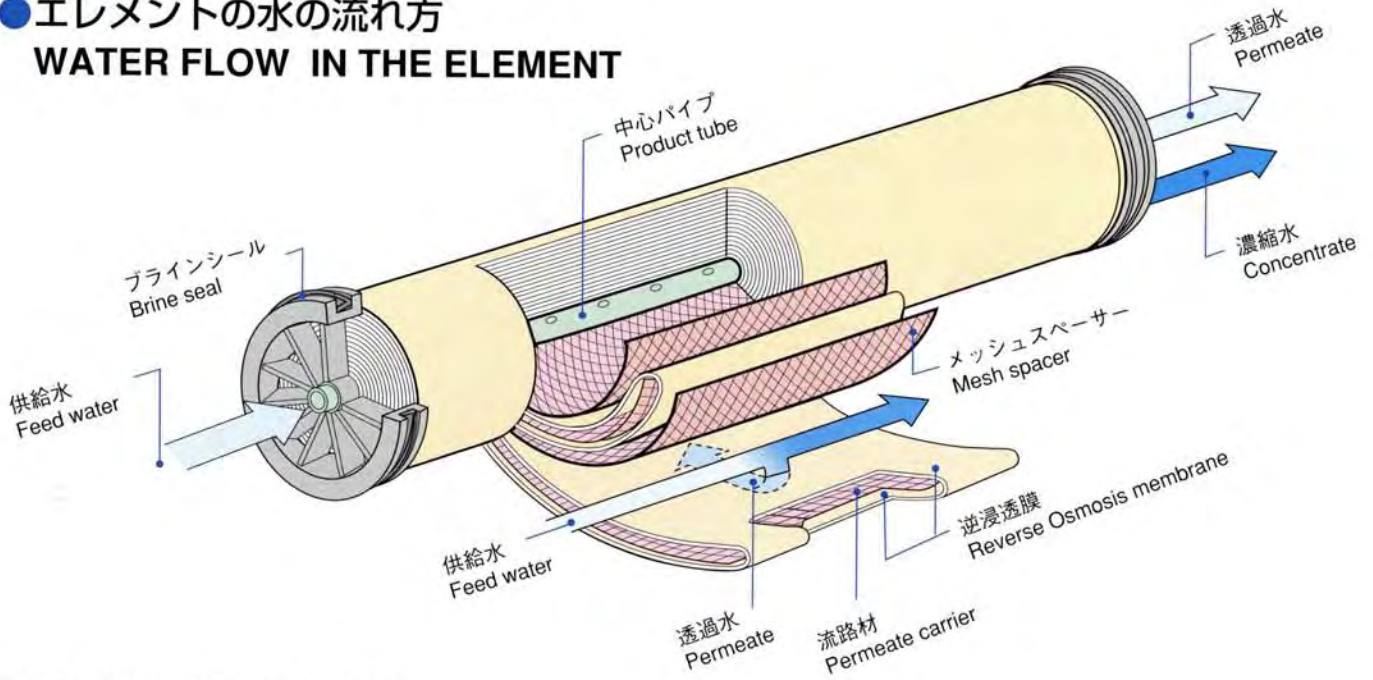
Membrane Main Application	Model	Description	Size		Performance		Test Conditions					
			Diameter	Length	Salt Rejection	Product Flow Rate	Operating Pressure	Feed Concentration	Temperature	pH	Brine Flow	
Operating Pressure			inch	inch	%	m ³ /d (gpd)	MPa (psi)	mg/l NaCl	°C (°F)		l/min (gpm)	
Polyamide												
Brackish Water and Industrial Water												
Standard	SU-720	High rejection	8	40	99.4	26 (6,900)	1.5 (220)	1,500	25 (77)	6.5	80(21)	
	SU-720F	High membrane area	8	40	99.4	32 (8,500)	1.5 (220)	1,500	25 (77)	6.5	80(21)	
	SU-720L	High flow	8	40	99	22 (5,800)	1.0 (150)	1,500	25 (77)	6.5	80(21)	
	SU-720LF	High flow and high membrane area	8	40	99	27 (7,100)	1.0 (150)	1,500	25 (77)	6.5	80(21)	
	SU-720R	Highest rejection	8	40	99.7	19 (5,000)	1.5 (220)	1,500	25 (77)	6.5	80(21)	
	SU-710	For small systems	4	40	99.4	6.5(1,700)	1.5 (220)	1,500	25 (77)	6.5	20(5.3)	
	SU-710L	For small systems	4	40	99	5.5(1,500)	1.0 (150)	1,500	25 (77)	6.5	20(5.3)	
	SU-710R	For small systems	4	40	99.7	4.75(1,300)	1.5 (220)	1,500	25 (77)	6.5	20(5.3)	
	SUL-G20	High rejection and energy saving	8	40	99.5	30 (7,900)	0.75(110)	500	25 (77)	6.5	80(21)	
	SUL-G20F	High membrane area, high rejection and energy saving	8	40	99.5	37 (9,800)	0.75(110)	500	25 (77)	6.5	80(21)	
SUL-G10	For small systems	4	40	99.5	6.5(1,700)	0.75(110)	500	25 (77)	6.5	20(5.3)		
Seawater												
High	SU-820	High rejection	8	40	99.75	16 (4,200)	5.5 (800)	Sea water 3.5%	25 (77)	6.5	80(21)	
	SU-820FA	High membrane area and high rejection	8	40	99.75	19 (5,000)	5.5 (800)	Sea water 3.5%	25 (77)	6.5	80(21)	
	SU-820L	High flow	8	40	99.7	21 (5,500)	5.5 (800)	Sea water 3.5%	25 (77)	6.5	80(21)	
	SU-810	For small systems	4	40	99.75	4 (1,100)	5.5 (800)	Sea water 3.5%	25 (77)	6.5	20(5.3)	
Hot Water Sanitizable												
Standard	SU-720TS	High rejection	8	40	99.4	26 (7,000)	1.5 (220)	1,500	25 (77)	6.5	80(21)	
	SUL-G20TS	High rejection and energy saving	8	40	99.5	30 (7,900)	0.75(110)	500	25 (77)	6.5	80(21)	
	SUL-G20FTS	High membrane area, high rejection and energy saving	8	40	99.5	36 (9,500)	0.75(110)	500	25 (77)	6.5	80(21)	
	SUL-G10TS	For small systems	4	40	99.5	5 (1,300)	0.75(110)	500	25 (77)	6.5	20(5.3)	
Ultra Pure Water												
Standard	SU-720P	Low elution and easy to rinse	8	40	-	32 (8,500)	0.75(110)	Pure water	25 (77)	6.5	12(3.2)	
	SU-710P	For small systems	4	40	-	8 (2,100)	0.75(110)	Pure water	25 (77)	6.5	3(0.8)	
	SUL-G20P	Low elution, easy to rinse and energy saving	8	40	-	32 (8,500)	0.75(110)	Pure water	25 (77)	6.5	12(3.2)	
	SUL-G10P	For small systems	4	40	-	7.5(2,000)	0.75(110)	Pure water	25 (77)	6.5	3(0.8)	
Ultra low	SUL-H20P	Low elution, easy to rinse and energy saving	8	40	-	27 (7,100)	0.5 (70)	Pure water	25 (77)	6.5	12(3.2)	
Nano Filtration												
Standard	SU-620	Basic NF element	8	40	55	18 (4,800)	0.35(50)	500	25 (77)	6.5	80(21)	
	SU-620F	Higher membrane area	8	40	55	22 (5,800)	0.35(50)	500	25 (77)	6.5	80(21)	
	SU-610	For small systems	4	40	55	4.5(1,200)	0.35(50)	500	25 (77)	6.5	20(5.3)	
Cellose Acetate												
Brackish water, Industrial Water and Waste Water												
Medium	SC-2201	High flow and chlorine resistance	8	40	95	35.2(9,300)	3.0 (440)	1,500	25 (77)	6	40(10.6)	
	SC-4201	High rejection and chlorine resistance	8	40	97	27.2(7,200)	3.0 (440)	1,500	25 (77)	6	40(10.6)	
	SC-6201X	Highest rejection and chlorine resistance	8	40	98	20.5(5,400)	3.0 (440)	1,500	25 (77)	6	40(10.6)	
	SC-2101	For small systems	4	40	95	8.8(2,300)	3.0 (440)	1,500	25 (77)	6	10(2.6)	
	SC-4101	For small systems	4	40	97	6.8(1,800)	3.0 (440)	1,500	25 (77)	6	10(2.6)	
	SC-6101	For small systems	4	40	98	5.3(1,400)	3.0 (440)	1,500	25 (77)	6	10 (2.6)	

MEMBRANE の構造とシステム例

Structure and Example of Module Unit

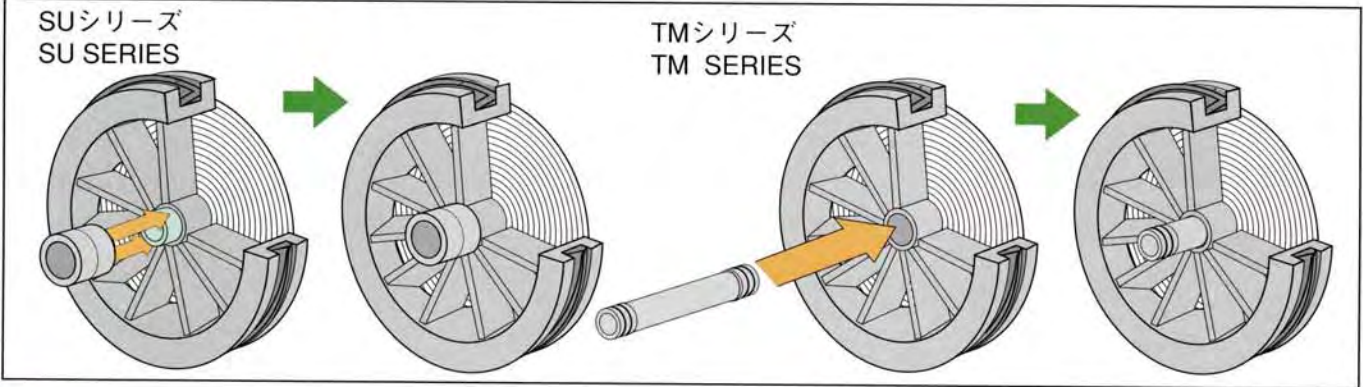
●エレメントの水の流れ方

WATER FLOW IN THE ELEMENT



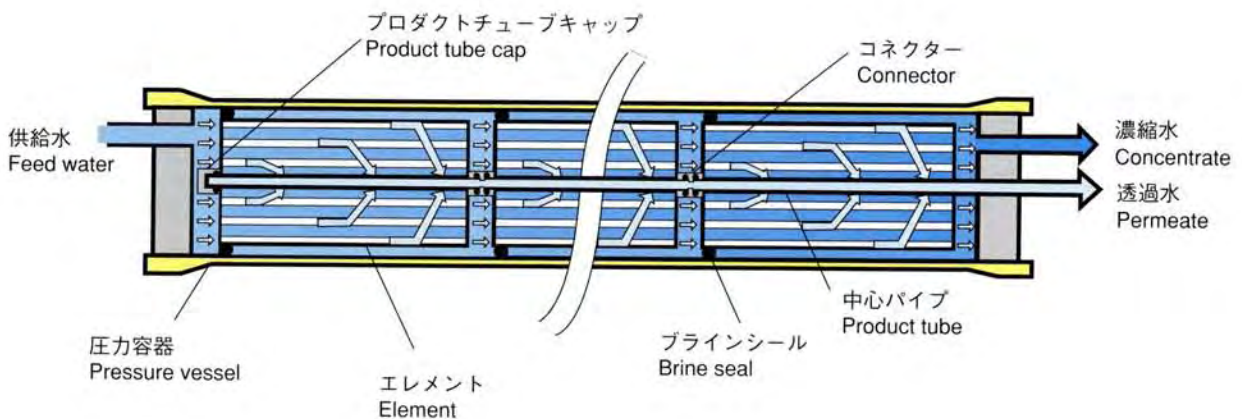
SU/TMシリーズ端板部分比較図


SU/TM SERIES COMPARISON



●モジュール構造図 (SU シリーズ)

STRUCTURE OF MODULE (SU Series)





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Element Production:



Membranes and elements are manufactured and undertaken the quality assurance at Toray Ehime Plant, which has obtained

Quality Management System ISO 9001 certification, registration number; JQA-0683, and Environmental Management System ISO 14001 certification, registration number; JQA-EM0440.

Toray accepts no responsibility for results obtained by the application of this information or the safety or suitability of products, either alone or in combination with other products.