

June 25, 2009

Toray's Latest Membrane Technologies

Dr. Masaru Kurihara
Toray Industries, Inc.

Toray's intention to membrane business

Toray as a company is:

1. Investing to serve a growing market

1) Capacity:

Toray has increased the number of Autowinders.

Toray is investing to meet the delivery needs of the market!

2) Quality:

Toray's automated technology assures the highest quality and most consistent product available

2. Recognized Humanitarian Award

3. Offering superior membrane technology

Based on continuous R&D, Toray has improved performance of membrane and elements to meet requirement from market.

2008 United Nations Humanitarian Award




The 2008 Humanitarian Award was in recognition for Toray's environmentally friendly business activities and CSR activities targeting climate change prevention and sustainable social growth.

Background for winning the award

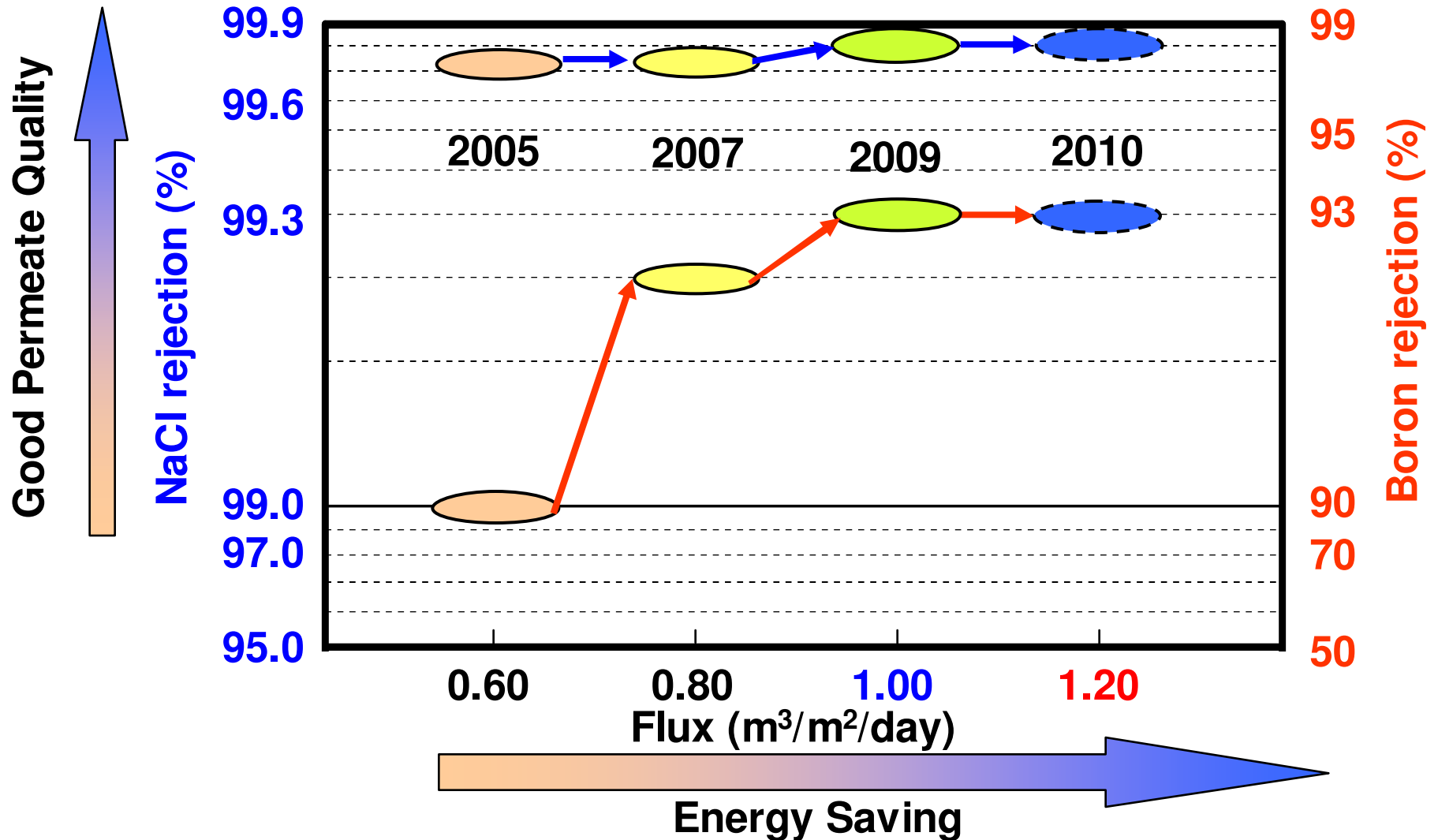
- **Water treatment business.**
- Carbon fiber composite materials for reducing global heating gas.
- CSR activities such as energy saving measures and betterment of workplace.



Toray Membrane Products

Size	0.001 μm	0.01 μm	0.1 μm	1 μm	10 μm
Separation materials	Ion, Low molecule weight organics		High molecular weight polymer		
	Trihalomethane Na ⁺ Cl ⁻	Agricultural & Organic Material Ca ²⁺ Mg ²⁺	Colloid	Clay	Bacteria Coliform Cryptosporidium
Types	RO/NF Membrane		Low Pressure Membrane		
	Reverse Osmosis [RO]	Nanofiltration [NF]	Ultrafiltration [UF]	Microfiltration [MF]	
Membrane products	Ultrapure Water, Seawater Desalination, Advanced Water Treatment 		Softening, Removal of Toxic substance 		Municipal Drinking Water, Reuse of Wastewater, Pretreatment for RO Process 
	RO membrane	NF membrane	PVDF Hollow Fiber membrane		PVDF Immersed membrane for MBR
<p>TORAY manufactures ALL ranges of membranes by its own ORIGINAL technologies.</p>					

Progress of Seawater RO Performance



Flux has been drastically improved with keeping high TDS Rej (>99.75%) in these 5 years.

World's most advanced Membrane for Energy-saving with Good Permeate Quality

Global Sales Expansion of Toray Membranes

RO for
Seawater
Desalination

<Trinidad >
136 km³/d

<Algeria>
200 km³/d

<Saudi>
150 km³/d

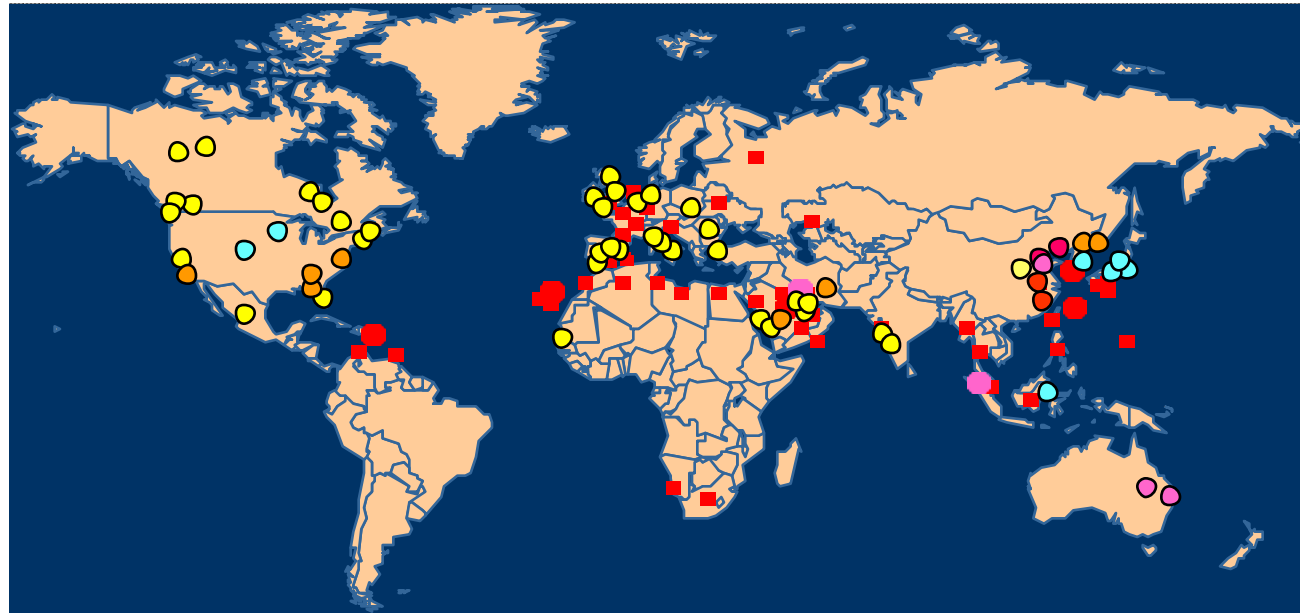
<Singapore >
136 km³/d

Wastewater
purification
by MBR

<UAE>
45 km³/d

<Saudi>
30 km³/d

<China>
6.5 km³/d



RO for
Wastewater
Reclamation

<Kuwait>
320 km³/d

<Singapore >
228 km³/d

<China >
78 km³/d

River water
purification
by MF, UF

<Japan >
88 km³/d

<Korea >
30 m³/d

RO for Brackish
Water Desalination

<KSA >
120 km³/d

<Iran >
100 km³/d

- ◆ Total Shipment of RO, NF, UF, MF and MBR : 21.5 mil m³/d (equivalent to daily life water of 60 million people)
(including) **Seawater Desalination : 2.8 mil m³/d (≒ daily life water of 10 mil people, Top share)**
Brackish Water Desalination : 8.0 mil m³/d (Largest application, main market is USA, ME, FE)
Wastewater Reclamation : 1.2 mil m³/d (Supplied to World's 1st, **Top share**)

Major Plants with Toray Membrane in MENA Countries



RO:

- >Seawater Desalination: 16 plants (1,000,000m³/d) ●
- >Brackish Water Desalination: 5 plants (310,000m³/d) ●
- >Wastewater Reclamation: 1 plant (320,000m³/d) ●

MBR (Membrane Bioreactor) Module:

- >20 plants (130,000m³/d) ●

Toray's Supply for Large Seawater Desalination Plants



as of May 2009

No.	Country	Location	Capacity *1 m ³ /d	Operation Year *2	Notes
1	Algeria	Hamma	200,000	2008	
2	Saudi Arabia	Shuaibah	150,000	2009	
3	Trinidad & Tobago	Point Lisas	136,000	2002	
3	Singapore	Tuas	136,000	2005	
3	UAE	Fujairah 2	136,000	2010	
3	Kuwait	Shuwaikh	136,000	2010	
7	Algeria	Oued Sebt	100,000	2010	
8	Saudi Arabia	Al Jubail-III	90,909	2000	*3 : 24,240 m3/d
9	Spain	Mallorca	69,300	2001	*3 : 23,100 m3/d
10	Spain	Alicante	65,000	2002	expansion: 15,000m3/d (2006)
11	UAE	Dubai	64,000	2008	
12	Nambia	Swakopumund	55,000	2008	
13	Malta	Ghar Lapsi, etc.	53,500	2008	replacement for three places
14	Saudi Arabia	KAUST	40,000	2009	
14	Japan	Okinawa	40,000	1997	*3 : 30,000 m3/d
16	Qatar	The Pearl	35,000	2008	
17	China	Yuhuan	34,600	2006	*3 : 11,500 m3/d
18	Saudi Arabia	Jeddah	32,000	2009	
19	China	Zhoushan Is.	31,850	2006	
20	Oman	Qarm Aram	25,000	2008	
21	Spain	Maspalomas-II	22,000	1994	*3 : 19,000 m3/d
21	Spain	Adeje Arona	22,000	1997	
23	Spain	Bahia de Palma	21,000	1999	
23	Spain	Teneriffe	21,000	2002	
25	Saudi Arabia	ARAMCO	18,000	2008	
26	India	LANCO	16,500	2009	
27	St. Marteen	St. Marteen	15,000	2008	
28	China	Zhuanghe	12,700	2008	
29	Netherlands Antilles	Curacao	11,400	2000	
30	Saudi Arabia	Jeddah	10,000	2009	
30	Tunisia		10,000	2009	
30	South Africa	Mpumalanga	10,000	2008	
30	Cyprus	Famgusta	10,000	2009	

(Notes)

*1 Total output of all units

*2 The year in which the plant was commissioned, () shows a project

*3 Toray's initial installation

=Acquired projects in MENA

**Toray's Cumulative Capacity for Seawater Desalination (Product Water Basis):
2,800,000 m3/day (Top Share in the World)**

Toray's Supply for Large Brackish Water Desalination Plants 'TORAY'

Innovation by Chemistry

as of end May 2008

No.	Country	Location	Capacity *1 m ³ /d	Online *2	Remarks
1	Korea	Asan	128,000	2009	
2	Saudi Arabia	Salboukh & Boweib	120,000	2006	
3	Iran	Fair	100,000	2001	
4	Korea	Daesan	84,000	1997	
5	Korea	Suwon	60,000	2001	
5	United States	Port St. Lucie	60,000	2004	
7	United States	Collier	45,000	2006	
8	Saudi Arabia	Al Rass	36,000	1989	
8	Saudi Arabia	Al Bukariyah	36,000	1989	
10	Korea	Seosan	35,000	2001	
11	United States	Pennsylvania	32,000	2003	
12	Barbados		30,000	1999	
13	United States	Florida 1	22,700	2005	
13	United States	Florida 2	22,700	2005	
13	Spain	Adeje Arona	22,700	1997	
16	Spain	Maspalomas	22,000	1994	
17	Spain	Bahia de Palma	21,000	1999	
17	Spain	Teneriffe	21,000	2002	
19	United States	Illinois	19,700	2003	
20	Japan	Kashima	19,240	1971/1991	
21	United States	Colorado	18,240	2005	
22	United States	Arizona	15,000	2006	
23	Spain	Mazarron	14,400	1995	
23	Bahrain	Ras abu jarjur	14,400	2006	
25	United States	Palm Bay	13,240	2006	
26	United States	Clewiston	12,500	2007	

(Notes)

*1 Total output of all units

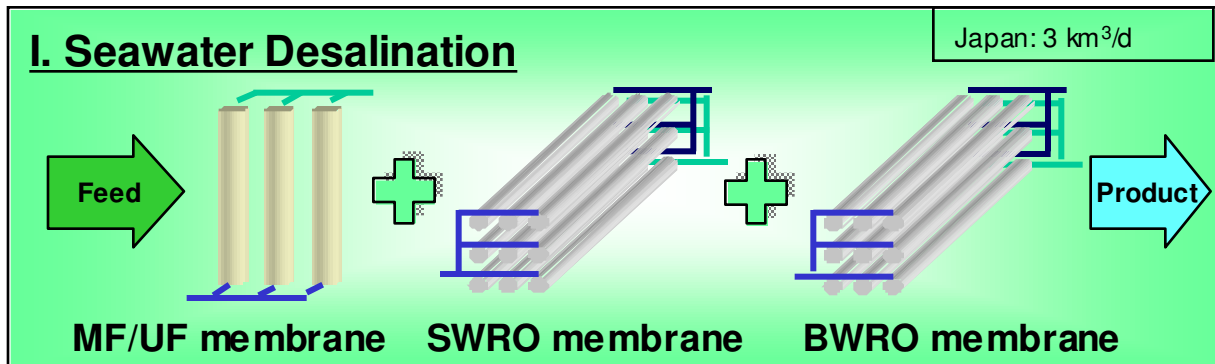
*2 The year in which the plant was commissioned.

*3 Toray's initial installation

=MENA countries

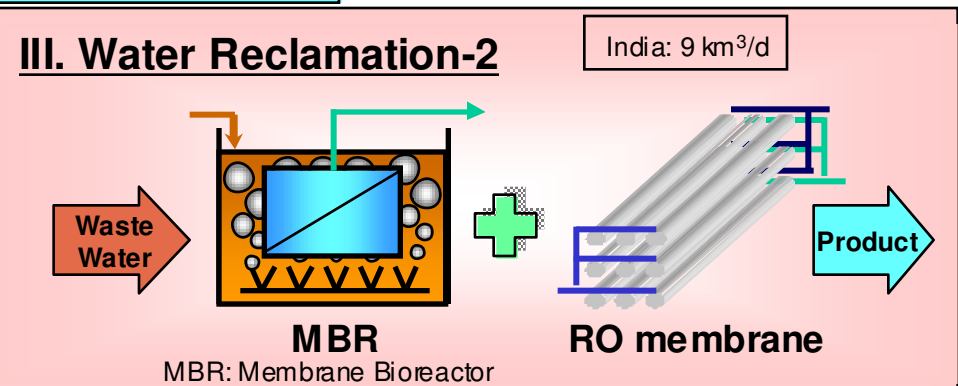
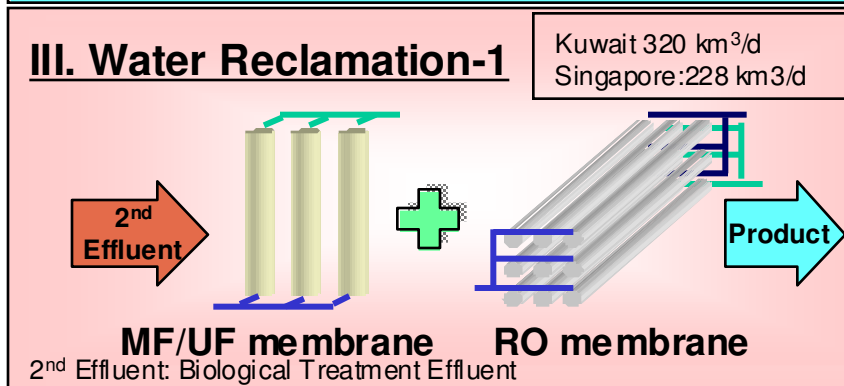
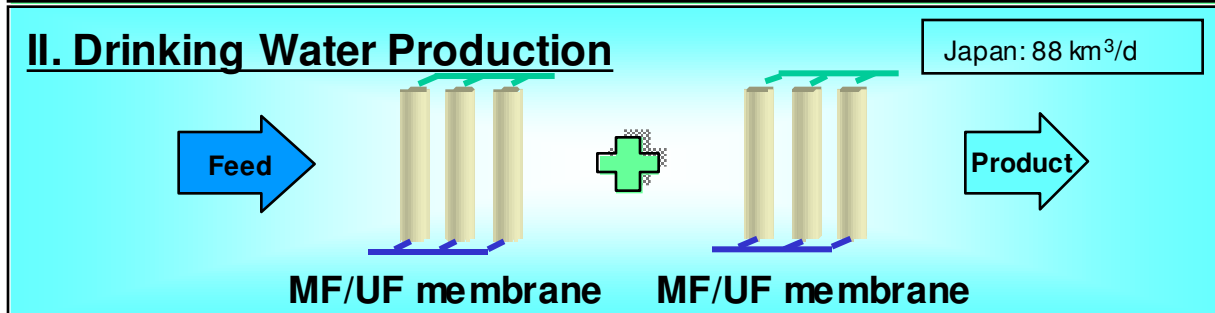
IMS (Integrated Membrane System)

Since Toray has all kinds of water treatment membranes, you can choose and combine suitable types of membrane to remove several types of water components.

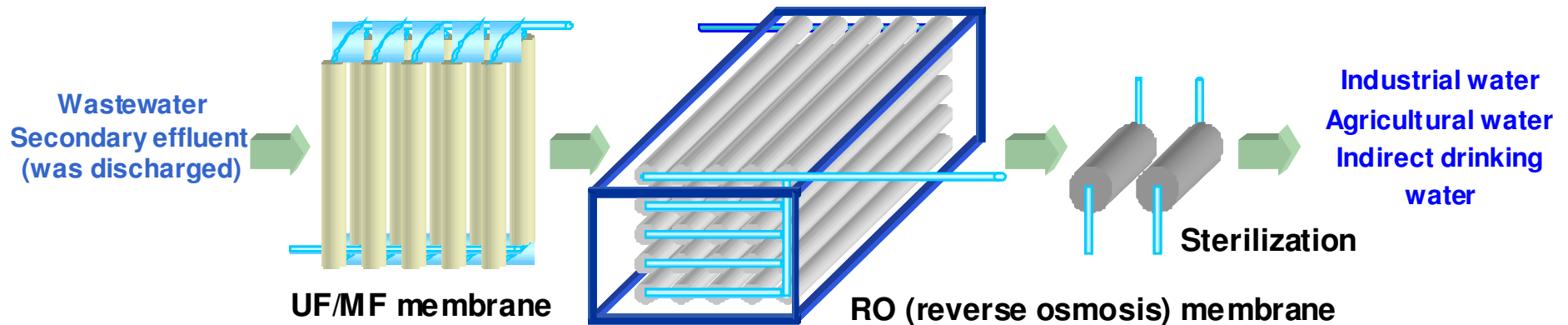


>>> High performance of total systems, cost reduction etc.

- ◆ Supplied for 26 plants
- ◆ Total Product 1.1 million m³/d
- ◆ Including 12 Toray package plants.



Toray Acquires Large Scale Wastewater Reclamation Projects



as of end May 2009

No.	Country	Location	Capacity (m ³ /d)	Operation Year
1	Kuwait	Sulaibiya	320,000	2005
2	Singapore	Changi	228,000	2009
3	China	Ningxia	78,000	2008
4	Australia	Luggage Point	66,000	2008
5	China	Tianjin TEDA	30,000	2006
6	China	Dongguan	25,000	2005
7	Singapore	Seletar	24,000	2004
8	China	Tianjin Dongjiao	12,000	2008

= Acquired Projects in MENA countries

**Toray's Cumulative Capacity for Wastewater Reclamation (Product Water Basis):
1,200,000 m³/day (Top Share in the World)**



Toray will Contribute to Secure Sustainable Water Resources and Water Environment Protection Through Membrane Technology.



Thank You for your Attention

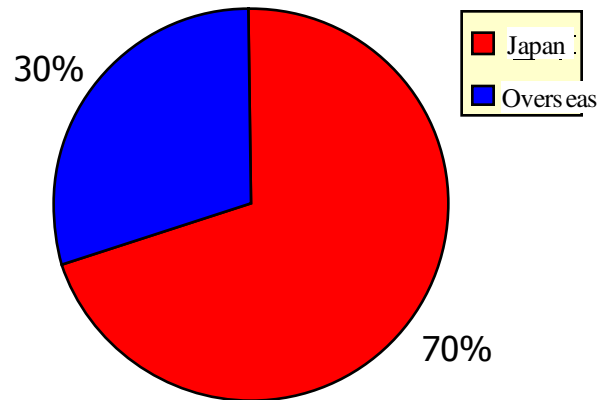


World Water Business Market: Typical Example

Share of Japanese membrane suppliers in the water treatment membrane supply market

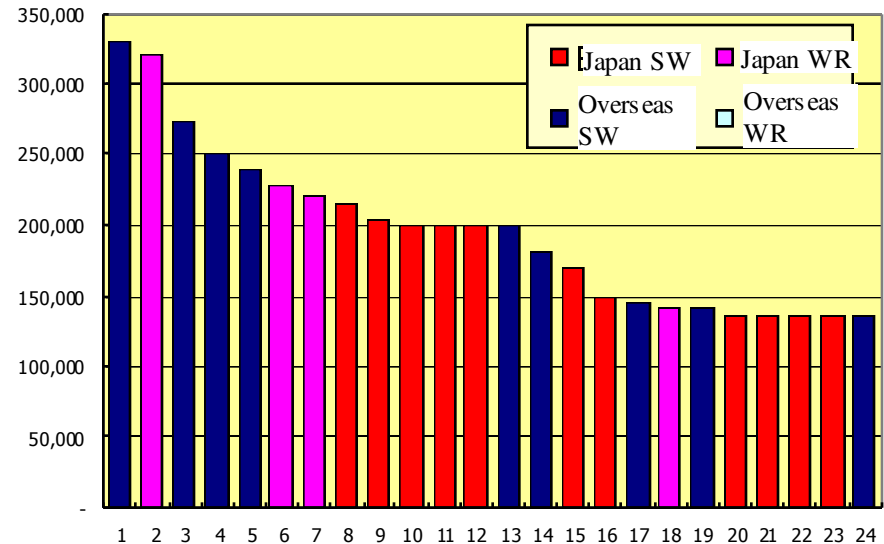
Japanese membrane manufacturers' supply volume for large RO membrane plant in the world

Membrane Supply for Seawater Desalination



[Survey by the Association of Membrane Separation Technology of Japan]

Plant Capacity (m3/d)



[Survey by Toray]