Water Purification Use Membrane Process Systems in Japan: Present State and Technology Development Trends

日本における水道用膜処理施設の現状と技術開発の動向

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Water Purification System with Membrane Filtration Process in Japan

Present State, and Trends in Technology Research and Development

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JWRC
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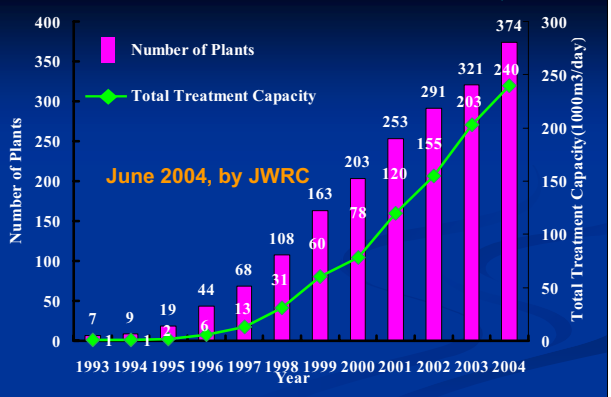


Membrane Water Purification Plants in Japan

Large Scale R&D

Year	Project Name	Content
1991 – 1993	MAC21	Pilot Plant for MF / UF Membrane
1994 – 1996	Advanced-MAC21	Pilot Plant for NF Membrane
1997 – 2001	ACT21	R&D on High efficiency Water Purification Technology
2002 – 2004	*e-Water*	R&D on Sustainable Water Purification Technology

Background in Japan

- Necessity of plants' renewal
- Standards for waterworks facilities (2000)
- New water quality standards (2004)

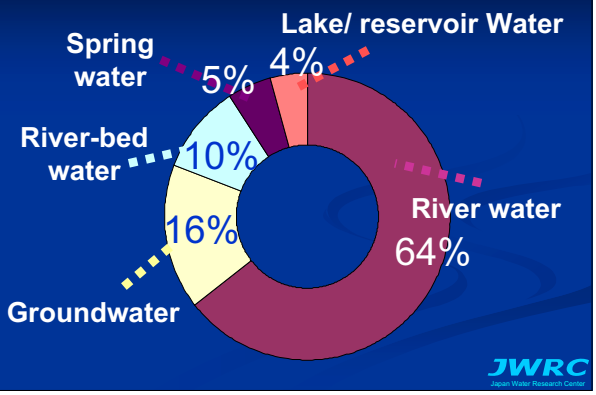
Present Situation of Membrane Facilities in Japan

Scale of Membrane Plants

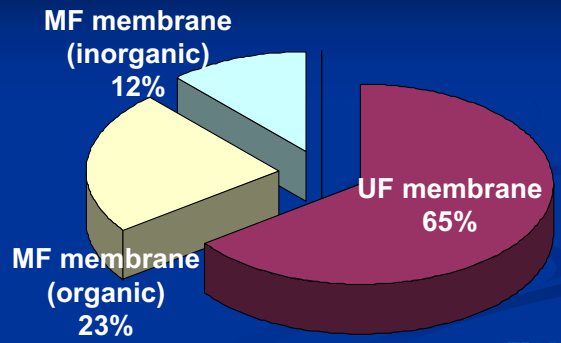
Treatment capacity (m^3/day)	0 ~ 100	101 ~ 1,000	1,001 ~ 10,000	10,001 ~
Number of plants	145	173	55	1

Total : 374
Total Capacity : 240,000m^3/day

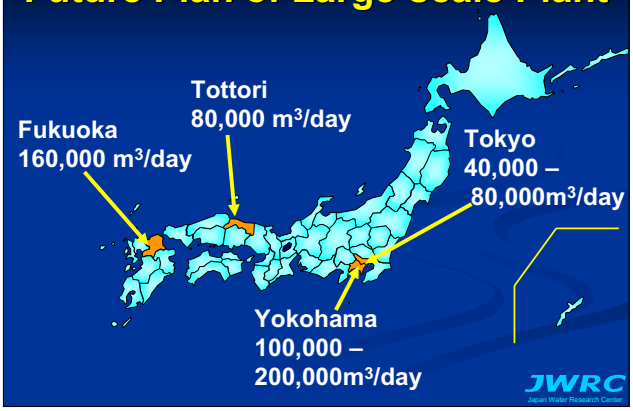
Water Sources



Membrane Material



Future Plan of Large-scale Plant



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Outline of Maintenance

Physical Cleaning

Every 20 - 120 minutes : Organic membrane
Every 6 hours : Inorganic membrane

Chemical Cleaning

Every 6 months - 2 years

Module replacement

? ? ?

Planned Module Replacement Schedule

Frequency	Once every 3 years or less	Once every 5 years	Once every 5–7 years	Once every 10 years	Once every 12 years	Once every 15 years
Case	2	5	5	1	1	1

Organic Inorganic

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Cost

(by 29 plants Interview survey)

Total construction cost

\300,000 – 400,000 / m³
65% : electric and instrumentation

Running cost

Electric power : \8 / m³
Chemical : \1 / m³
Chemical cleaning : \16 / m³

Advanced Membrane Technology

- New type of membrane
- 100,000m³/day-class plant
- Application to existing plants
- Others

New Types of Membrane

- ✓ Ceramic Membrane
- ✓ Ozone resistant Membrane
- ✓ Large pore Membrane

Ceramic Membrane

R=90mm
L=1000mm

Character

Long membrane life
Superior chemical resistance

Ozone-resistant Membrane

PVDF Membrane Plant
PVDF: Polyvinylidene Fluoride

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Large Pore Membrane Element

Nominal pore size : 2μm

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Challenge to Introduction of 100,000m³/day Scale Membrane Plant

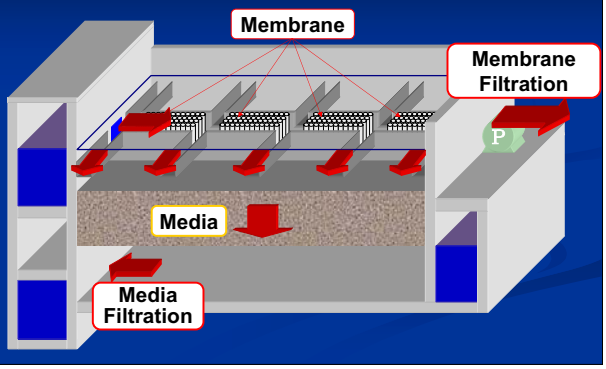
R & D projects is now conducted under a big project, "*e-Water*" .

6 research groups are involving in Yokohama

Application of Membrane Technologies to Existing Plants

Submerged membrane system

Hanshin Water Supply Authority



Related Systems for Promotion

(1) Government subsidy system

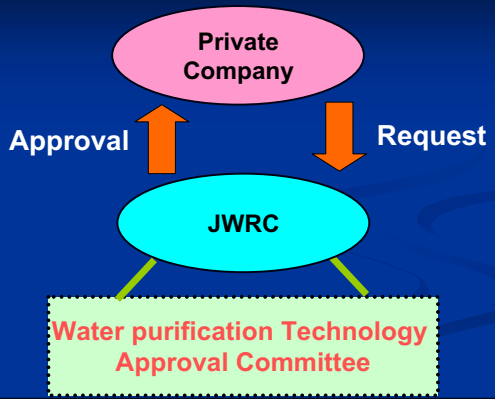
(2) Equipment approval system

(3) Membrane module approval system

(4) Study of membrane module standardization

(5) Development of Cryptracer-M

Equipment Approval System



Development of *Cryptosporidium* Tracer

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Name	Cryptracer-M
Purpose	Simulated Cryptosporidium Particle
Diameter	3.1 μm

Fluorescent Dye

Fluorescence Microscope

Seawater Desalination Plant

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Seawater Desalination Plant

70 plants

Most of plants in isolated Islands.

Large plants in Okinawa etc.

Seawater Desalination Plant in OKINAWA
40,000m3/day

A Plant Under Construction in FUKUOKA
50,000m3/day

Operating Large Seawater RO Desalination Plants in the World (2002)

	Country	Location	Capacity (m3/d)	Operation (year)	Plant Supplier	Membrane Supplier
1	Trinidad & Tobago	Point Lisa	136,000	2002	Ionics	Toray
2	Saudi Arabia	Yanbu RO2	128,000	1998	Mitsubishi	Toyobo
3	Saudi Arabia	Al Jubail III	91,000	2000	Preussag	DuPont*/Toray
4	Saudi Arabia	Jeddah RO1	56,800	1989	Mitsubishi	Toyobo
4	Saudi Arabia	Jeddah RO2	56,800	1994	Mitsubishi	Toyobo
6	Spain	Marbella	56,400	1999	Inima	DuPont*
7	Malta	Penbroke	54,000	1994	Polymetric	DuPont*
8	Bahrain	Al Dur	45,000	1989	Weirwest gathge	DuPont*
9	Spain	Bl Mallorca	42,000	1998	Degremont	DuPont*/Toray
10	Japan	Okinawa	40,000	1997	Kurita,Ebara,etc.	Toray,Nitto

* DuPont withdrew from RO business in 2001

Thank you for your kind attention