

Corporate introduction

NITTO DENKO CORPORATION / HYDRANAUTICS
Membrane Division



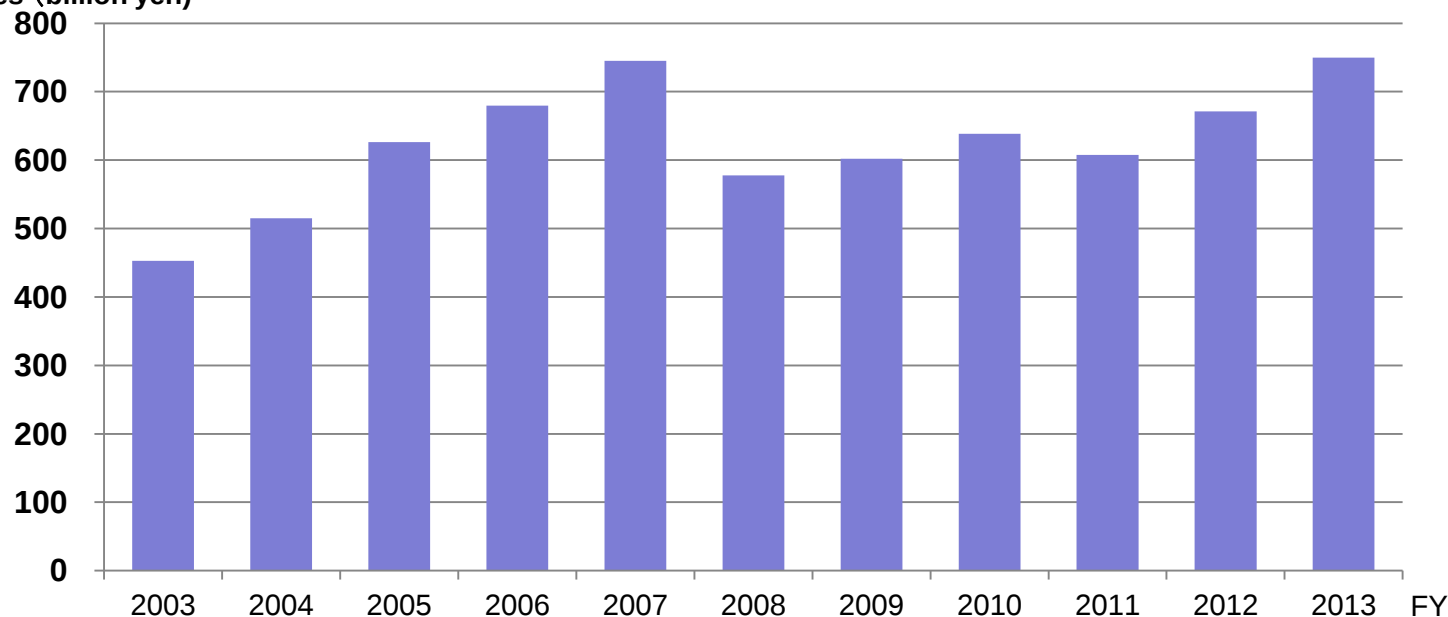
Established: October 25, 1918
Capital: 26,783 million yen
Non-consolidated Sales: 493 billion yen
Consolidated Sales: 749 billion yen <7.49 BUSD>
Employees: 31,504 (consolidated)
6,069 (non-consolidated)

Products:

(As of March 31, 2014)

- 1) Industrial materials based on the high-polymer synthesis & adhesive processing technologies
- 2) Leading-edge electronic device Environment-related products

Sales (billion yen)



Nitto Denko products support our life in various fields

Lightweight
vibration-
damping
material

Body Panel-
reinforcing &
Vibration-
damping
Material

**Surface
Protection
Film**

**Optical
Film for
LCD**

Transparent
Conductive
Film

Thin-film Metal
Circuit Board
For HDD

Porous
Filtration
Membrane

Electronics &
Optical
Components

Thermal
Release
Sheet



Automotives

**LCD, OLED
HDD**

**Electronic
components**

Environment

Healthcare

**Housing &
Construction**



Reverse
Osmosis
Membrane
Element for
Seawater
Desalination

Reverse
Osmosis
Membrane
Element for
Wastewater
Recycle

Ultra
Filtration
Membrane
Element for
Water
Treatment

Transdermal
Therapeutic
Patches

Otane Ninjin

Surgical
Tapes &
Dressings

Waterproofing
&
Airtight Tape
for Housing

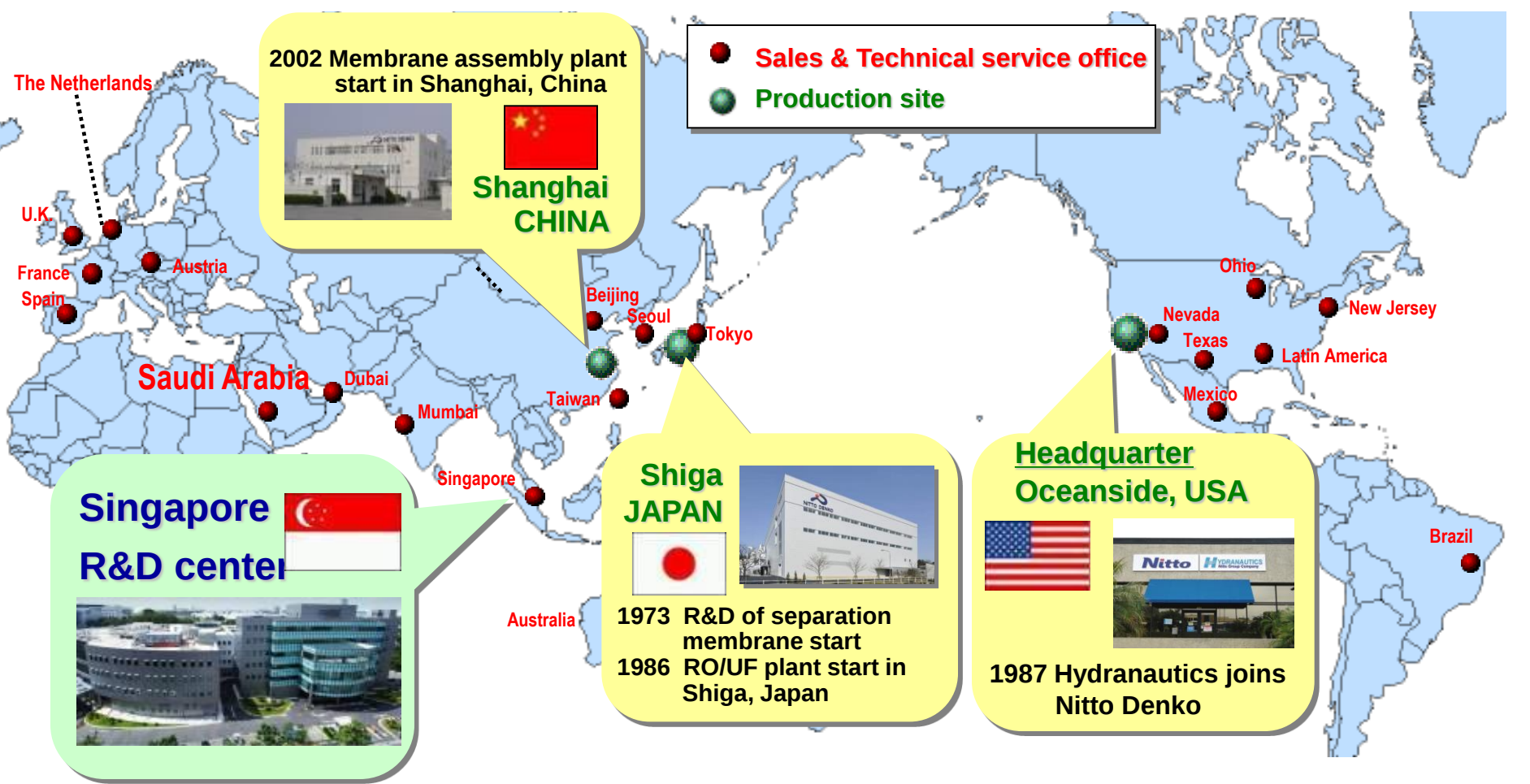
Flooring
Protection
Tape

Waterproofing
& Airtight Tape
for
irregular Surfaces

- '70 '73 **Start R&D for industrialization of separation membrane (CA type RO, tubular membrane module)**
- '78 Commercialized prototype of capillary & spiral
- '80 '83 Release Ultrapure UF membrane for semiconductor
- '86 **Shiga Plant started up as the world first RO/UF plant**
- '87 **Acquisition of Hydranautics in USA by Nitto Denko**
- '88 Release Low-pressure aromatic PA-RO product
- '90 '91 Release Seawater desal aromatic PA RO product
- '95 Release ultra-low pressure RO product
- '97 Release fouling-resistant RO product
- '98 Pretreatment UF membrane (Hydracap / RS) process patent of compound RO membrane (ES) received remarkable invention award
- '00 '02 **Spiral mem. assembly started in Songjiang, Shanghai**
- '03 High boron-removal RO membrane product released
- '04 Release seawater desal high boron-removal RO membrane
- '08 SWC5 (seawater desal RO element) wins '07 Nikkei Superior Products and Services Awards
- '08 **Establish R&D center in Singapore**
- '10 **Start new plant operation in Shiga Plant**



Nitto Denko membrane division has been globally developing its business with the subsidiary, Hydranautics (California, USA) and the group company, Nitto Denko Shanghai Songjiang. We have **3 manufacturing plants** and **more than 20 Sales & Technical service branches** in the world.



We provide full range of separation products



RO/NF spiral wound modules



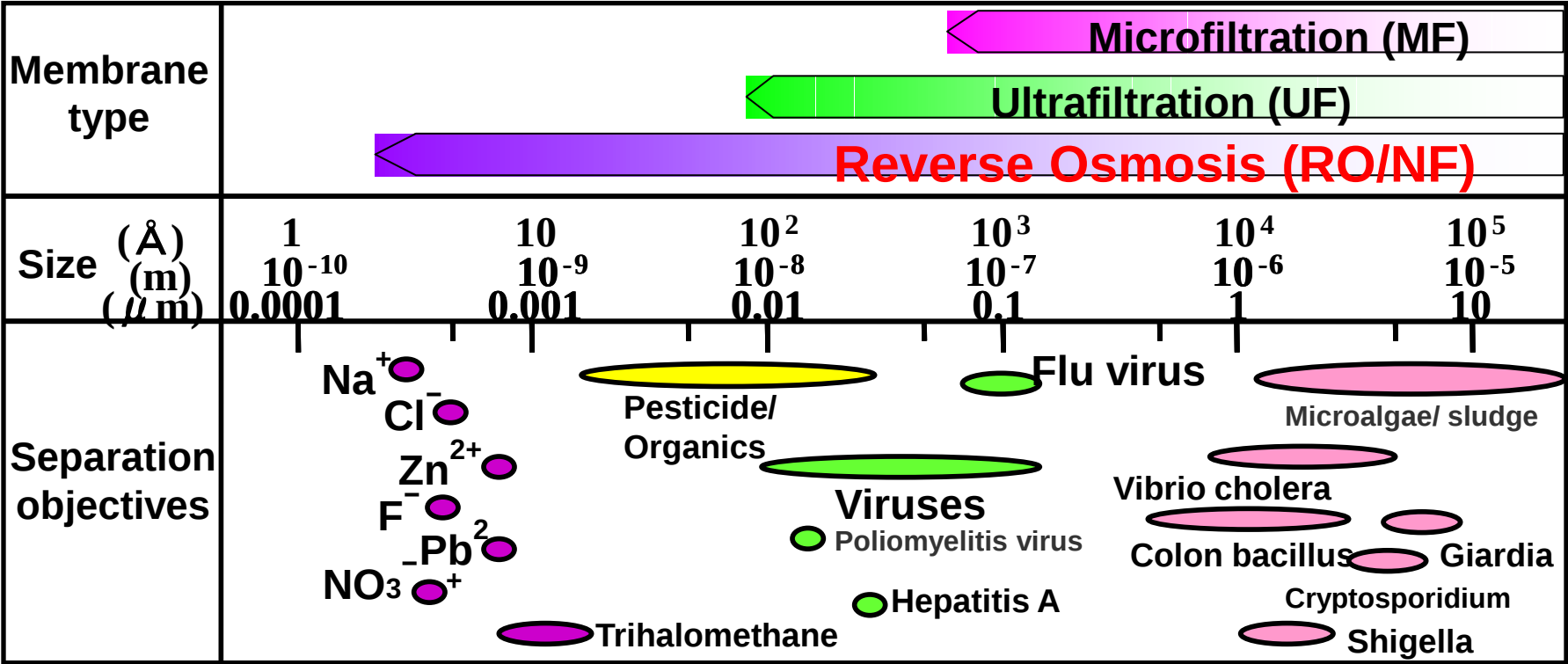
Process Separation modules (RO/NF/UF/MF)

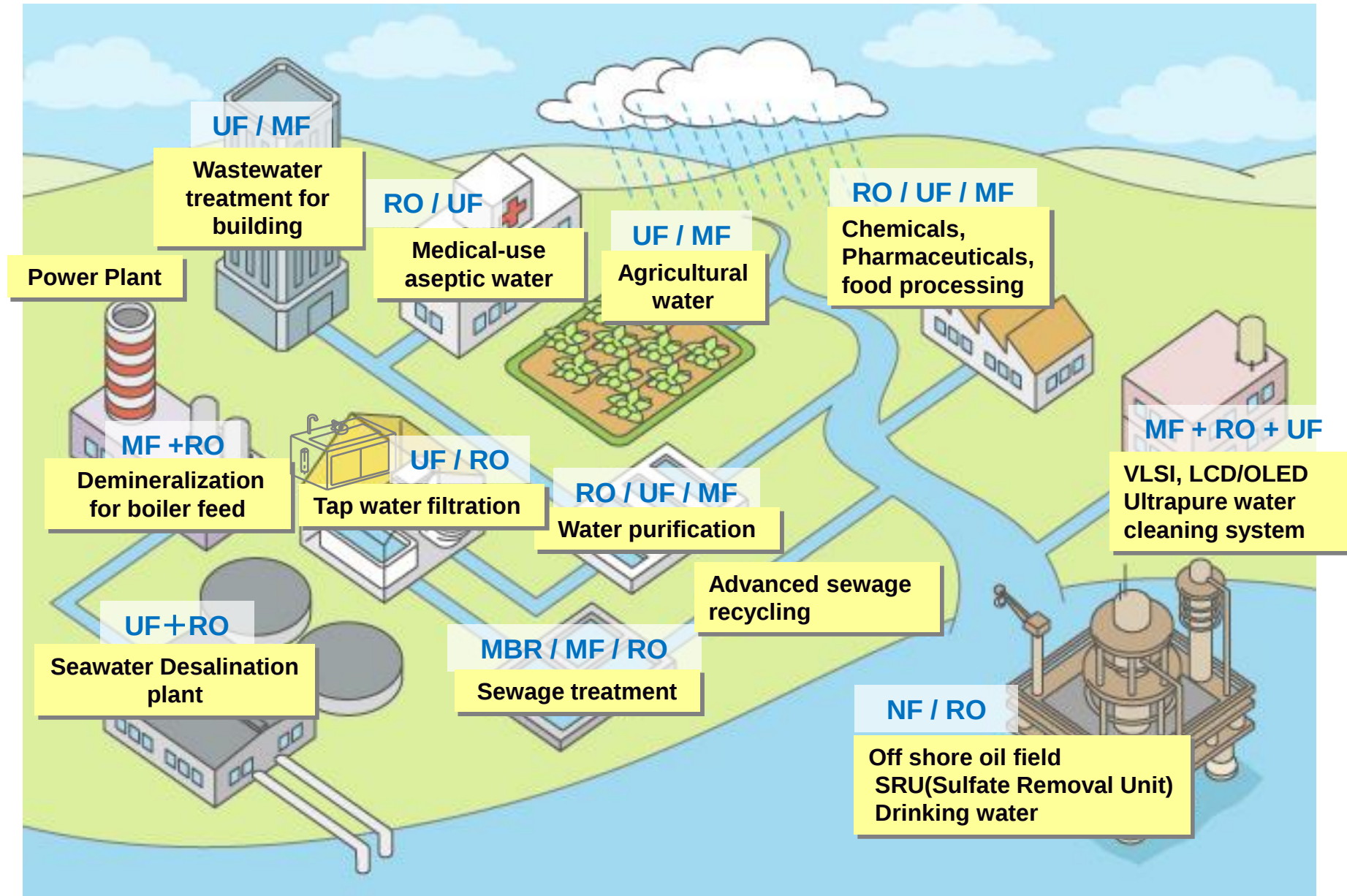


UF Hollow Fibers modules



MBR Modules

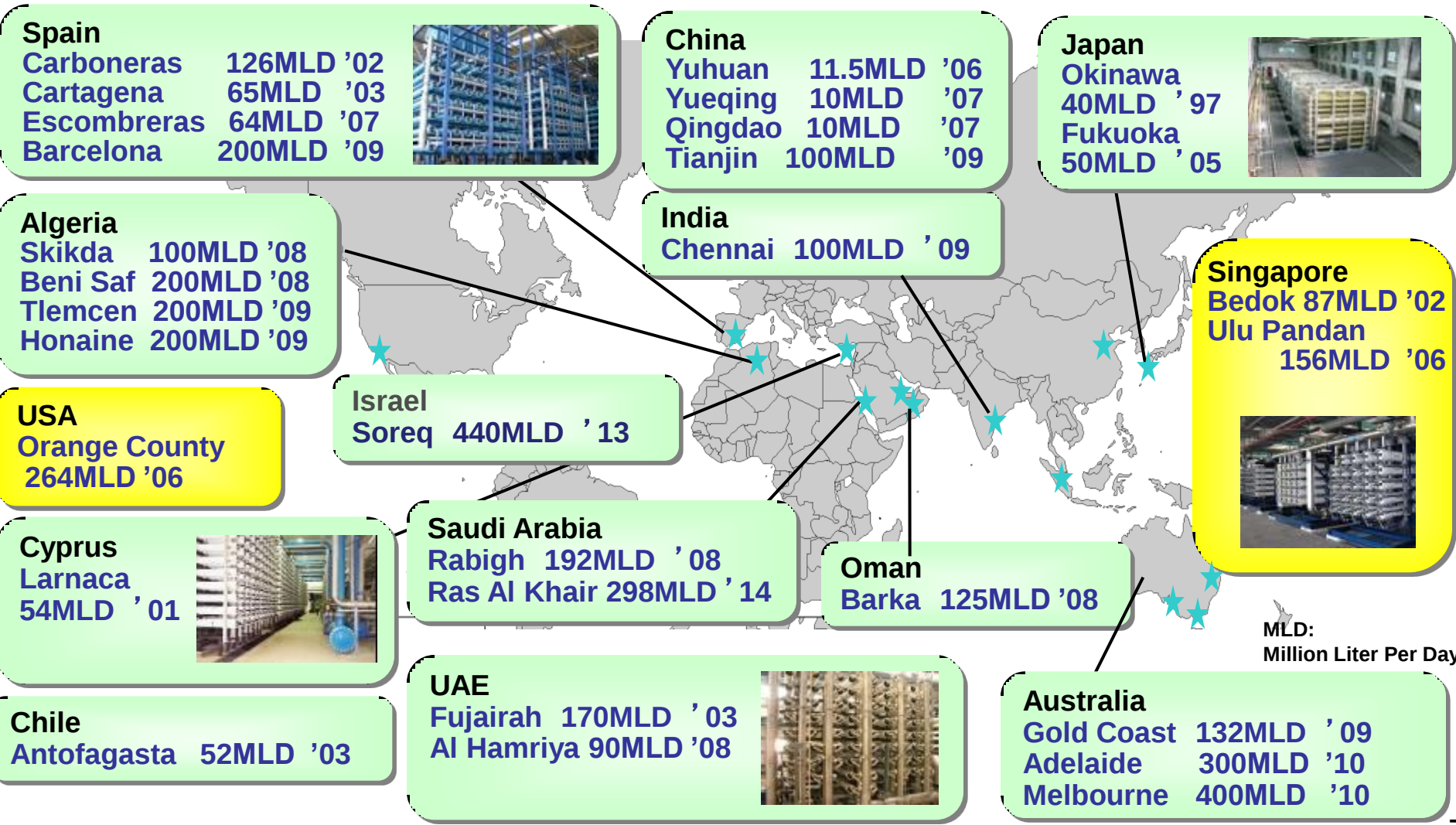




Large-Scale Plant References

Seawater Desalination : Total 6,000,000 m³/d and over

Wastewater Reclamation : Total 1,000,000 m³/d and over



MLD:
Million Liter Per Day

We have MBR and NEWater plants references in Singapore

Jurong WRP, Singapore

- Treatment Type: BOD, Nitrogen, Phosphorus Removal
- Membrane Area: 81,000 m² (30 HSM1800 modules)
- Capacity: 45,333 m³/day (12 MGD)
- Net Flux: 35 LMH
- Commissioned: February 2012

Jurong MBR



NEWater Plants



Plant	Start-up	RO production (m ³ /d)	RO manufacturer
Bedok I	2002	32,000	Nitto Denko/Hydranautics
Bedok II	2008	55,000	Nitto Denko/Hydranautics
Ulu Pandan	2006	156,000	Nitto Denko/Hydranautics
Kranji	2002	82000	Woongjin
Changi	2009	228,000	Toray

NEWater Factory in Singapore

NEWater
For Industry, For Living, For Life!

Secondary
Effluent

Chloramines



Microfiltration



Reverse Osmosis

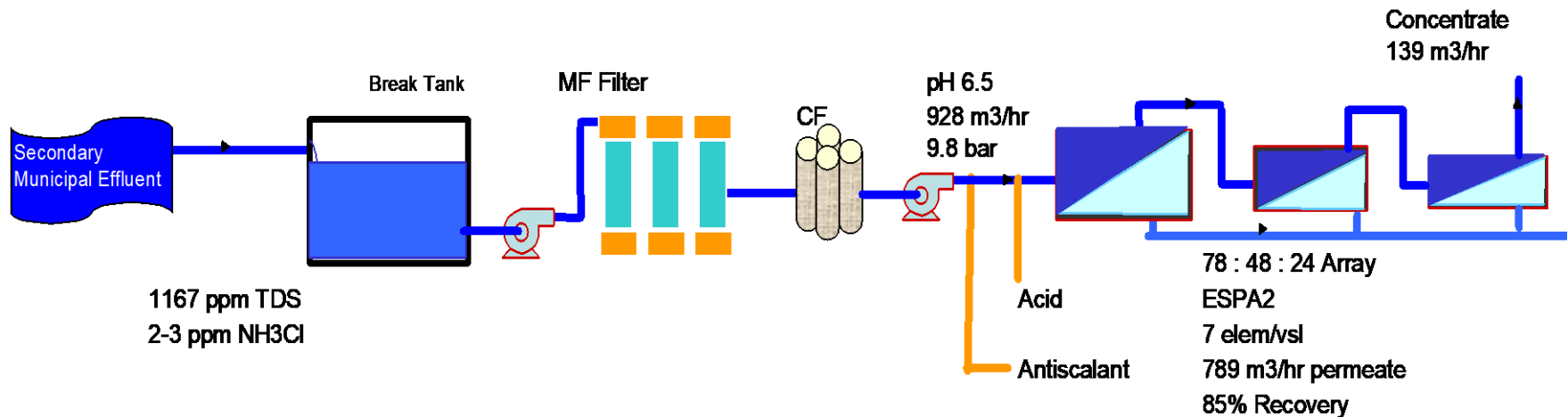


UV Disinfection

Protect of bacteria and viruses

1. Continuous dosing the chloramines
2. Dual treatment of MF/UF and RO membrane
3. Hybrid treatment of membrane and UV disinfection

Orange county water district plant in CA, USA



【Design condition】

- Water production : 14 × 789 m³/hr
= 264,950 m³/d
- Array : 78:48:24
(7 element per vessel)
- Recovery ratio : 85%
- Design Flux : 20.2 L/m²·h
- Membrane type : ESPA2 MAX



Reference list in Saudi Arabia

- Application for Seawater desalination, brackish water desalination and Industrial wastewater reclamation
- Total 700,000 m³/d and over



Project Name/ End User	End User	City	Membrane Type	Year Comm.	Capacity [m3/d]
Ras Al Khair Power and Desalination Plant – Phase 1	SWCC	Ras Al Khair	ESPA2 MAX	2014	298,000 (MSF:727,000)
Jubail Phase 2	Al Fatah Water & Power	Jubail	SWC5-LD/ESPA2Max	2014	23,400
Kindasa Phase B2	Kindasa Water Services	Jeddah	HydraCap 60/ SWC4-LD / ESPA2	2012/2013	8,945
Jubail Phase 1 replacement	Al Fatah Water & Power	Jubail	SWC5-LD+SWC6Max	2012	50,150
SOJECO	SAWACO	Jeddah	SWC5-LD	2012	2,500
Al Buhairat City	MOYA BUSHNAK	Al Buhairat	SWC4-LD	2012	2,500
Petro-Rabigh	ARAMCO	Rabigh	SWC5-LD	2011	20,000
North Obhur	SAWACO	Jeddah	SWC5-LD	2011	2,500
Ras Meshaab			SWC5-LD	2010	6,000
KAEC	EMAAR	Rabigh	SWC5-LD	2010	5,000
Barge SWRO	NOMAC	Yanbu	SWC5-LD	2010	15,000
Petro Rabigh plant	RAWEC	Rabigh	ESPA2 MAX	2008	192,000
Saudi Airlines City	Kindasa Water Services	Jeddah	SWC4+	2007	8,000
Hilton Hotel		Jeddah	SWC4+/SWC5-LD	2007	3,000
Kindasa Phase B1	Kindasa Water Services	Jeddah	SWC3 & SWC4-LD / ESPA2 / HydraCap 60	2006	25,500
National Prawn Company	Al Rajhi	Jeddah	SWC3+ / SWC5-LD	2005	1,500
King Faisal Naval Base	MOD	Jeddah	SWC4+	2003/2006	9,000
Bayadh - Saudi			CPA2	2002	8,400
Buwaib, Saudi			CPA4	2002	7,200
Dahran Airport		Dahran	CPA2	2002	2,700
Inter Continental Hotel		Riyadh	CPA3	2002	3,000
Prince Sultan hum city		Riyadh	CPA3	2001	1,500
King Khaled Airport		Riyadh	CPA3	1996	13,000

Nitto

 **YDRANAUTICS**
www.membranes.com
A Nitto Denko Company