Aigua i Indústria Química: Necessitats i solucions

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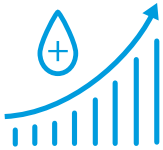
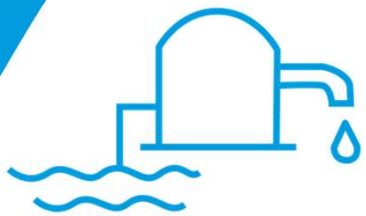
Rise of desalination



Population growth and **climate change** continue to place demands on limited freshwater resources.

By 2050, **30% more water** needed to keep up with rising **population** and **400% more water** needed for **manufacturing.**



Desalination is fast becoming a safer investment for securing water supply.

Boretti, A., Rosa, L. Reassessing the projections of the World Water Development Report. npj Clean Water 2, 15 (2019)

Reverse Osmosis vs Thermal Desalination

- Membrane based desalination can save more than 55% energy compared to thermal processes

Membrane process

3 kWh/m³

Thermal process

7-10 kWh/m³

Source: "Water Desalination: History, Advances, and Challenges - Manish Kumar, Tyler Culp, and Yuexiao Shen." National Academy of Engineering. 2017. Frontiers of Engineering: Reports on Leading-Edge Engineering from the 2016 Symposium

Desalination Installation

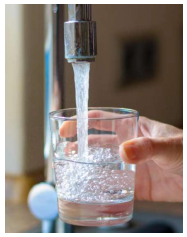
- A typical desalination plant has a system to remove suspended solids and a membrane step to reduce salt content
- Uses energy recovery device to minimize energy consumption

Desalination Facts

Is it expensive?

- The cost of desalinating water for a family of 4 people for a year equals the cost of a refrigerator for one year

1 L = 0.50 €



1 L = 0.002 €

(1,000 L = 2 €)

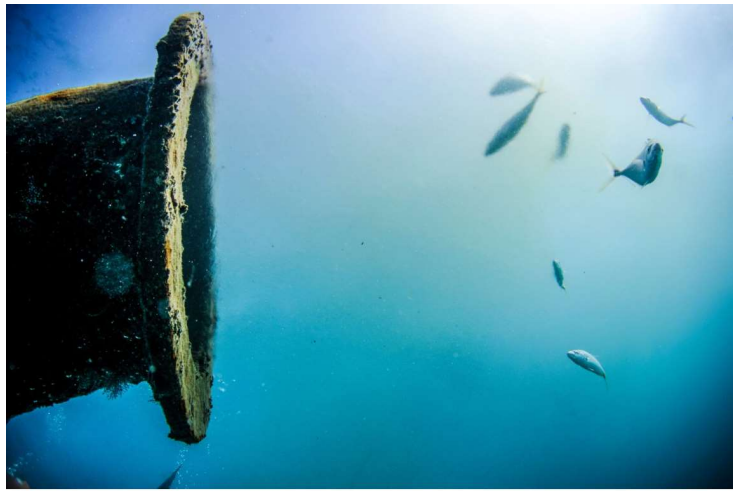
1 L = 0.0005 €

(1,000 L = 0.50 €)

Desalination = 3 kWh/m³ · 0.15 €/kWh = 0.50 €/m³
Refrigerator = 400 kWh/y · 1 y / 365 d· 0.25 €/kWh·d = 100 €/y
Desalinated Water = 4 person/d · 140 L/person · 365d · 0.0005 €/L = 100 €/y

What about the discharge?

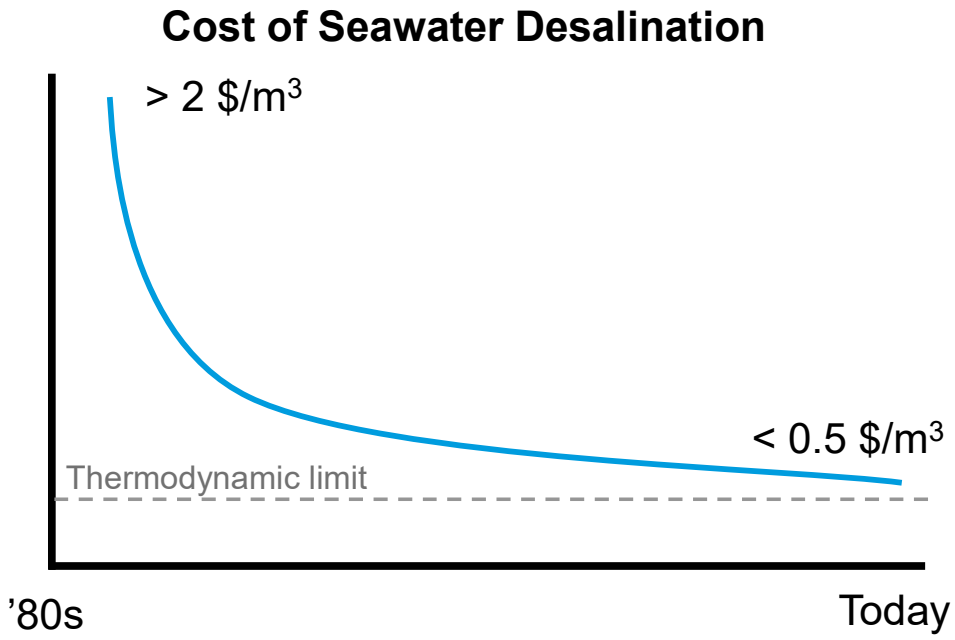
- Brine has a bit less than twice the concentration of seawater
- With a proper mixing, it is just seawater returned to the sea
- It can be valorized



Source:
https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176834&menu=ultiDatos&idp=1254735976602
https://www.mincotur.gob.es/es-es/IndicadoresyEstadisticas/BoletinEstadistico/Energ%C3%ADa%20y%20emisiones/4_12.pdf

Cost of Seawater Desalination

- As the technology approaches its thermodynamic limit, **innovation beyond product specification** becomes more relevant



Source: Shrivastava et al., Energy efficiency breakdown of reverse osmosis and its implications on future innovation roadmap for desalination, Desalination, 2015. 368: p. 181-192.

Customers benefit from superior membrane life

- Well designed and operated membranes can last very long

Alicante Desalination Plant

> 6,000 membranes

14+ years in operation

DUPONT

FilmTec™ Seamaxx™

- Offer 5% energy savings
- Useful for installations with:
  - High energy consumption, low temperature
  - High electricity cost (> $0.15 USD/kWh)
  - No or low efficiency energy recovery systems

Energy Recovery Device

Dry Seawater Membranes

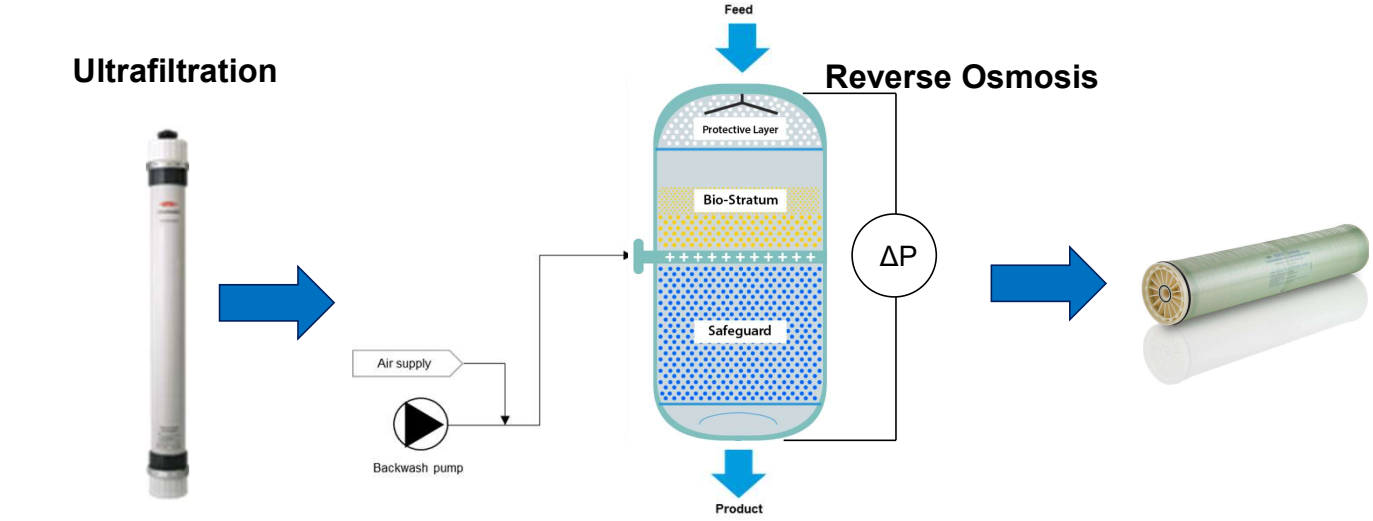
- Delivered without preservative solution

Safer installation
due to 4 kg less weight

Longer Storage

DuPont™ B-Free™

- Protects Reverse Osmosis membranes from biological fouling



Suspended solids removed

Biofouling removed

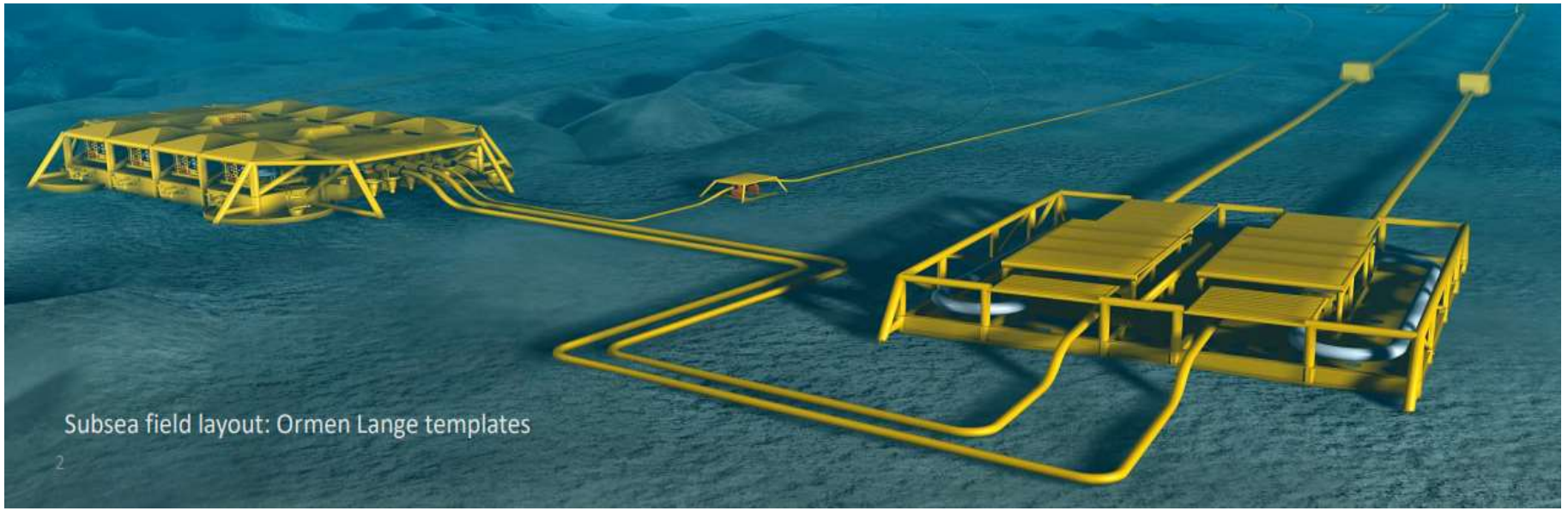
Salinity removed

With B-Free™

Without B-Free™

Subsea Desalination

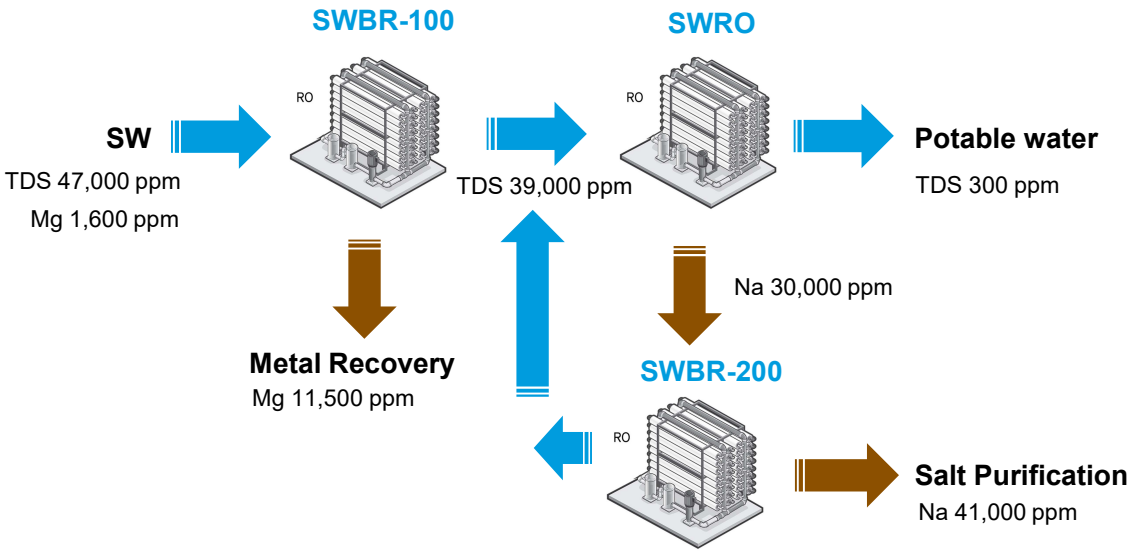
- Uses the hydrostatic pressure of 400 m below sea to save 30% energy



Decreasing energy cost from 2.4 kWh/m³ to 1.7 kWh/m³

Brine Recovery

FilmTec™ Desal SWBR-100 & SWBR-200 enables customer to effectively up-concentrate and valorize magnesium hydroxide and sodium chloride respectively, as well as producing drinking water from seawater.



DUPONT

DuPont Selective Desalination

valorizing what matters™

Water footprint

- The International Desalination Society (IDA) is working on a mechanism to establish water credits (like carbon credits) to allow companies to become water neutral in terms of water footprint

140 L/day

130 L
(20,000 L/kg)

4,000 L

NET ZERO = WATER POSITIVE IMPACTS (Water Recharge, Water Purification) − NEGATIVE WATER IMPACTS (Water Withdrawals, Water Polution / Discharge)

Aliened with United Nations (UN) Sustainable Development Goals (SDG)

SUSTAINABLE DEVELOPMENT GOALS

6 CLEAN WATER AND SANITATION

14 LIFE BELOW WATER

15 LIFE ON LAND

IDA International Desalination Association

DUPONT

Tarragona Global Water Technology Center

Accelerated product launches
- 16 new products since 2011
- Time to launch a product 10 times faster

Enhanced R&D pipeline
- 25 R&D projects per year

Customer collaboration
- 150 customer projects per year
- More than 3,000 visitors