

WTW Jan Lagrand

Top of the bill !

PWN at a glance

WTW Jan Lagrand



Position PWN in Dutch water community

Puur water & natuur

- 10 Dutch water supply companies
- Since 1950 many mergers
- PWN fourth in size



The organisation

Puur water & natuur

PWN consists of three primary sectors

- Drinking water
- Nature & Recreation: management of dunes and recreation facilities
- Customer & Market: all customer contacts

Three supporting departments:

- Finance and Planning & Control dept.
- Human Resources
- Development & Innovation



Core activities

Puur water & natuur

Drinking water

- 775.000 connections to our network
- 105 billion litres of drinkingwater a year
- About 130 litres per capita a day

Nature & Recreation

- 7.400 hectares dune area under management
- 7 million visitors a year
- 2 visitors centres: De Hoep and De Zandwaaier
- 3 independent campsites:
The Kennemer Dune Campsites

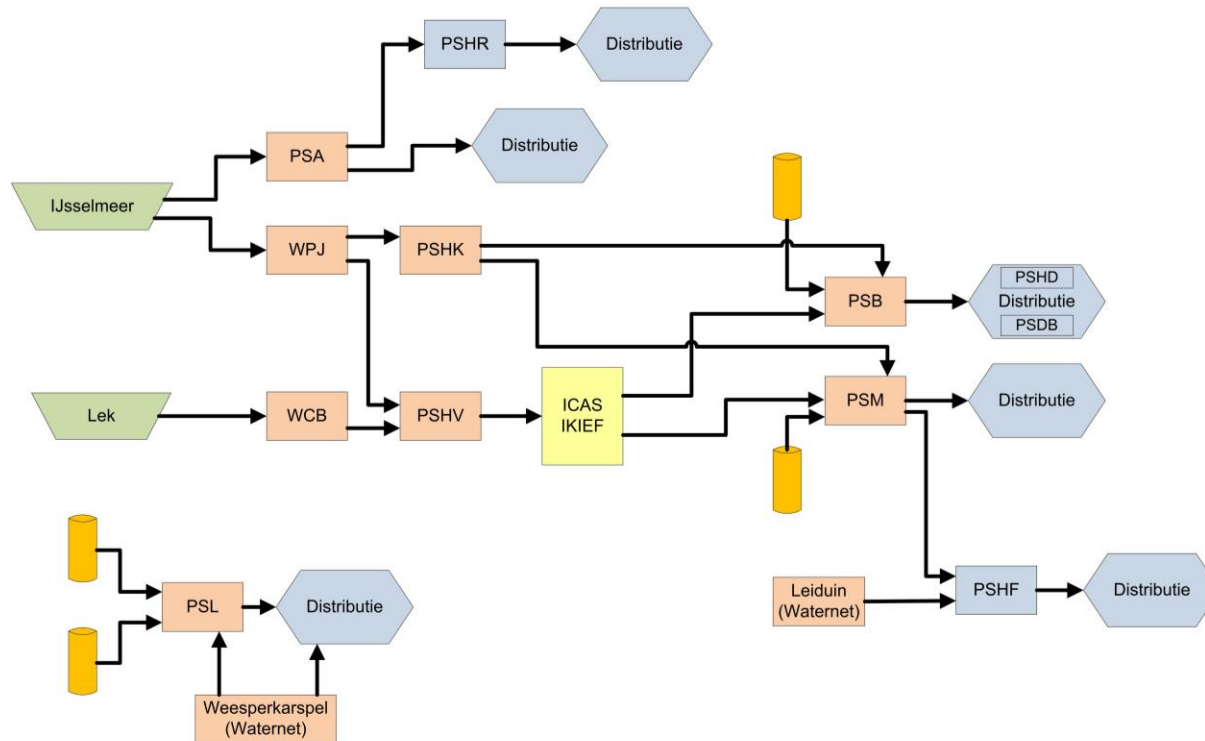




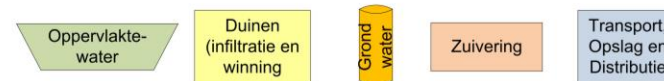
- 1919** Province of North Holland decides to found PWN
- 1934** Province charges PWN with the management of Provincial natural areas
- 1956** Start infiltration of surface water into the dunes
- 1990** Privatization → N.V. PWN Waterleidingbedrijf Noord-Holland
- 1997** Merger between WLZK and PWN
- 2002** Reorganisation PWN
- 2009** Foundation PWN Technologies
- 2011** PWN starts to build AndijkIII



PWN Water Treatment Schemes



Legenda:



Production and transport



Direct purification at Andijk and Heemskerk

Production locations and storage reservoirs are coupled through a ring pipeline

History PWN: link between water and nature



History PWN: link between water and nature

- In North Holland, natural freshwater supplies are only found in the sand dunes and Gooi area.
- Initially, dune water was the only source for drinking water.

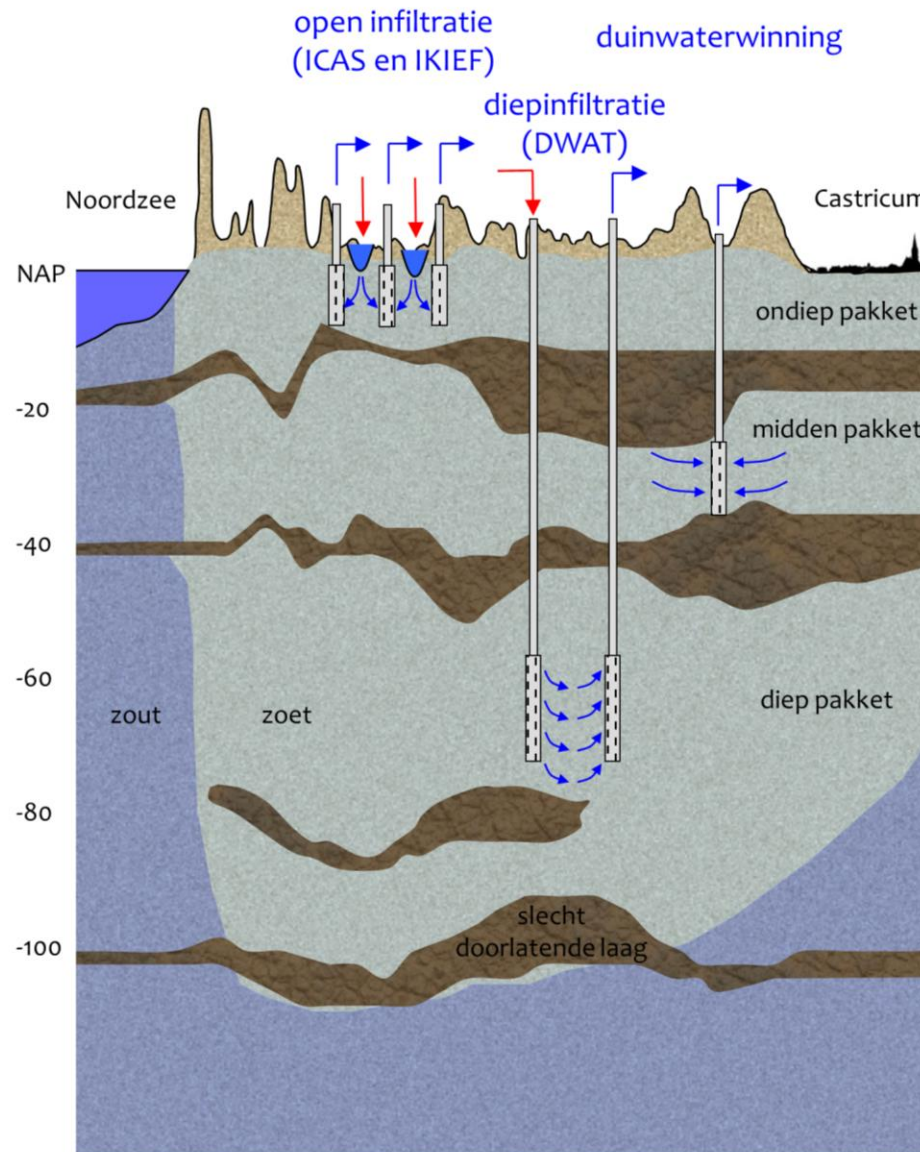


History PWN: link between water and nature

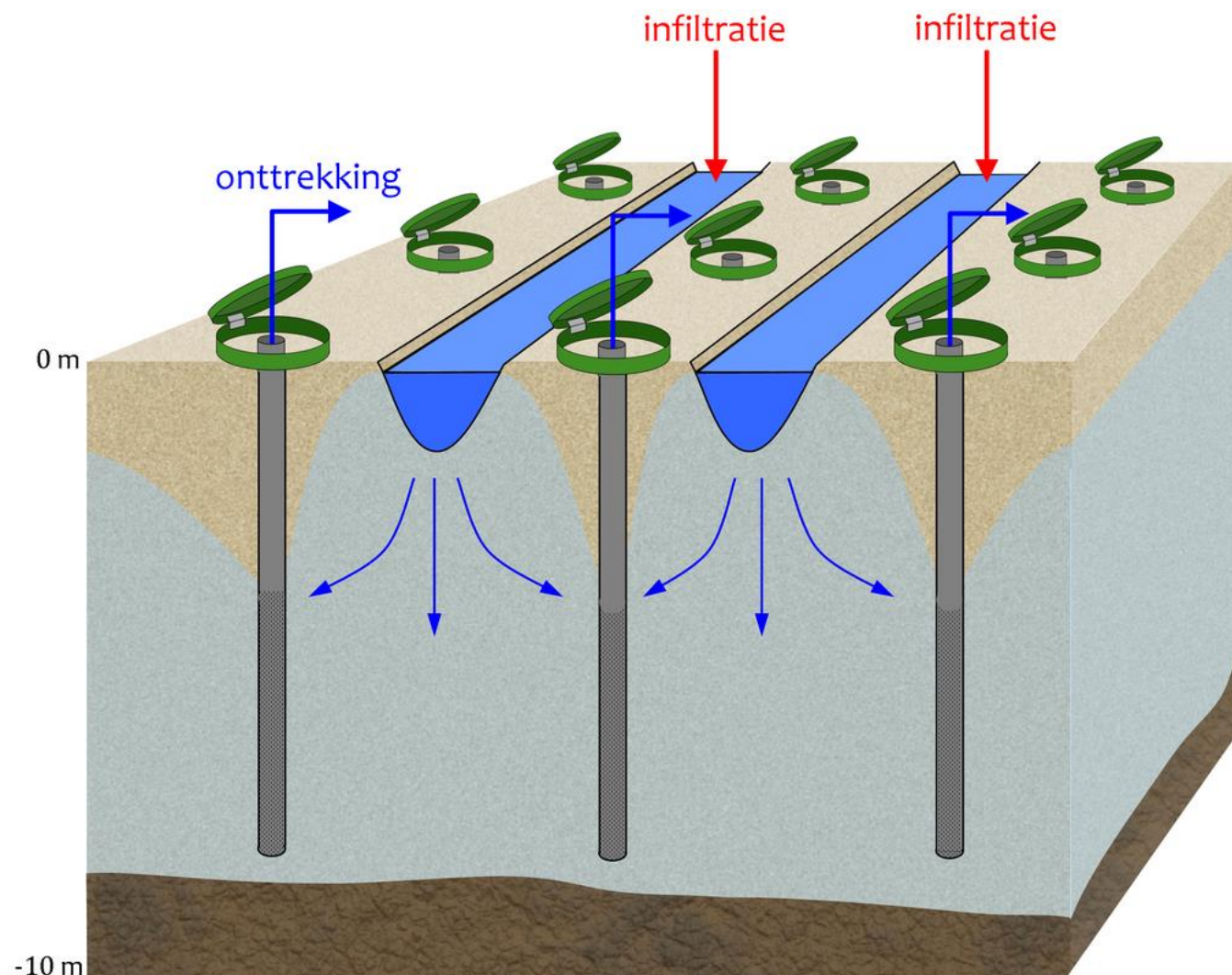
- In North Holland, natural freshwater supplies are only found in the sand dunes and Gooi area.
- Initially, dune water was the only source for drinking water.
- From 1956 on, replenished by surface water (Lake IJssel, rivers Lek and Rhine).
- The dunes are still an important strategic reservoir for drinking water in North Holland.
- Without dunes no reliability of supply.



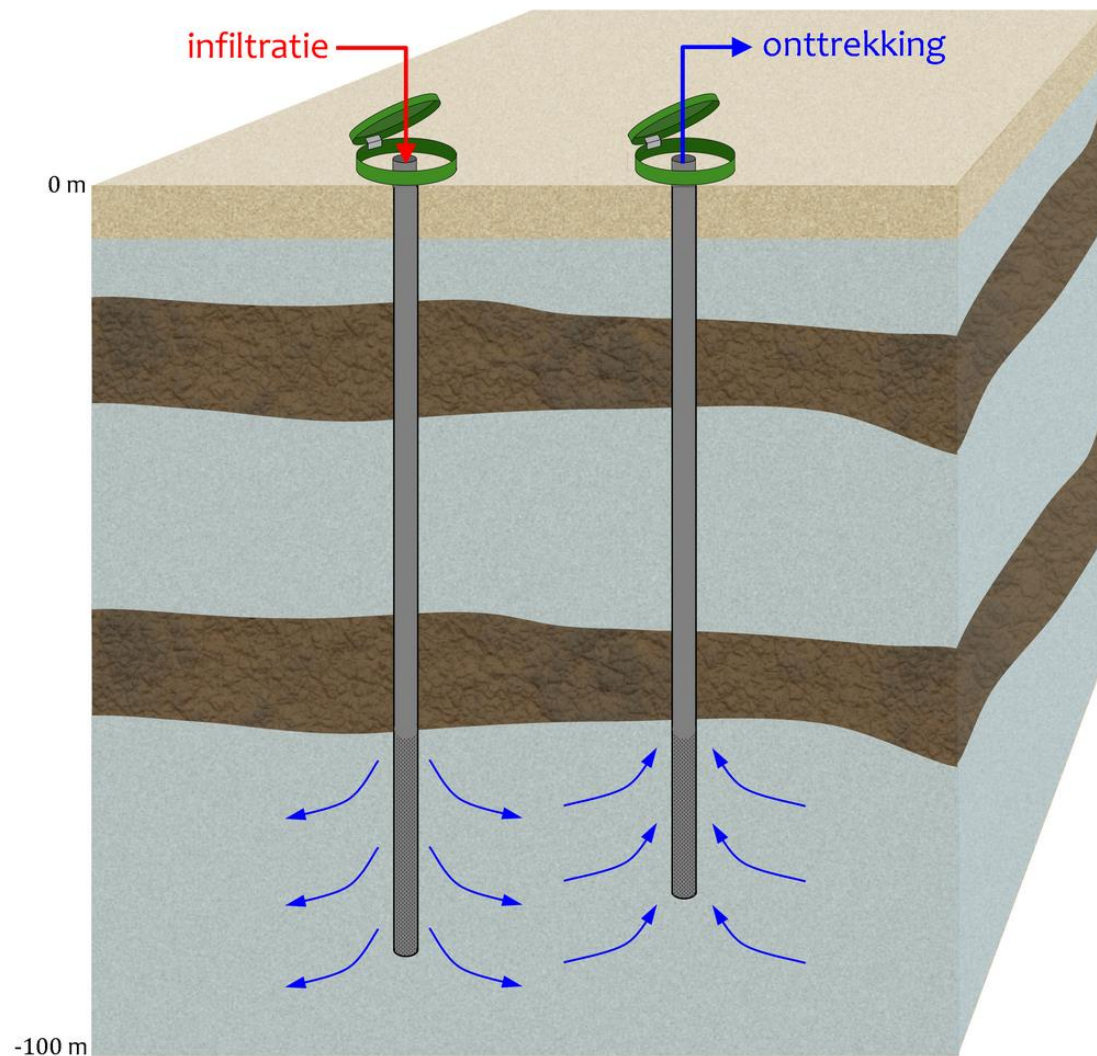
Infiltration systems



Open infiltration



Deep well infiltration



Infiltration area ICAS (1956)



Infiltration area IKIEF (1976)



Innovation-focused culture of PWN results in worldwide leadership in drinking water technology

1989	Deep-well infiltration
1999	Membrane filtration
2004	UV/H ₂ O ₂
2004	Perfector-E
2008	Heemskerk 2
2008	Relining
2010	SIX technology



Pre-purification Andijk

Puur water & natuur

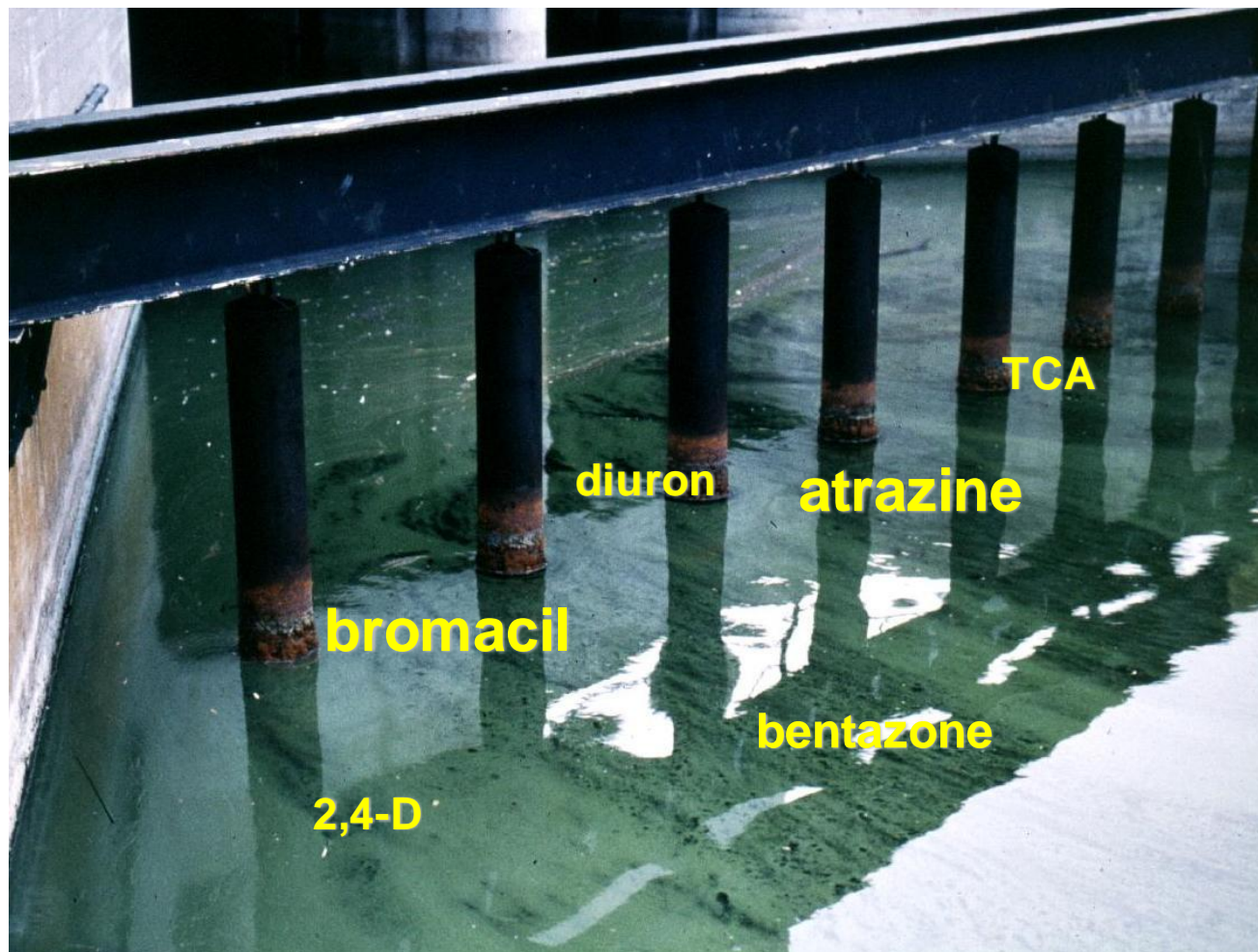


Pre-purification Nieuwegein

Puur water & natuur



Raw water intake at Andijk



Advanced requirements

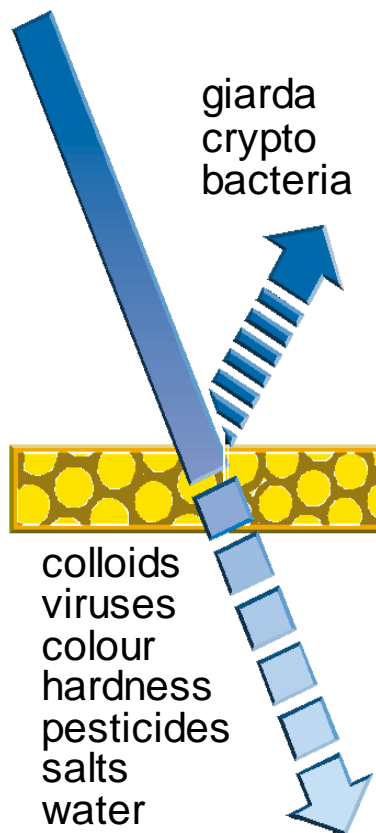
- Improved drinking water quality requires:
 - disinfection, preferably without chlorine application
 - barrier for organic micro pollutants (pesticides, industrial contaminants, medicine & hormone residuals)
 - softening
 - desalination (for control of Na content)



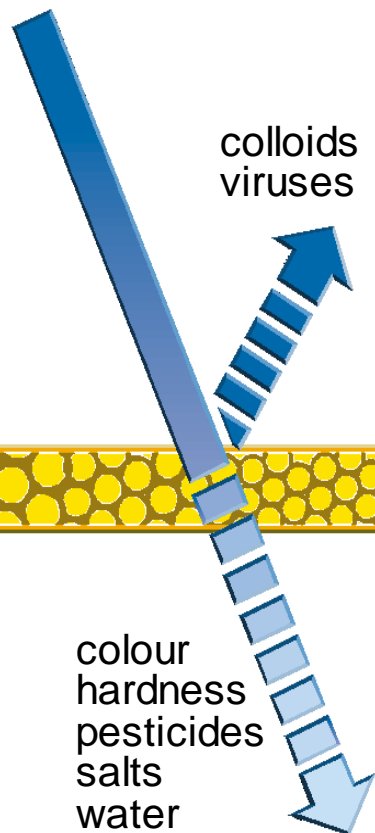
Heemskerk 1

- Membrane technology
 - Ultra Filtration + Reverse Osmosis
- Characteristics
 - disinfection: dual barrier! --> no chlorine
 - softening: cost savings, consumer comfort, network protection
 - barrier to organic micro pollutants (pesticides, hormone & medicine residuals)
 - concentrate waste (brine) --> sea outfall

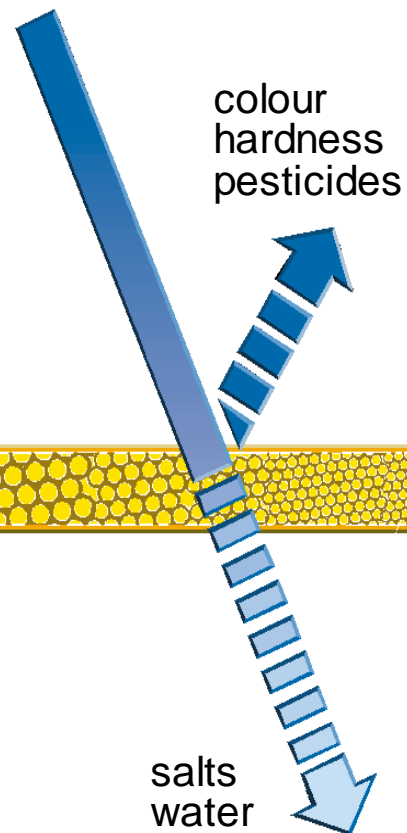
Micro Filtration



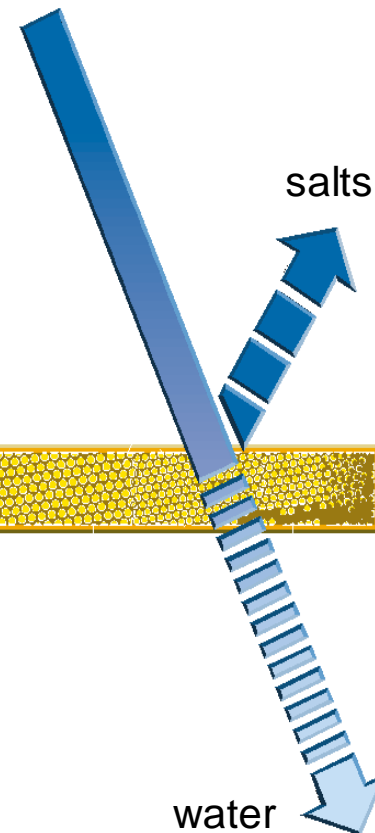
Ultra Filtration



Nano Filtration

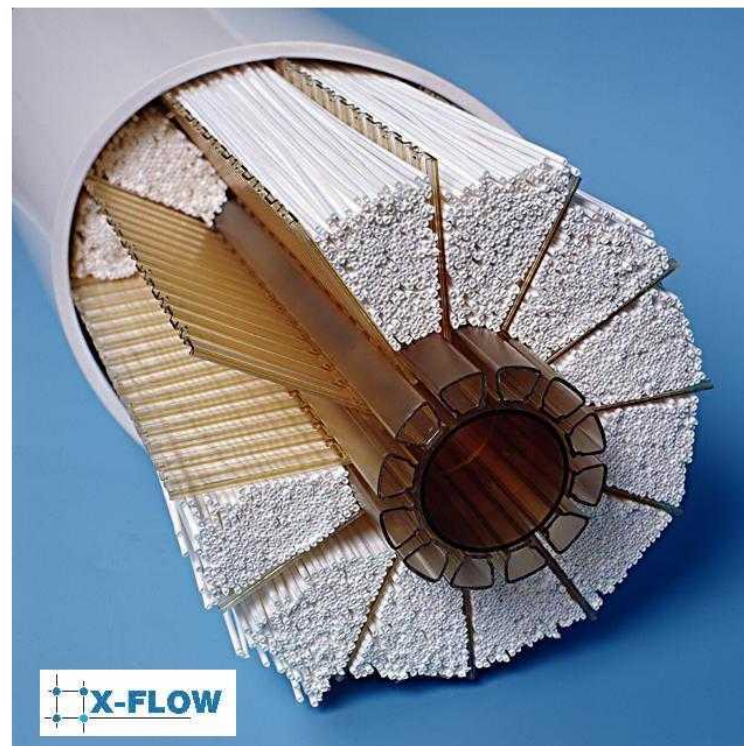


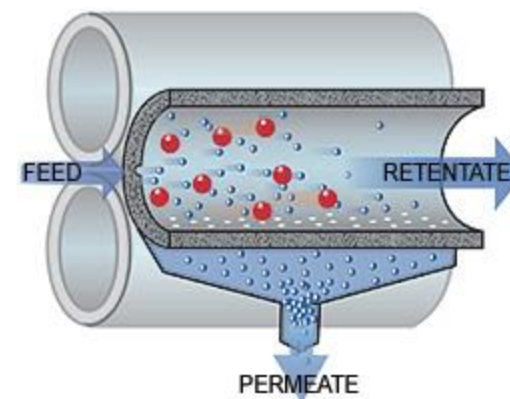
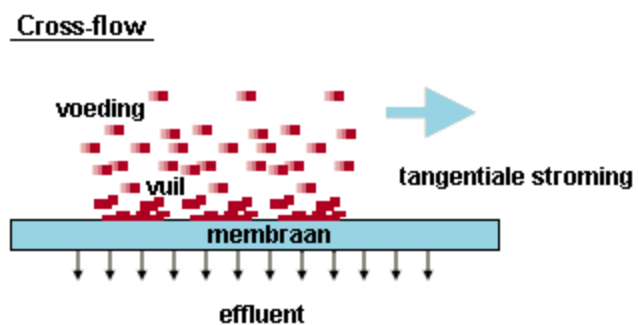
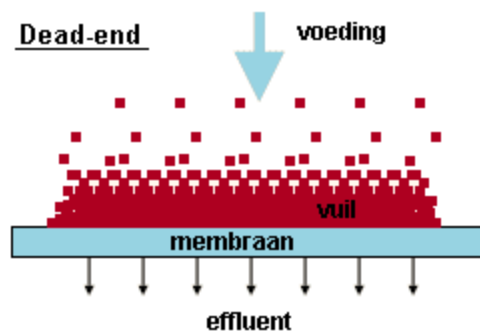
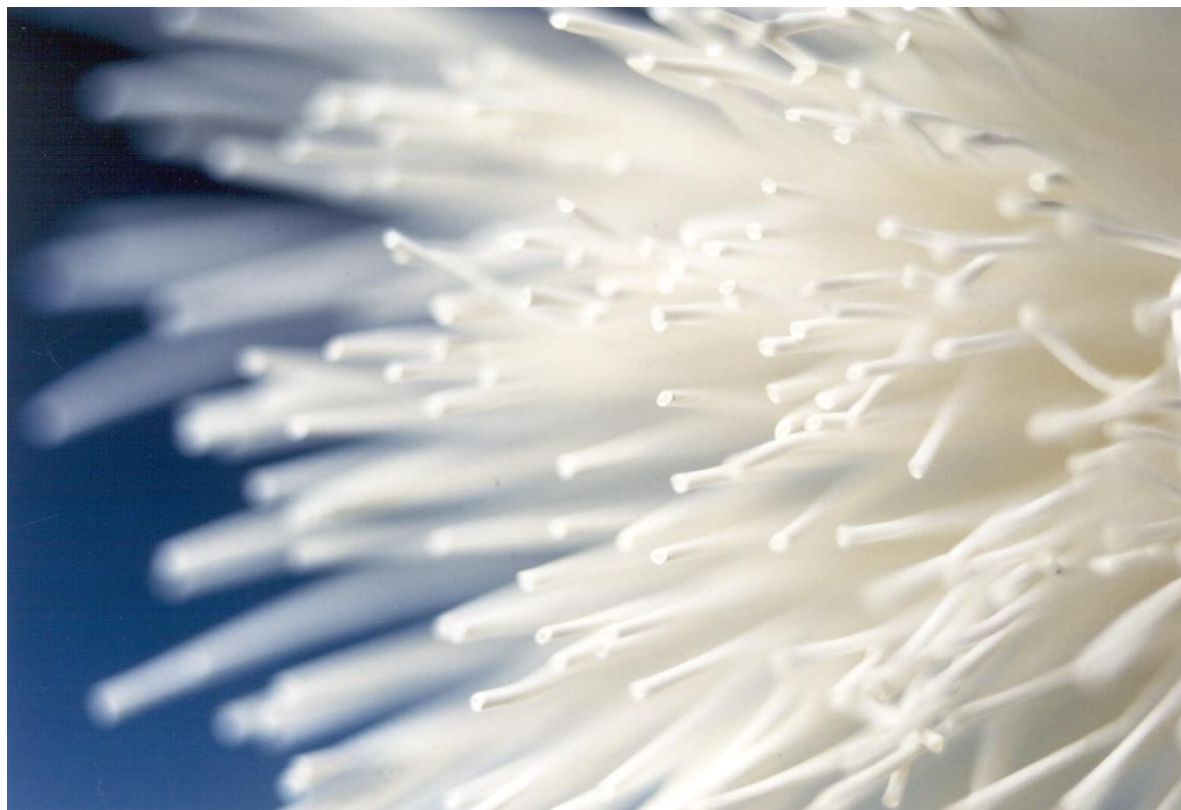
Reverse Osmosis

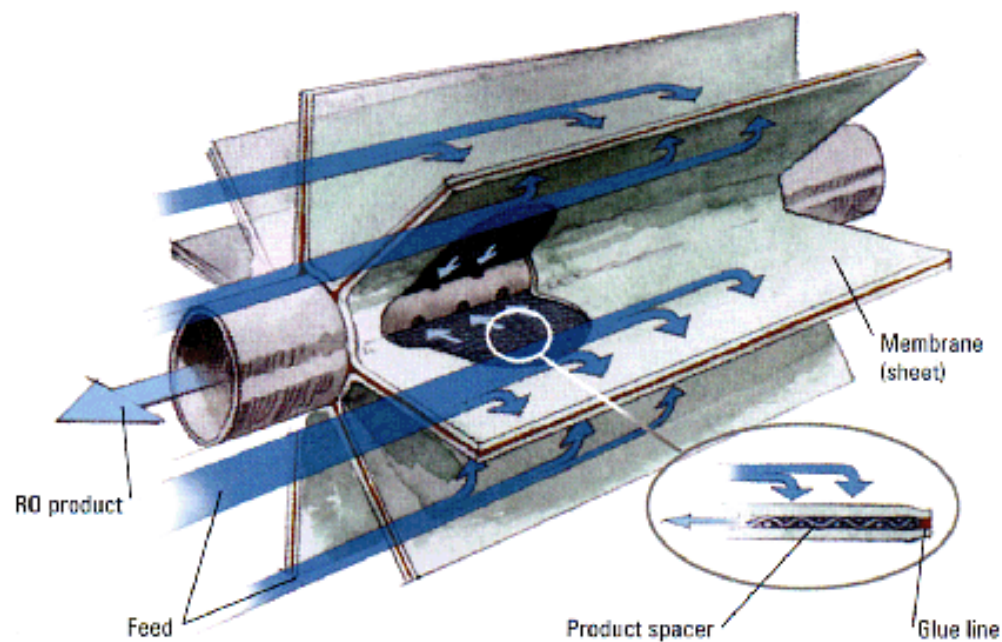


Hollow fibre UF

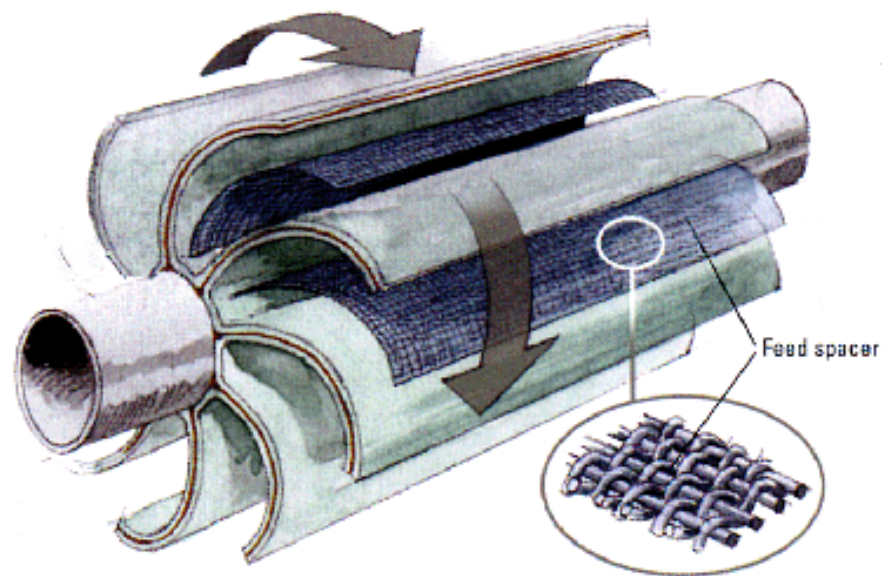
dead end-filtration





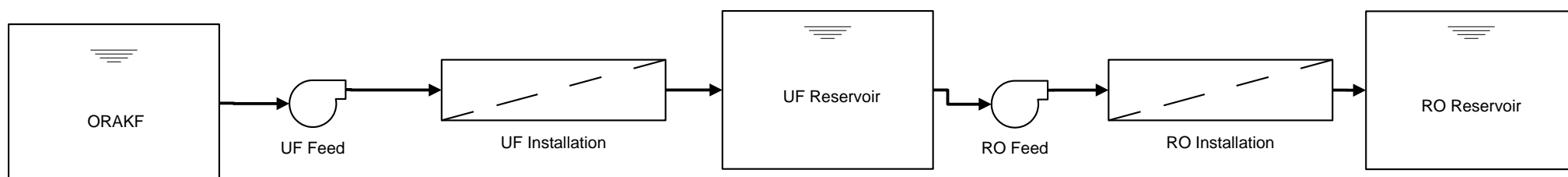


Spiral wound RO cross flow filtration



Schematic diagram hyperfiltration

PFD Heemskerk 1



Large scale UF



Heemskerk 2

- Technological concept:
 - existing pretreatment (Lake IJssel and Rijn-lek canal)
 - UV/H₂O₂ treatment
 - GAC reactor
 - dune infiltration
- Characteristics
 - disinfection (optional)
 - barrier for organic micro pollutants

UV/H₂O₂

- Principles:
 - UV irradiation affects DNA
 - UV irradiation affects organic compounds
 - UV + H₂O₂ --> OH^{*}-radicals
 - OH^{*}-radicals affect organic compounds

Heemskerk AOP (PSHV)

Puur water & natuur



