

Water Technology an innovative Dutch approach



Hein Molenkamp Banff, 11 April 2014





The Netherlands European Water Technology Hub



Water hubs in world



**WATER
CAMPUS**
Leeuwarden

- Strong water technology network
- Development and commercialization of breakthrough water technologies
- Cooperation > 150 companies and 50 universities / institutes
- Focused at Water Campus Leeuwarden

Water (quality) is crucial



**1.1 billion people
no safe drinking water**

**2.5 billion people
no safe sanitation**



**WATER
CAMPUUS
Leeuwarden**
Innovations



**Increasing
shortage
safe fresh water**



Decreasing biodiversity

Water Technology in The Netherlands

Since many years companies in the Netherlands have been developing and producing high-quality, cost-effective purification systems for water and gas, using **innovative water technology**

Sensing technology



Clean water technology

Waste water technology



Authoritative position Membrane Technology



Strong international position

Leading position Biotechnology



WATER CAMPUS

Leeuwarden

Science



Education



Business



Innovation chain

Scale up of technologies



2005 – 2009
PhD project Wetsus

mW



2007 – 2013
Pilot Wetsalt Harlingen

W - kW



> 2015
Full-scale application

MW

Water Technology Innovation Chain From idea to market!



Water Campus

Water Alliance
Business

**WATER
CAMPUS**
Leeuwarden

CEW
Education

Wetsus
Science

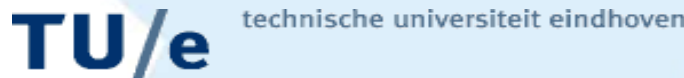




Research Excellence via 19 knowledge partners



Rijksinstituut voor Volksgezondheid
en Milieu
Ministerie van Volksgezondheid,
Welzijn en Sport



University of Minho



Wroclaw University of Technology

UNESCO-IHE
Institute for Water Education



UNIVERSITY OF AMSTERDAM



Strategic cooperation with >90 companies

<u>2003</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>	<u>2008</u>	<u>2009</u>	<u>2011</u>	<u>2013</u>
Alliander (Nuon)	Nalco	KWR / BTO	Triodos Bank	De Alg	Applus RTD	Water Alliance	Kemira
Vitens	NAM	Dura Vermeer	Aquacare	Fuji Film	Philips	Ballast Nedam	Skion
Shell	Esco/Frisia Zout	Hunze en Aa's	PWN	Oasen	Dutch Rainmaker	General Electric	Veolia Eau
Unilever	Waterb. Groningen	Photonis	Brabant Water	GMB	Arcadis	A. Hak Beheer	CEW
	Waterm. Drenthe	Schlumberger	Dow Chemicals	Ingrepo	Avebe	Biothane	BioCompact
<u>2004</u>	Paques	TCNN	WS Dommel	Eneco	Purac	Algae Biotech	Stork Veco
Bioclear	Danone Research	Westt	Coram	Syngenta	AquaExplorer	Aqua Nirvana Foundation	Desah
Magneto	DHV	FrieslandCampina	Stowa	Neste Oil		O2 Environmental	Redstack
Energy Valley	Boskalis		DSM	AF&F	<u>2010</u>	EFCseparations	
Landustire/Hubert	Procede		2M Engineering	Microlan	Ambysis	Paqell	
Norit/X-flow	Evides		Multifund	Feyecon	Femto Invest	Voltea	
Triqua	Global Membrains		Trojan UV	Delta	Pure Green Techn.		
Grontmij	Rabobank		EasyMeasure	NOM	Siemens	<u>2012</u>	
Royal Haskoning	Wetterskip Fryslân		CvO-BTO	Essent	Hatenboer Water	Anglian Water	
Thermphos	Bright Spark			Evodos	Biaqua	WS Noorderzijlvest	
Heineken					Duynie	Berson UV	
					IMD	Brightwork	
					Van Remmen	Kuraray	
					Water ProMaSys	Duplaco	
					MAST Carbon	De Friesland Zorgverzekeraar	
					IPF/Grander		
					Sensor Intelligence		
					TailTec		





Breakthrough Innovation

Clean water technology

Distribution

Priority compounds

Non-piped water systems

Applied water physics

Desalination

Capacitive deionization

Concentrates

Biofouling

Pressurized water

Aquatic worms

Advanced waste water treatment

Algae

Separation at the source

Blue energy

Resource recovery

Membrane processes

Biomimetic membranes

Sensing

Process monitoring and control

DNA based detection technologies

Well management

Sulfur

Eutectic Freeze Crystallization

24 themes; 120 research projects; 15 mio Euro annual budget

150 Knowledge workers; 20 scientific discipline's

280 papers; 60 patents; 18 spin-off companies

Water Campus

Water Alliance
Business



**WATER
CAMPUS**
Leeuwarden

Wetsus
Science

CEW
Education



Human Capital Roadmap

Age →

10

Study Track Water

25

primary &

secondary
education

vocational
education

applied
sciences
water

master water
technology

PhD



Regional

National

International

Water Campus

Water Alliance
Business



**WATER
CAMPUS**
Leeuwarden

Wetsus
Science

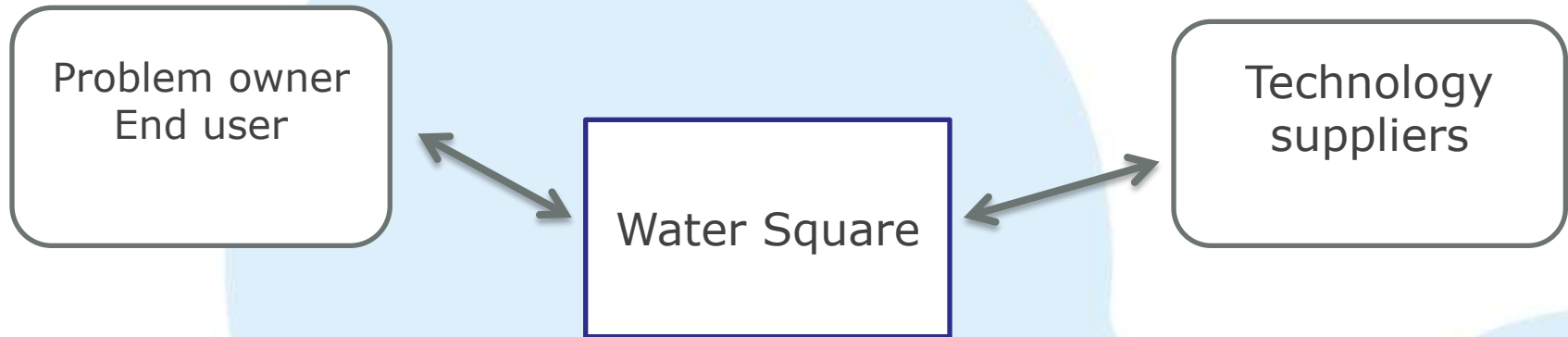
CEW
Education



- Stimulate Business
- Connecting other sectors
- Launching customers
- Organize sustainable partnerships
- Export of water technology
- Network
 - Netherlands
 - Europe
 - Global water hubs

Water Square

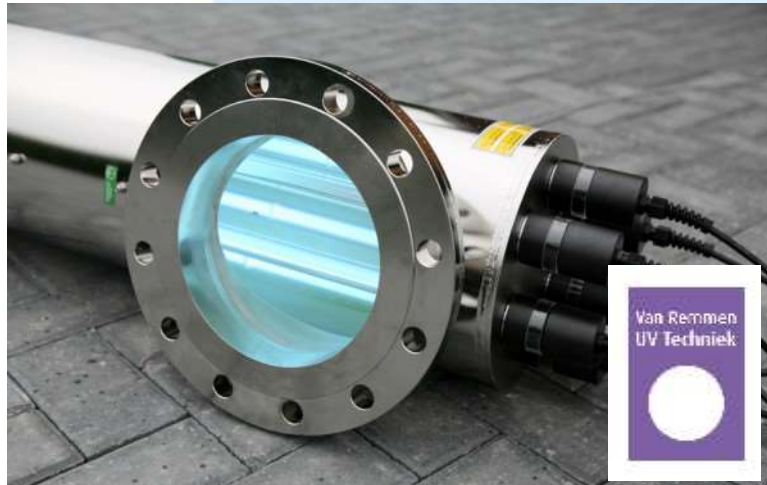
Business generator Water Technology



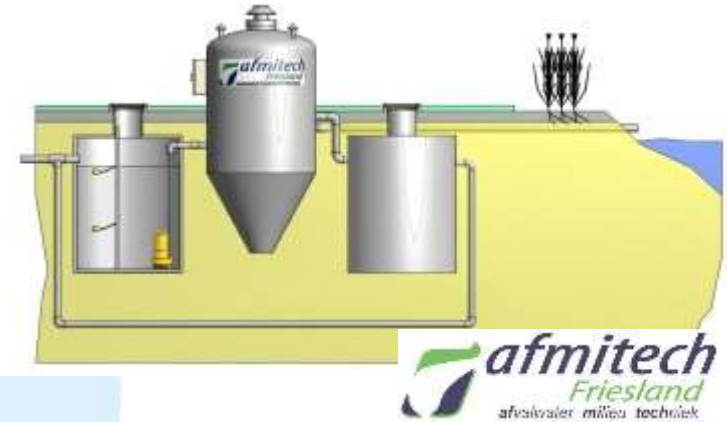
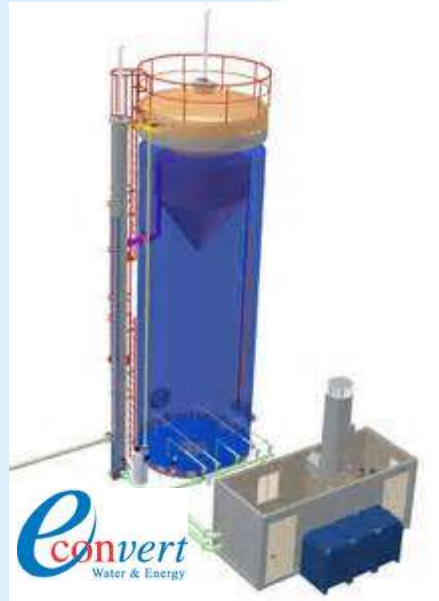
Sensor Technology



Potable water treatment



Waste water treatment



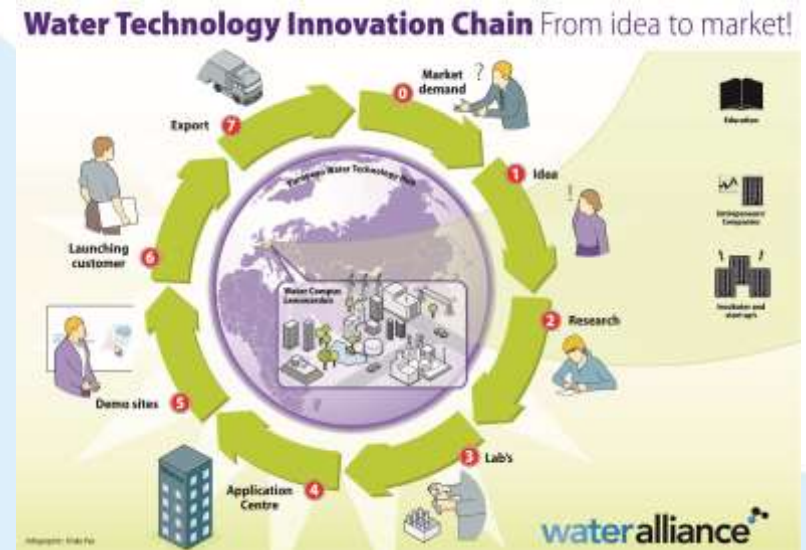
Water Campus

Demosites

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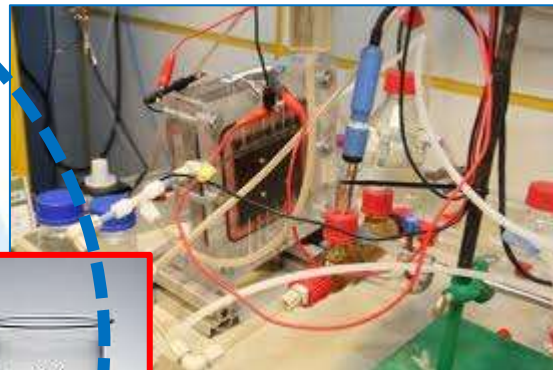
Facillities

Showcases



WATER CAMPUS

Leeuwarden



Water Application Centre



Test facilities



Laboratory

Water Campus

Demosites



**WATER
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Leeuwarden

Showcases



Facillities

Demo-sites



WetSalt Desalination
Harlingen



Municipal Waste Water
Wetterskip Leeuwarden



Hospital Waste Water
Sneek



Demo site Drinking Water
Vitens Noord Bergum



Sensor Test Center
Glimmen



Wetterskip Fryslân - Leeuwarden



SenTec - Glimmen



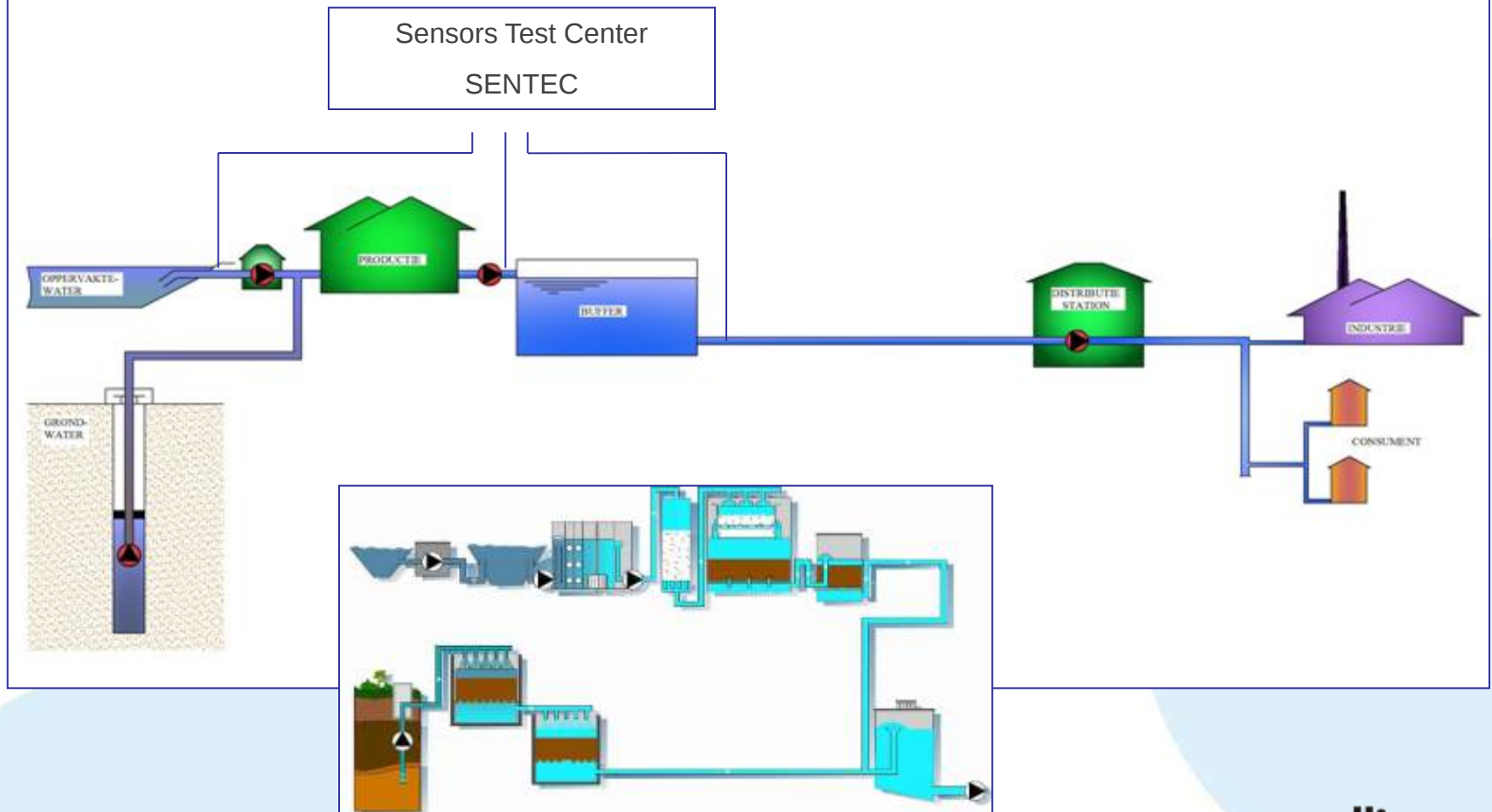
Antonius Ziekenhuis - Sneek



Vitens - Noardburgum

Sentec / Sensors and Water Safety

SAWA (Sensors and Water)



Water Campus

Demosites



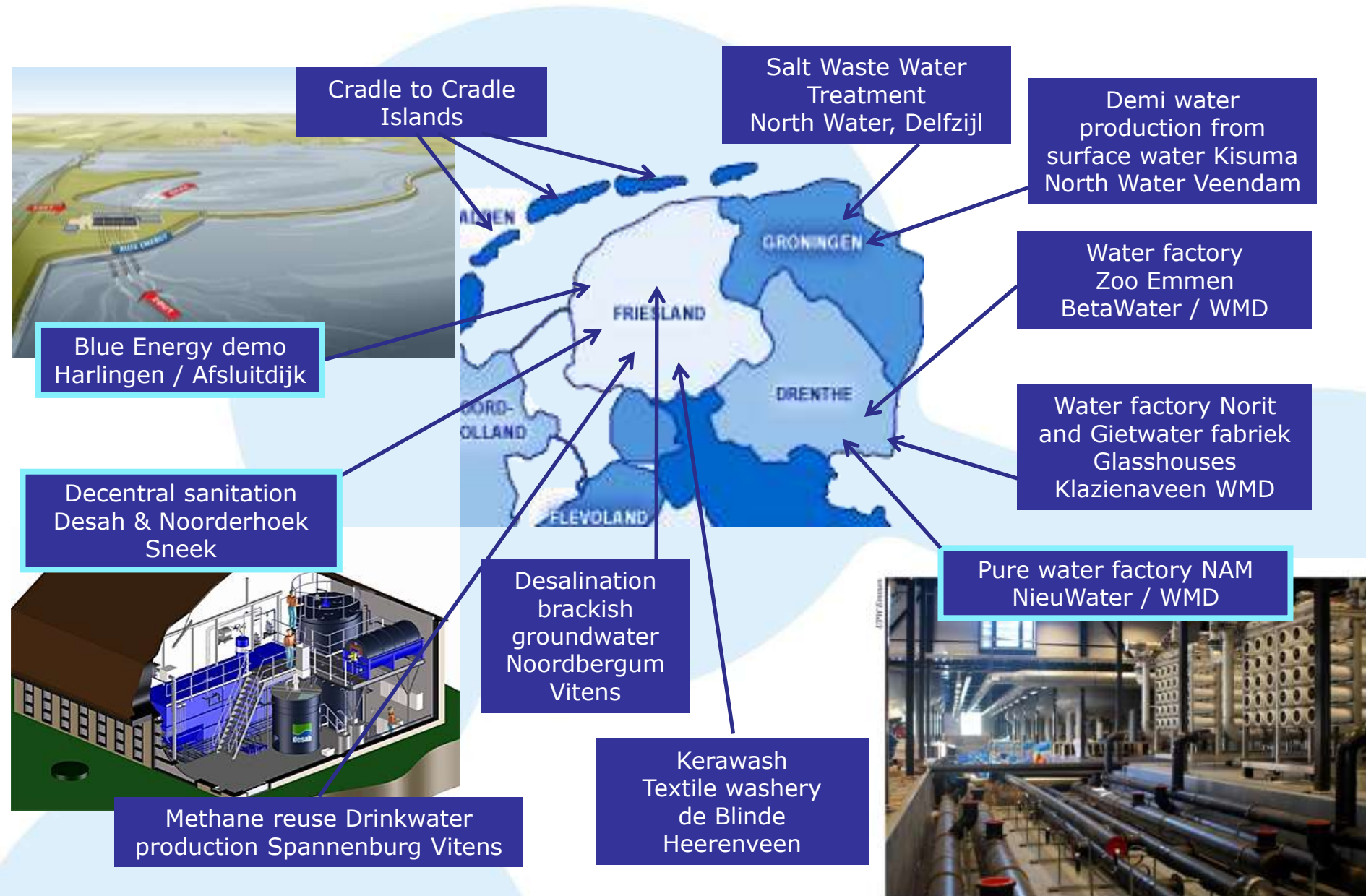
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Showcases



Facillities

Test garden show cases & projects



Example of show case project

Red Stack /Blue Energy

Salinity power as new source for energy

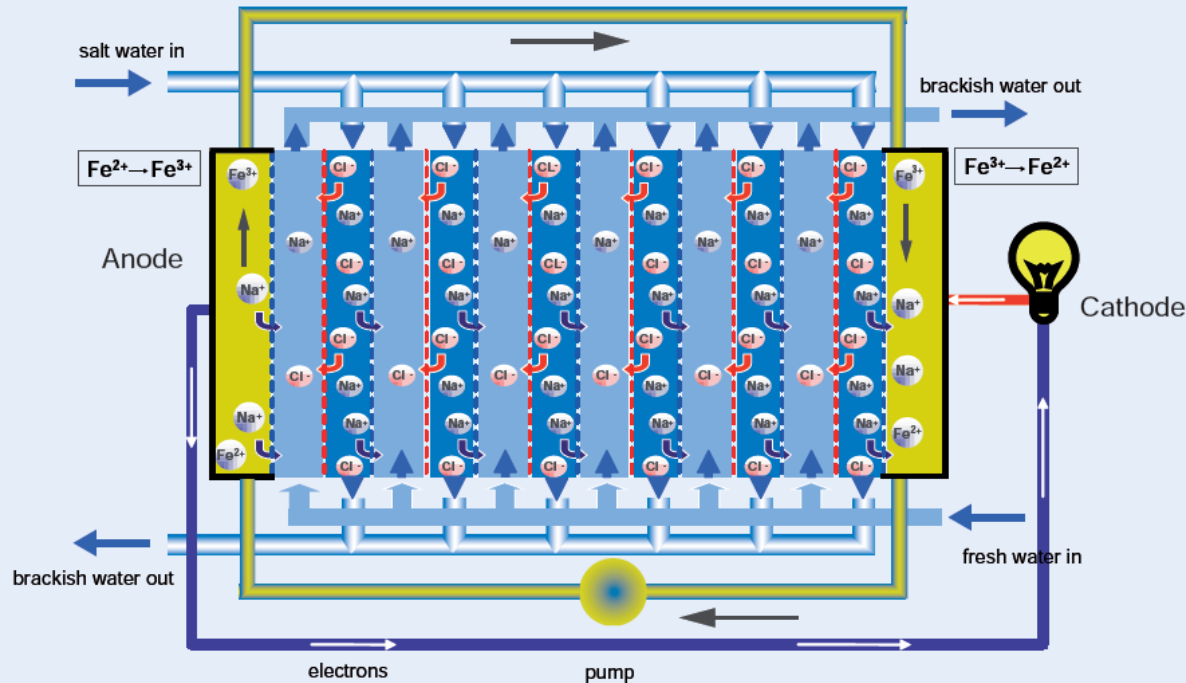
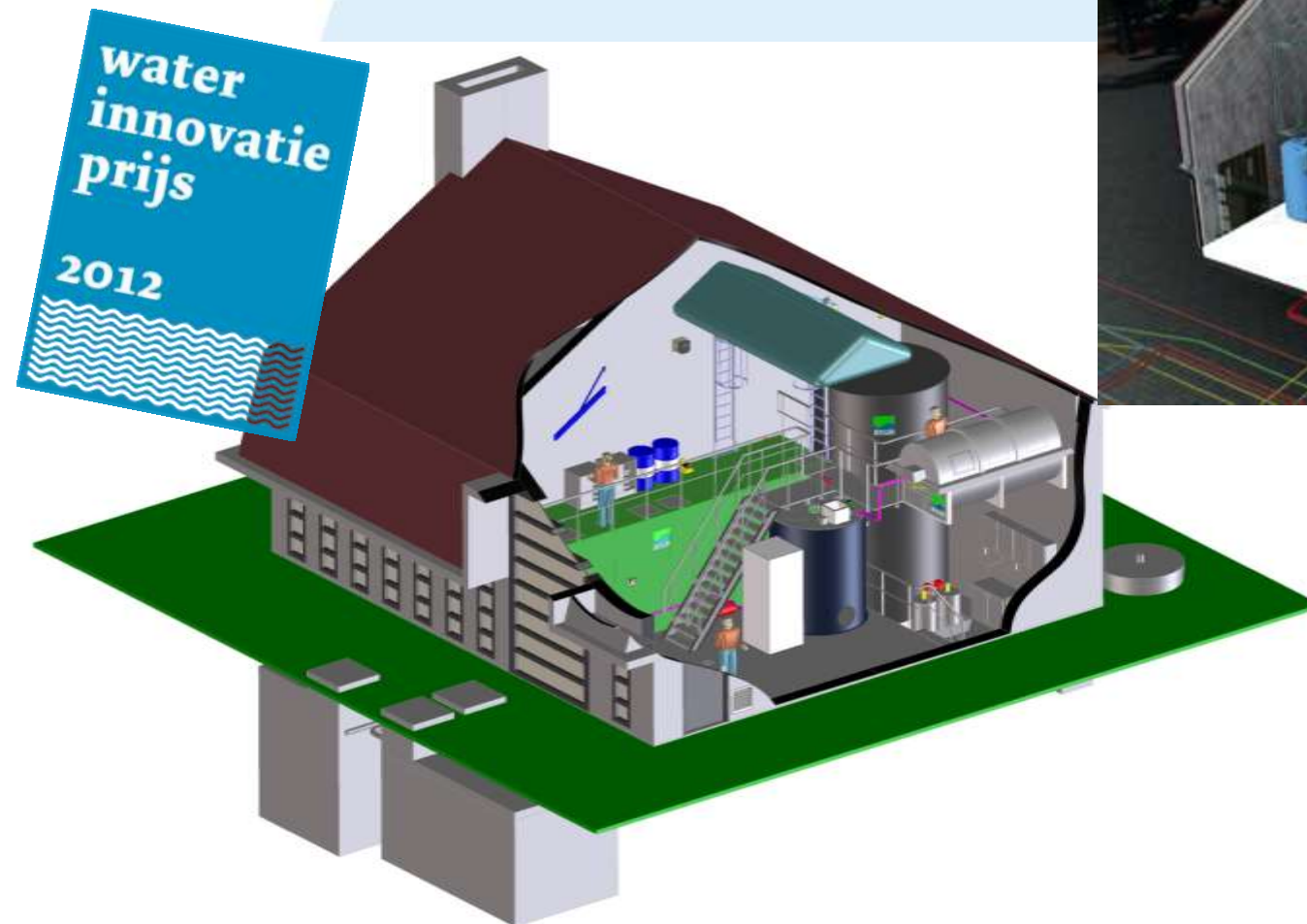
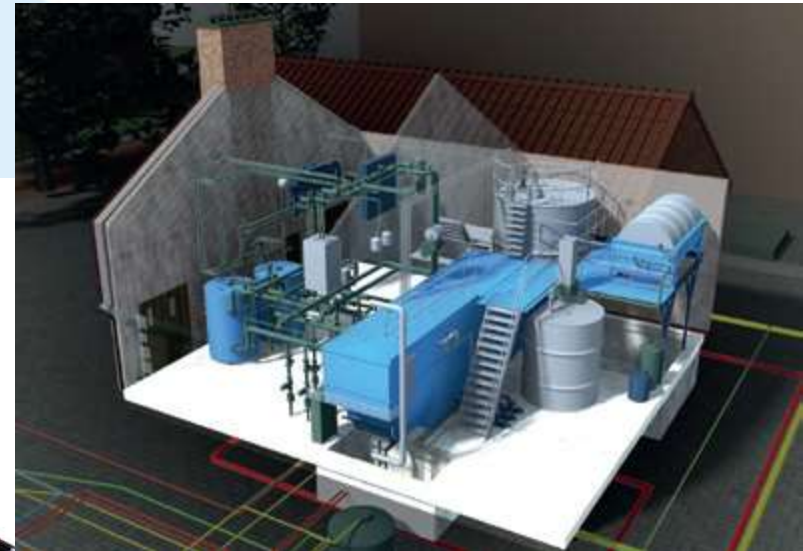


Figure 1: Schematic representation of reverse electrodialysis (RED)



Decentralised sanitation and Reuse Project Waterschoon **Sneek**

- 232 houses **vacuum toilets and black water pilot plant**
- Separation of grey and black water
- Reuse of energy and nutrients



Decentralized Waste Water Treatment also at extremely low temperatures

DMT MemBioRex®



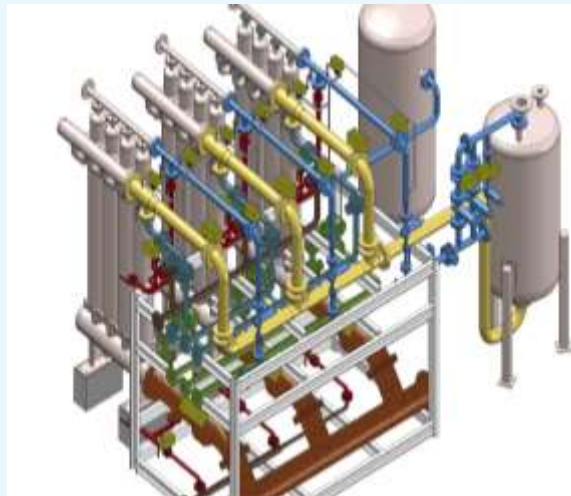
DMT Milieutechnologie BV - Joure

Oil Water Separation

Produced Water Treatment

Ceramic membranes

- High flux
- Low fouling
- Long life time
- Stable process
- Low operating costs



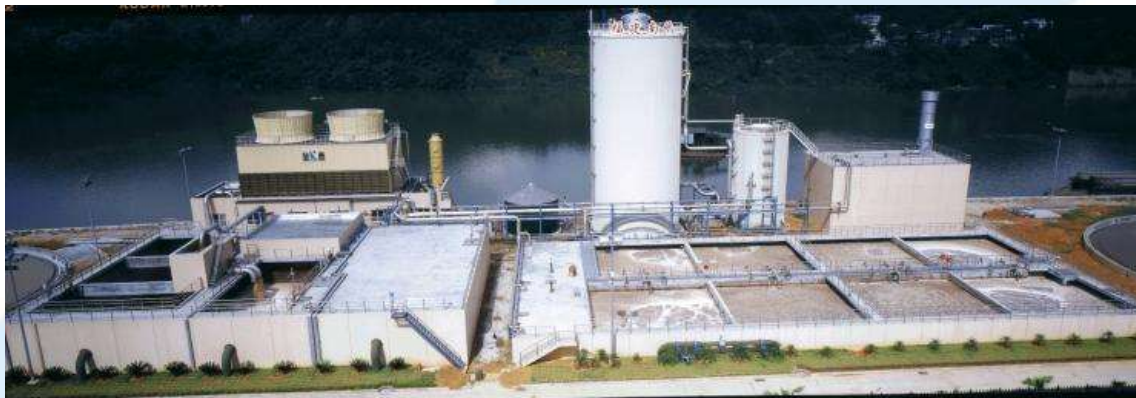
- Salttech BV has developed a unique system for desalination of salty waste water streams; Dynamic Vapor Recompression (DVR)
- The DVR is an energy effective way for the evaporation of process liquid in high concentrations of salts
- Possible applications
 - Oil & Gas
 - Food industry
 - Agriculture





World leader in Anaerobic Industrial waste water treatment

- Paques BV, Balk NL
- World leader in anaerobic waste water technology in paper, beer & beverage and food industry.
- > 1.000 references world wide



Cooperation is a challenge what's in it for me?



Members of Water Alliance



Water Alliance

Have an inspiring day!

**WATER
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Leeuwarden

