IWEC

water reuse 3.0

Best business practices on Eco-innovation

A SME's point of view

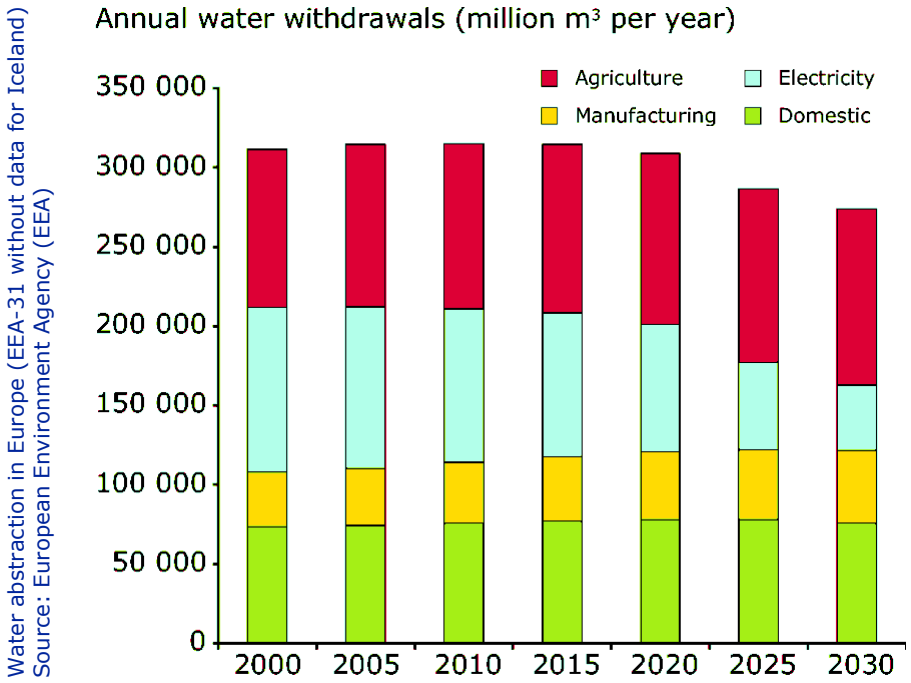
André Reigersman - RWB Water Services BV

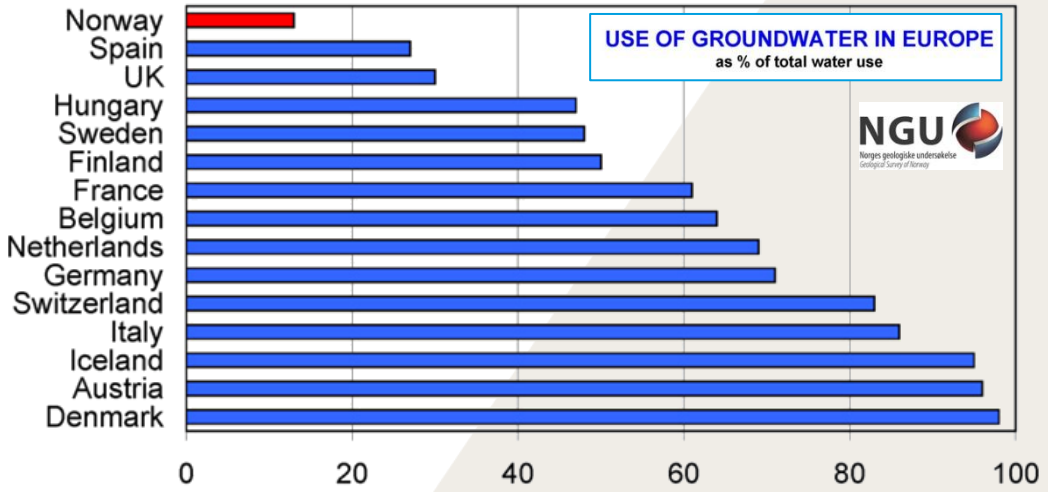
A collaboration between: Rwb Vitens LAAT WATER VOOR JE WERKEN EUROSTEEL

Supported by: eco-innovation WHEN BUSINESS MEETS THE ENVIRONMENT

Solutions for efficient water usage

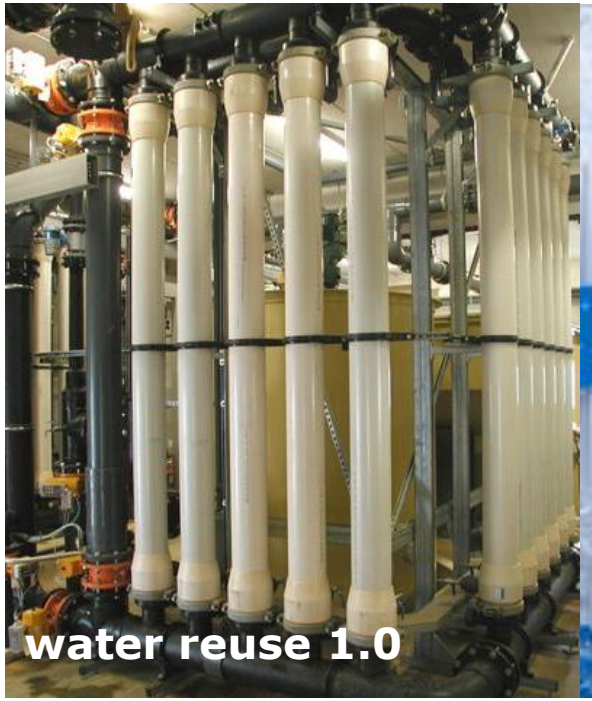
- Did you know:
  - 5 minutes shower ≈ 30 liters to drain + 2 liters fresh groundwater production waste
  - Spent filter backwash water ≈ 2.000.000.000.000 liters per year in Europe
  - Dutch + Swedish drinking water consumption ≈ 2 km^3





Spent filter backwash water

Spent filter backwash water



Conventional:

Treatment and discharge

Standard industry practice

State-of-the-art:

Reuse (polymer membranes)

Mandatory or economical viable

Research on backwash water reuse

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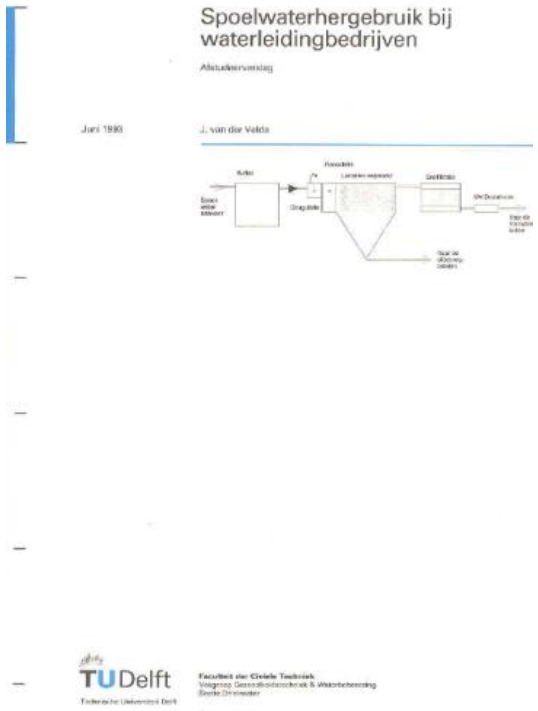
Spoelwaterhergebruik bij waterleidingbedrijven

Afstudeerverslag

Juni 1993

J. van der Velde

TU Delft

Faculteit der Civiele Techniek

Vakgroep Gezondheidstechniek & Waterbehandeling

Sectie Drinkwater

1993

Figure 1: HYDRAcap Installation at Seedy Mill WTW

Operating parameters

Field experience indicates that, for backwash water recovery applications, larger ID capillary fibres are required, as compared to the conventional 0.8 mm, to prevent plugging of the fibre bore. A 50% larger ID of 1.2 mm is sufficient to prevent fibre blockage by suspended matter encountered in filter backwash effluent. The LD module contains approximately 2/3rds of the area of the standard fibre module.

A pilot unit, equipped with the HYDRAcap LD module, was operated for the treatment of filter backwash effluent at Seedy Mill. The objective of the study was to optimize process parameters for a design of a full-scale commercial system at this location. The unit was treating supernatant from a continuous thickener. The thickener was receiving backwash water from a commercial filtration system processing surface water for potable use. The module operated at a filtrate flux rate range of 80 – 100 l/m^2.hr (44-55 gfd). The time between backwash cycles was 20 min.

The backwash operation was initiated with a 5 sec forward flush at a flow rate of 7.5 m^3/hr (33 gpm) (though in the main plant design, this has been replaced by an air

2001


ELSEVIER

Desalination 198 (2006) 225–235

DESALINATION

www.elsevier.com/locate/desal

Ultrafiltration for the reuse of spent filter backwash water from drinking water treatment

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Received 3 November 2005; Accepted 7 March 2006

Abstract

During most water treatment processes, spent filter backwash water (SFBW) is generated. Reuse of SFBW is of concern because of the possible recycling of heavy metals, precursors for disinfection by-products and micro-organisms. Innovations in membrane technology, especially in micro- and ultrafiltration processes, offer a suitable treatment for SFBW in order to guarantee a water quality necessary for reuse. Results from a pilot-scale ultrafiltration plant with submerged membranes are presented. Experiments were performed with SFBW from a full-scale water treatment plant. The plant was operated with high fluxes of more than 40 L/(m^2.h) using clarified and non-clarified SFBW. Best membrane performance was obtained using non-clarified SFBW. As a result, no space- and time-consuming sedimentation processes are necessary. The presence of powdered activated carbon in the SFBW did not have a negative impact on flux and TMP. Results confirmed that the filtrate can be used as an additional and safe water source. When a continuous maintenance disinfection was provided, filtrate was free of microbial contamination and could be reused without any safety concerns.

Keywords: Ultrafiltration; Water reuse; Drinking water treatment; Spent filter backwash water

1. Introduction

In several parts of the world, water reuse is becoming an important issue to satisfy future water demands. A continuously increasing world population as well as higher quality standards and expenses for drinking water lead to numerous efforts to apply water reuse systems. Membrane technology offers a wide range of possibilities to

*Corresponding author.

Presented at the 2nd Membrane Science and Technology Conference of Visegrad Countries (PERMEA), Polanica Zdroj, Poland, 18–22 September 2005.

2006


TECHNEAU

Ceramic membrane applications for spent filter backwash water treatment

Techneau, 05/02/07
MAY 2007

TECHNEAU

Ceramic membranes

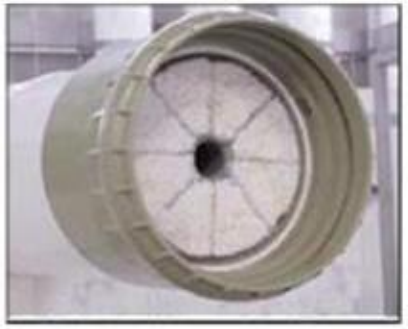
Case related protocol for optimal operational conditions to treat filter backwash water

SIXTH FRAMEWORK PROGRAMME

2007 / 2008

eco-innovation

Comparative pilot test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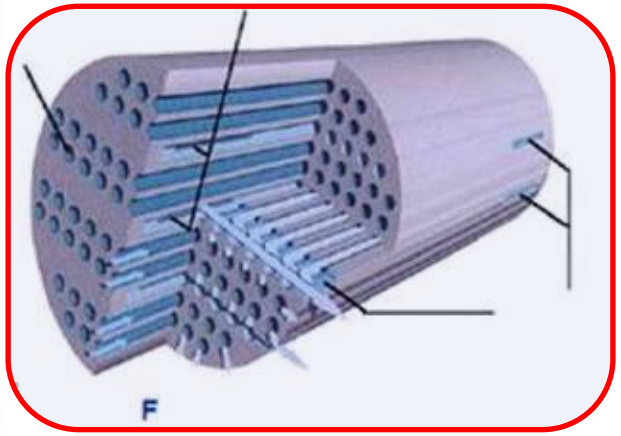
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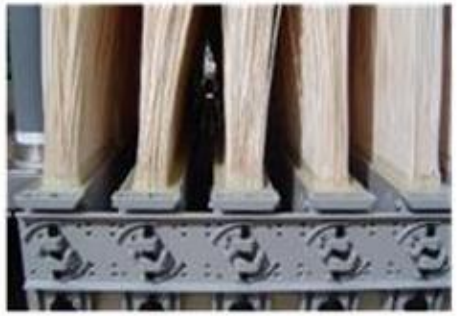

B


E

Vitens

Re-use of backwash water

Comparative study of 6 MF/ UF membranes

2009

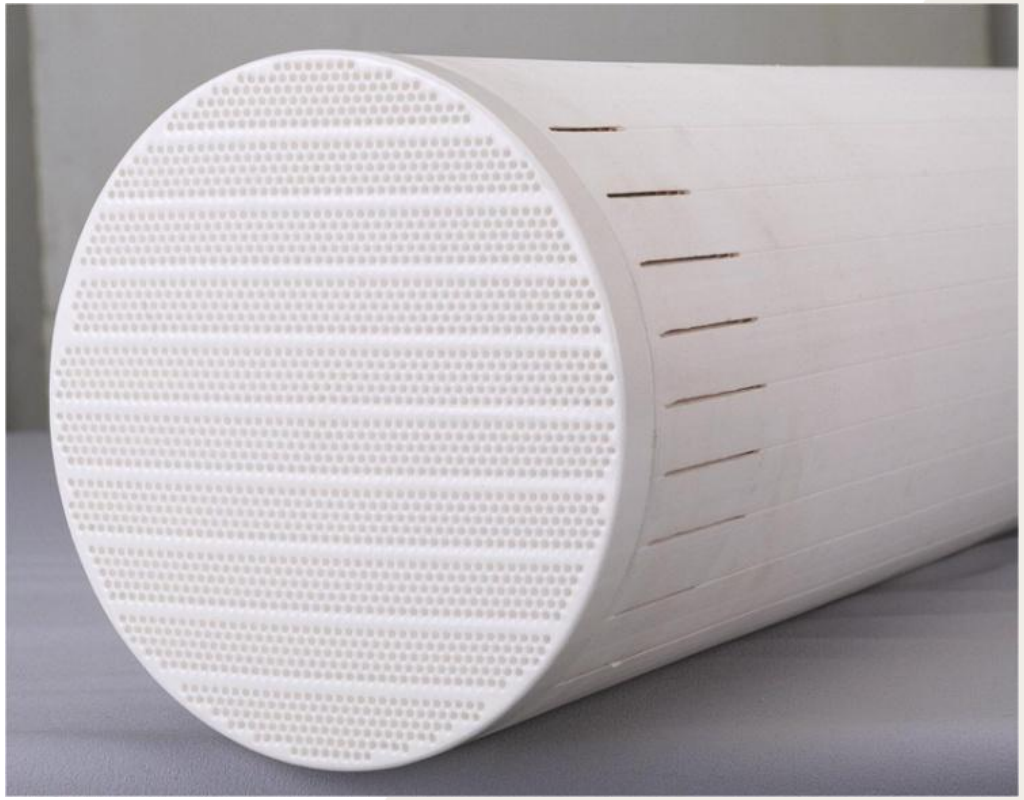
Best Available Technique: Ceramic membranes

- Reduced costs: production of large filter elements

- Outperforms state-of-the-art
  - High reliability
  - Small footprint
  - Less energy

- Suitable for large and small quantities

- Meets sanitary standards - regulations



Best Available Technique: Full scale demonstration

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Increased Water Efficiency

with **Ceramic** membrane technology

Construction:	July 2012 – March 2014
Demonstration:	April 2014 – June 2017

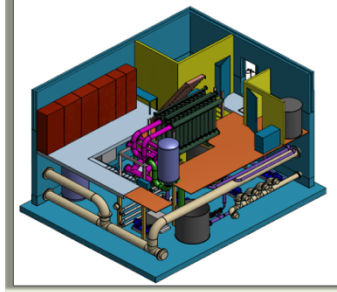
Launching customer: Vitens N.V.

Project management: Vitens N.V. (Ontwerp en Aanleg)

Technology: RWB Water Services B.V.

Eurosteel Sp. Z.o.o.

Grant advisor: Evers + Manders



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www.iwec-water-reuse.eu

ECO-INNOVATION

Co-funded by the Eco-innovation Initiative of the European Union

First full scale application at drinking water treatment plant Wierden

Project in partnership

Launching customer Vitens,

- is the largest drinking water company in the Netherlands
- supplies drinking water to 5.4 million people with a total annual production of 330 million m^3
- is constantly on the look out for ways to save energy or to use green energy and to minimize the use of chemicals

www.vitens.nl

Project in partnership

Polish S.M.E. Eurosteel Sp. Z.o.o.,

- has a group of 30 highly qualified and experienced employees and a toolshop of 3.000 m^2
- all welders have CE welding certificates
- has wide experience in constructing complex and innovative installations for (drinking) water treatment

www.eurosteel.pl

Project in partnership

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Dutch S.M.E. RWB Water Services bv,

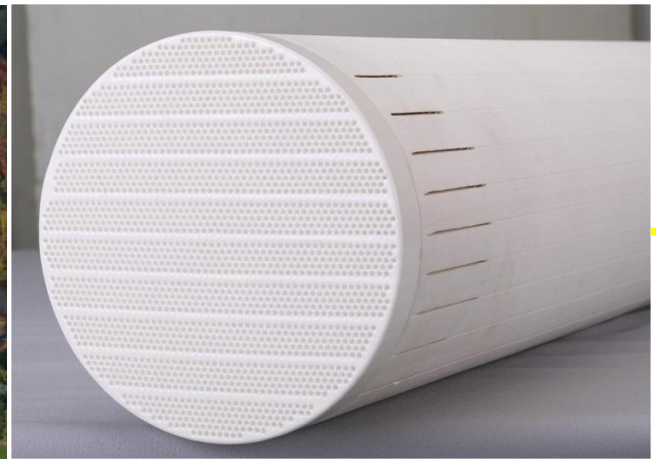
- spreading the technology into the European market
- experienced in design, build, operate, and maintain of water treatment plants
- licensee for: Culligan, METAWATER

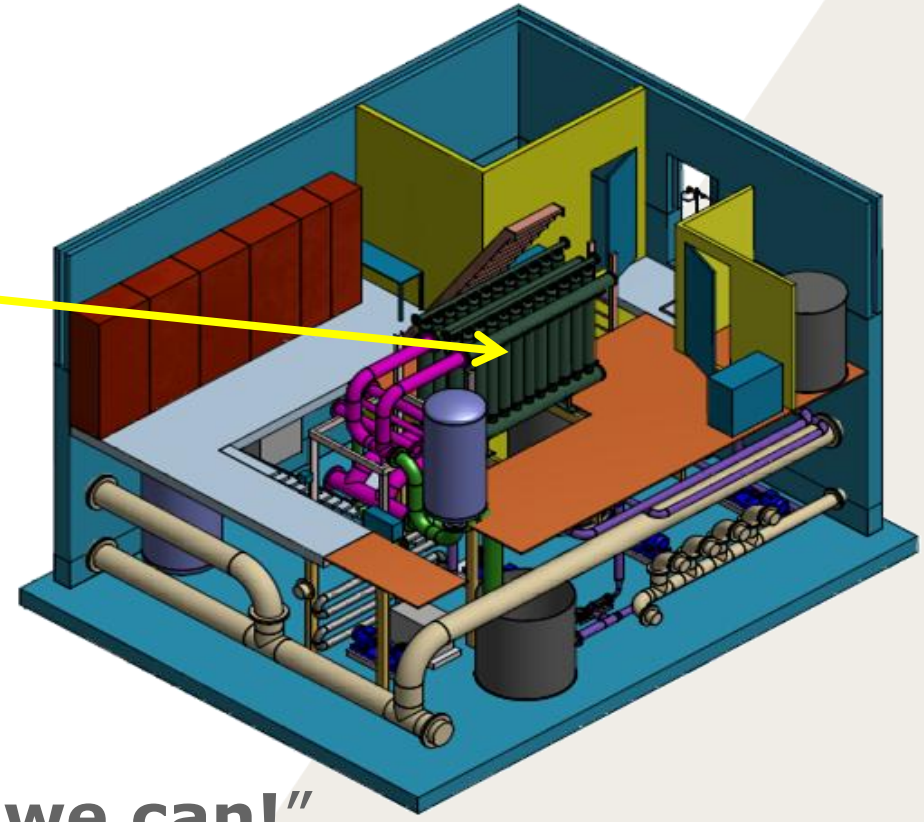
www.rwbwater.com



IWEC project goals

- Building first application *(Full scale demonstration plant Wierden - NL)*





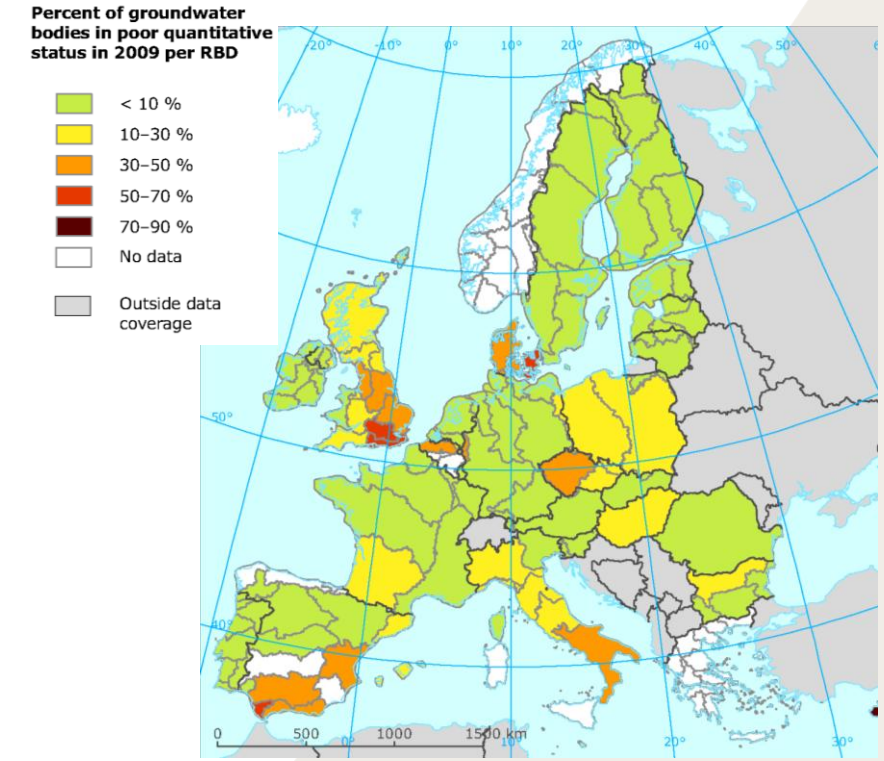
- Commercial exploitation across EU
- Validate calculated savings
- Spread the word: "**Recover resources, yes we can!**"

IWEC project goals

- Building first application *(Full scale demonstration plant Wierden - NL)*
- Commercial exploitation across EU

  Drinking water companies
  - Country selection on water sources
  - Desk study on policies (groundwater and water scarcity)

  Other applications
  - Industrial groundwater use
  - (De-)centralized drinking water production



- Validate calculated savings
- Spread the word: "**Recover resources, yes we can!**"

IWEC project goals

- Building first application *(Full scale demonstration plant Wierden - NL)*
- Commercial exploitation across EU
- Validate calculated savings:

	Project	Europe
Water reuse (m^3)	1.000.000	1.000.000.000 / year
Energy savings	30%	30 – 80%
Reduction chemical usage	50%	

- Spread the word: "**Recover resources, yes we can!**"

IWEC project goals

- Building first application *(Full scale demonstration plant Wierden - NL)*
- Commercial exploitation across EU
- Validate calculated savings
- Spread the word: "**Recover resources, yes we can!**"

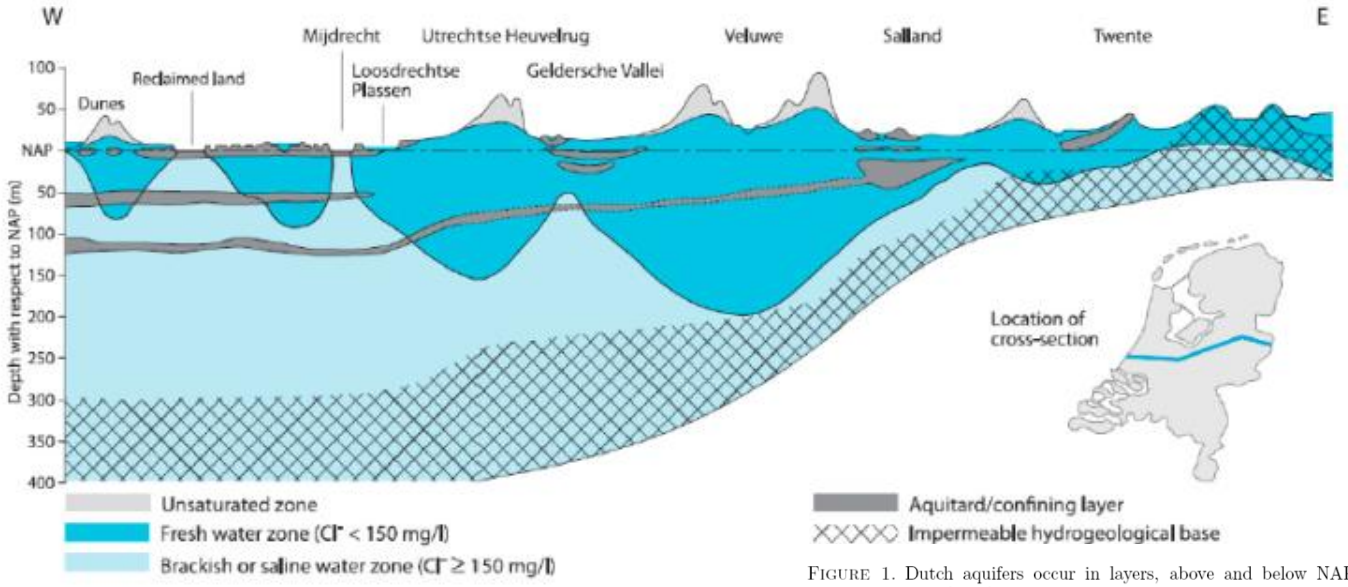


FIGURE 1. Dutch aquifers occur in layers, above and below NAP. *Source:* De Vries (2007).

IWEC project challenges

Economics

- Threats
  - Dutch groundwater tax was aborted
  - No standards for costs calculations

- Opportunities
  - Resource valuation instead of tax on usage
  - Environmental investment deduction programs

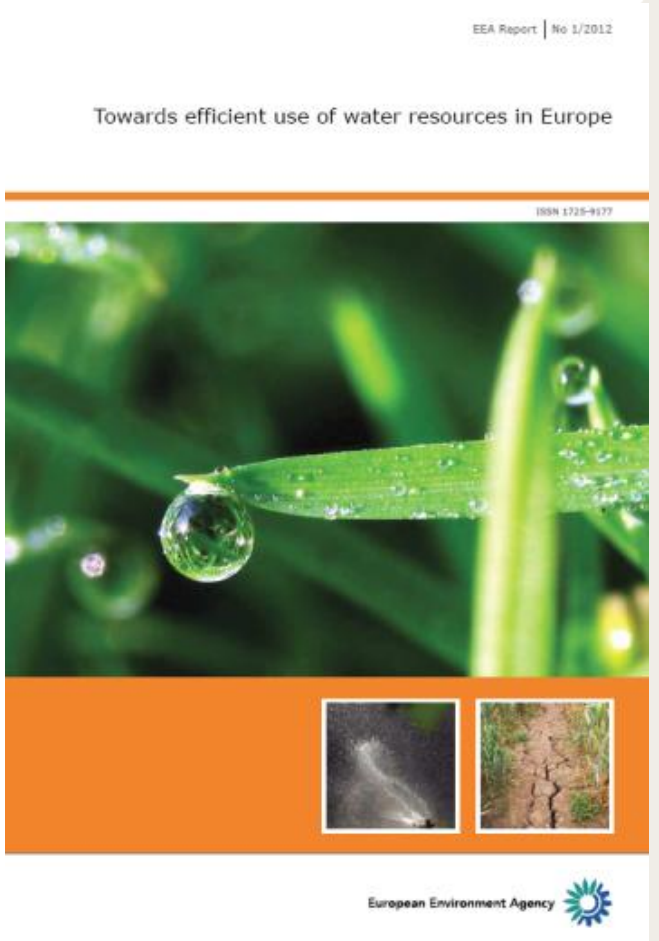
IWEC project challenges

Policies

- Threats
  - EU policies and legislation on water (re)use are not uniform (yet)
  - EU testing methods not harmonized (yet)

- Opportunities
  - Towards efficient use of water resources
  - Launching customer is industry frontrunner

Danish Minister for the Environment Ida Auken: Groundwater must be protected



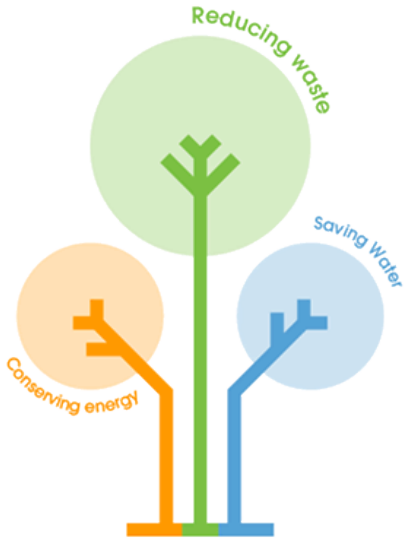
IWEC project challenges

IWEC water reuse 3.0

Technological

- Threats
  - "Old" state-of-the-art technology turns out to be unstable
  - Complex implementation in existing building

- Opportunities
  - Implementation of Best Available Techniques
  - We can offer the alternative!




EUROPEAN COMMISSION
JOINT RESEARCH CENTRE
Institute for Prospective Technological Studies
Sustainable Production and Consumption Unit
European IPPC Bureau

Best Available Techniques (BAT) Reference Document

for

Common Waste Water and Waste Gas Treatment/Management Systems in the Chemical Sector

Industrial Emissions Directive 2010/75/EU
(Integrated Pollution Prevention and Control)

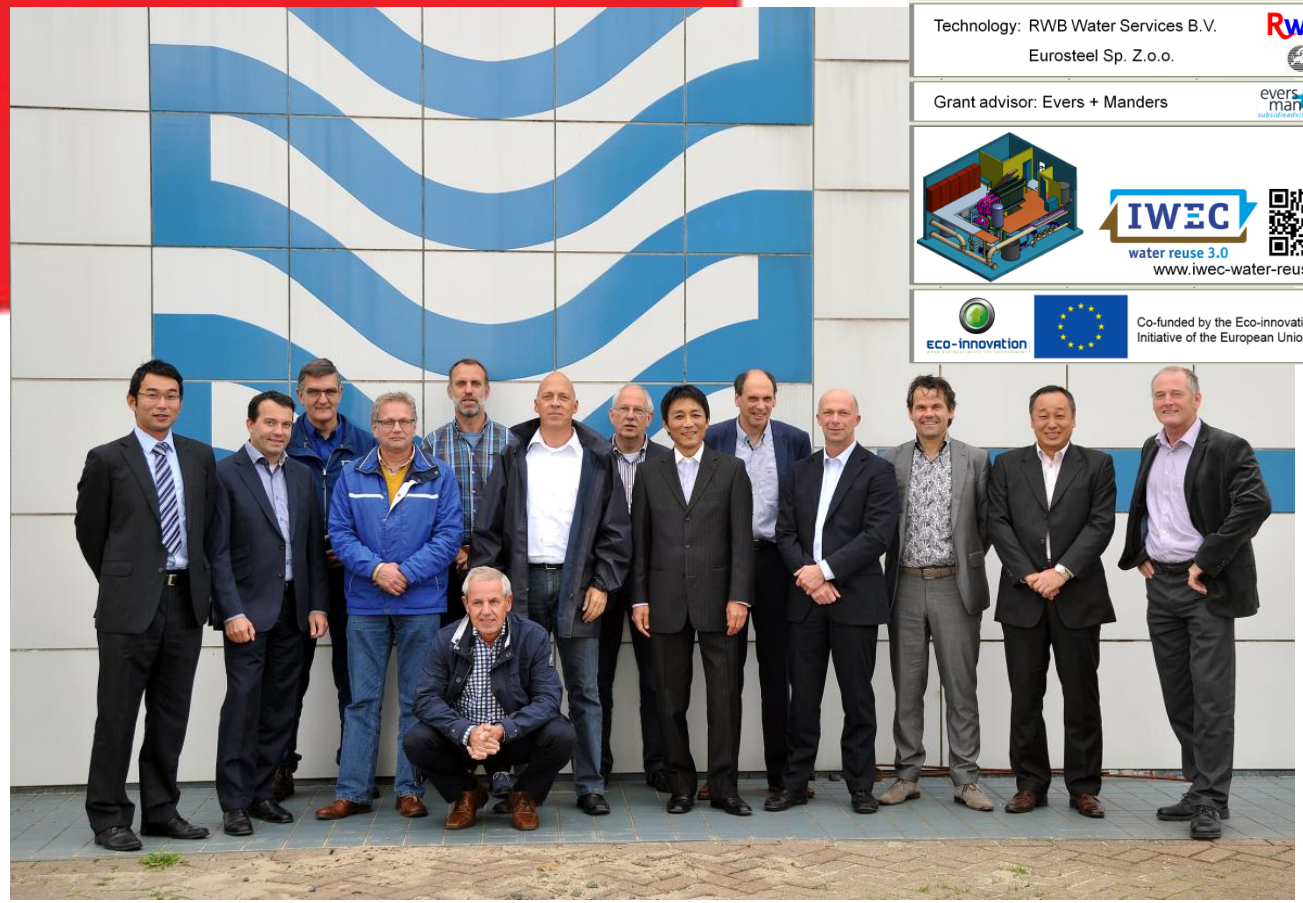
Draft 2

20 July 2011

WORKING DRAFT IN PROGRESS

Face these challenges as a team!

Together, we can fix it



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