



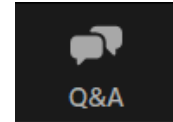
Digitaal Vlaams-Nederlands Webinar Watertechnologie

- Koelwaterbehandeling
- Verwijdering van microverontreinigingen en hergebruik van industrieel afvalwater
- Concentraatbehandeling (brine treatment) en ZLD

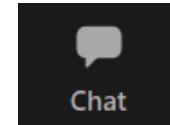
Donderdag 16 september
14:00 - 15:30

Welkom

Tijdens het evenement kunt u vragen stellen via de Q&A box



Technische vragen kunnen gesteld worden via de chat



Dit evenement wordt opgenomen

We beginnen in een paar minuten.





Digitaal Vlaams-Nederlands Webinar Watertechnologie

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- Concentraatbehandeling (brine treatment) en ZLD

Donderdag 16 september
14:00 - 15:30

Programma

1. Programma
2. Introductie watercircle.be & Vlaamse watervraagstukken
3. Introductie Water Alliance & Nederlandse watervraagstukken
4. Pitches bedrijven op thema concentraatbehandeling (brine treatment) en ZLD
5. Pitches bedrijven op thema verwijdering van microverontreinigingen en hergebruik van industrieel afvalwater
6. Pitches bedrijven op thema koelwaterbehandeling
7. Q&A en afsluiting





watercircle.be

'Flow of Technology'

watercircle.be

watercircle.be vzw (voormalig TNAV)

Sectorfederatie voor de watertechnologiebedrijven

+/- 100 leden: bedrijven & kenniscentra → Indirect eindgebruikers

“Flow of Technology”

- Netwerking
- Innovatie
- Marktontwikkeling

Activiteiten

- **Netwerking**

Ledenevents (AMI, demonstratie- en infosessies etc.)



December 9th, 2021

- **Innovatie**

Eigen projecten: [De Blauwe Cirkel](#) (2012-2016)



[IntelSens](#) (2016-2018)



[KO-Water](#) (2018-2020)



Deelname in andere projecten met kenniscentra, industrie of clusters

- **Marktontwikkeling**

Actief opvolgen en interageren met overheid

Beurzen

Communicatie

- Website: www.watercircle.be
- [LinkedIn](#)
- [Twitter](#)
- Nieuwsbrieven:
 - Eigen nieuwsbrieven
 - Vakblad Aquarama

- Infosessies en co-creatie workshops

- Beurzen en workshops

- Aquarama
- Aqua NL
- etc.



- Samenwerking met federaties

Contact: matthias.mertens@watercircle.be



watercircle.be

'Flow of Technology'



VZW watercircle.be
Looierijstraat 14
8750 Wingene

Matthias Mertens
Algemeen manager
matthias.mertens@watercircle.be

Valérie Verjans
Projectingenieur
valerie.verjans@watercircle.be

info@watercircle.be

www.watercircle.be



watercircle.be

Vlaamse watervraagstukken

DROOGTE/WATER TEKORTEN/BEPERKEN GEBRUIK WATERBRONNEN

HERGEBRUIK VS CONCENTRATEN

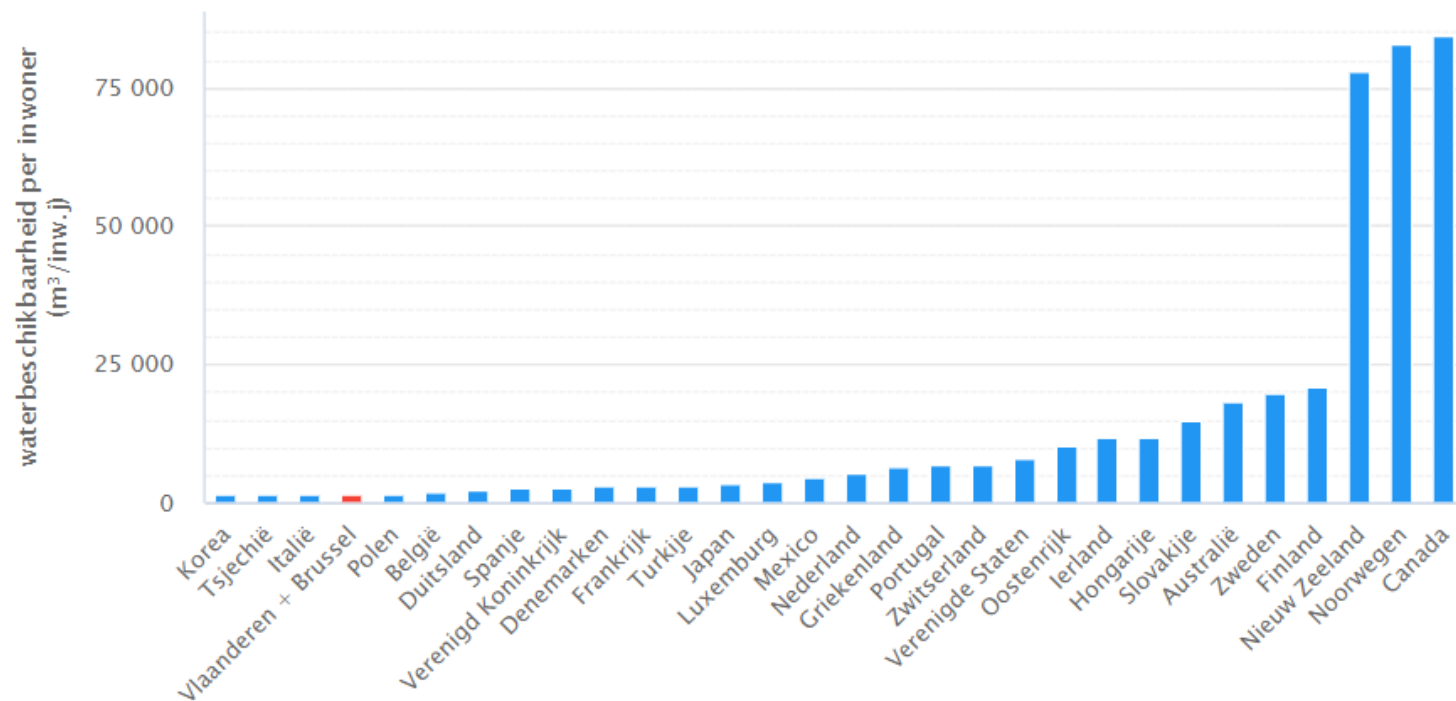
UITDAGENDE IN DE INDUSTRIE

Vlaamse watervraagstukken

Droogte/water tekorten/beperken gebruik waterbronnen

- Vlaanderen vierde laagste waterbeschikbaarheid van alle OESO-landen (1657 m³/jaar/persoon)
 - ➔ efficiënt omgaan met water
- Water op maat? Is de kwaliteit van het water echt nodig? Is gebruik van DW echt nodig? Of kan ik met een lagere proceswaterkwaliteit het proces laten draaien?
- Uitvoeren wateraudit!
- Omschakeling nodig van waterbronnen
 - GW → HW, OW, LW, hergebruik

Waterbeschikbaarheid OESO-landen



IJsland staat niet op de figuur wegens een extreem hoge waterbeschikbaarheid (564 784 m³/inw.j)

Vlaamse water vraagstukken

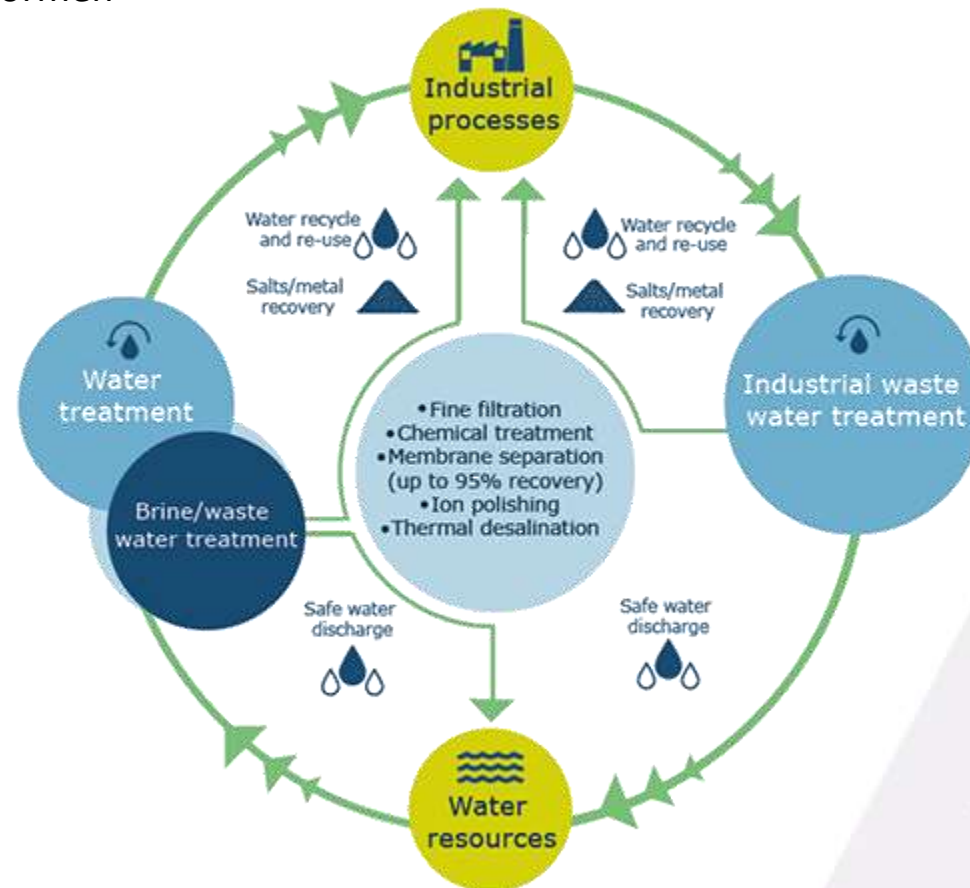
Hergebruik vs concentraten

Minder afhankelijk van droogte → waterhergebruik, maar wat met concentraat lozing??

VLAREM: Concentraten vs vrachten → lozingsnormen

Milieu impact (bv zouten, contaminanten...)?

(near) Zero Liquide Discharge?



Sectorale uitdagingen

Chemie

Heel veel water nodig

Voeding

Water moet voldoen aan strenge kwaliteitseisen

Textiel

Gekleurde waters + veel chemicaliën

Aquacultuur

Antibiotica in het water?



3) Introductie Water Campus & Nederlandse watervraagstukken

Harro Brons
International Business Development



WATER CAMPUS

Leeuwarden



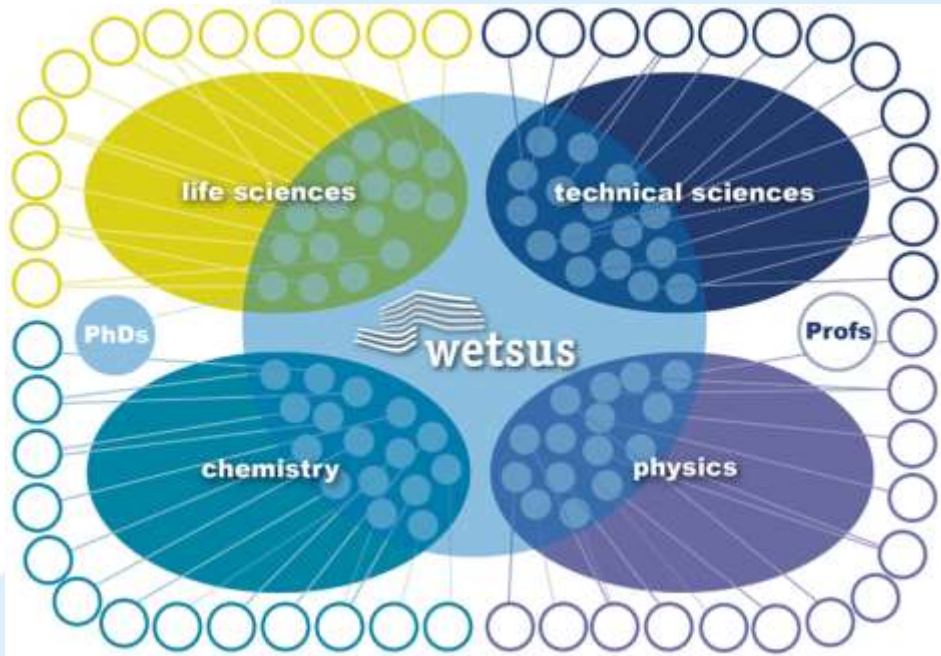
Water Technology Innovation Eco System



wetsus European Centre of Excellence for

Sustainable Water Technology

- 23 universities, 50 scientific chairs
- 105 companies
- 23 Research themes
- *65 PhD projects*



Idea &
Research

Centre of Expertise Water Technology

- Product Development
- Application Development
- Research & Demonstration projects

wateralliance

- 110 Dutch Members
- Water Tech Network
 - ✓ Branding & Promotion
 - ✓ Business Development
 - ✓ Matchmaking
 - ✓ Theme meetings

Water Application Centre

Applied research lab

- 900 m2 experimental area
- Rent on demand
- Analytical laboratory
- Technical Support

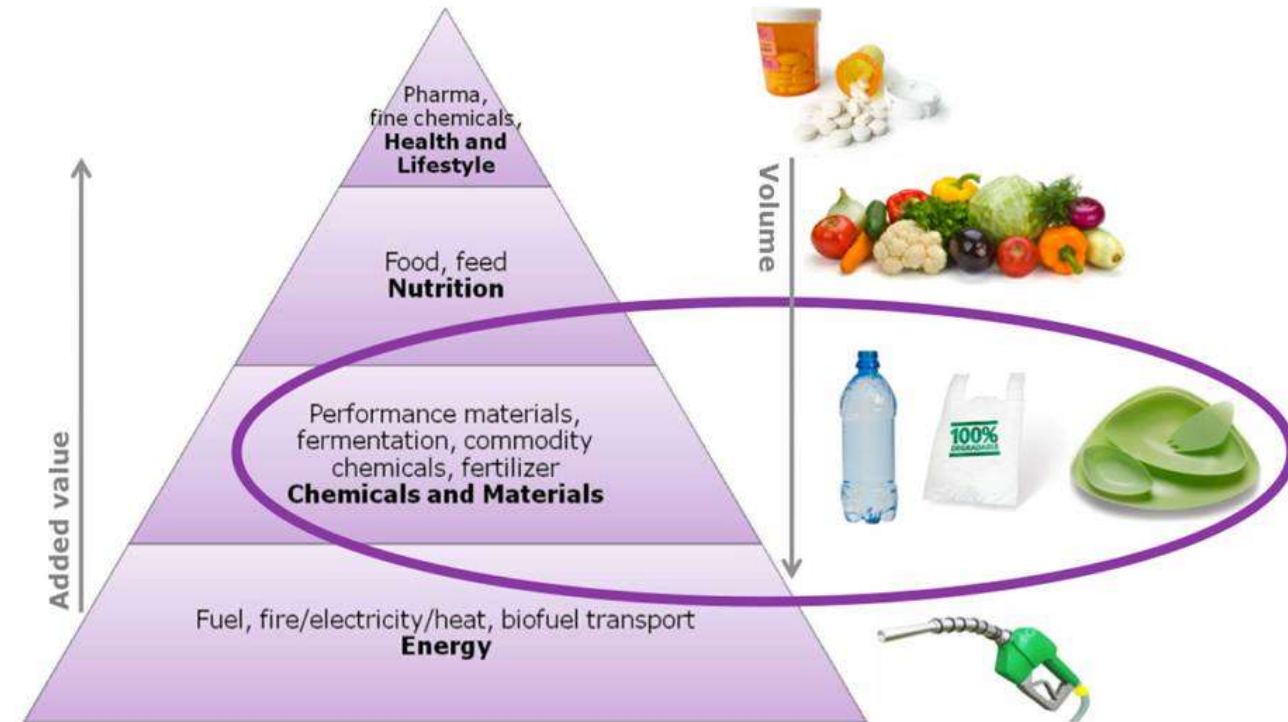
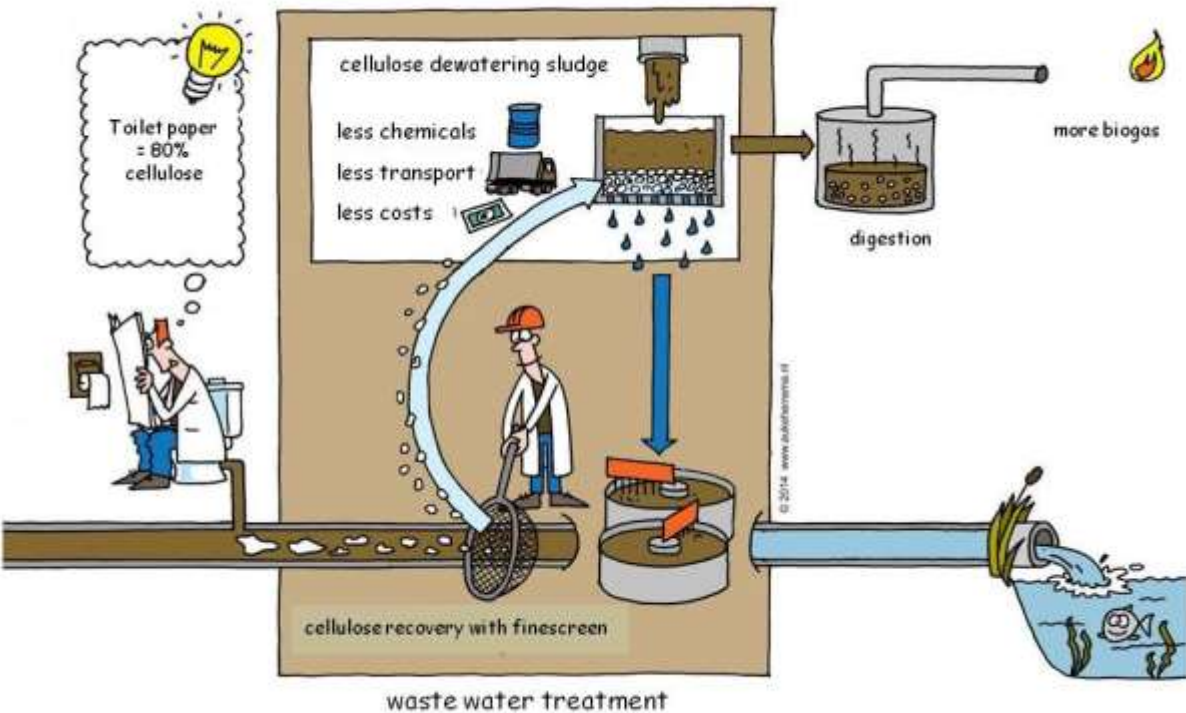


Dutch water (tech) topics

- Circular Economy approach
 - Municipal WWtW as Energy and Nutrient factory
 - Energy production and **water re-use**
 - **Resource recovery and (material) recycling**
- Water scarcity, seasonal drought issues, water saving and water re-use, water resilience
 - Smart in-house water solutions / water in the built environment
 - **Municipal and industrial (waste)water re-use applications**
- **Micropollutants removal, i.e. trace substances, medicine residues, microplastics, etc.**
- Digitalisation

Material recycling and resource recovery

- Cellulose recovery and reuse
- Struvite harvesting
- Production of bioplastics / biopolymers recovery from sewage
- In process recovery of f.e. valuable proteins (or heat)



Water re-use and micro pollutants removal

- Quaternary treatment; removal of trace substances, i.e. microplastics or medicinal residues/pharmaceuticals.
- Water for non-potable re-use, f.e.;

 - irrigation in agriculture using reclaimed water.
 - fit for purpose industry water of WwTP effluent

Alternative solution to conventional WwTW's



- 100% physical/chemical treatment
- resource recovery
- energy neutral

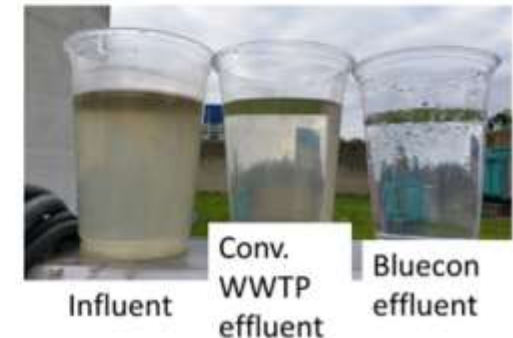


Blueconizing wastewater

Blueconizing is an innovative 100% physical/chemical domestic wastewater treatment process for the reuse of water.

Bluecon's mission:

"Optimise the water cycle for local communities"



4) Concentraatbehandeling (brine treatment) en ZLD

Marlies Christiaens, Witteveen+Bos - ZLD bij een truck wash installatie waar ook externe afvalwaters verwerkt worden: Drijfveren en oplossingen

Reimond Olthof, Salttech - Succesvolle RO Retentaat valorisatie met behulp van DyVaR technologie gerealiseerd in zuivelfabriek van Lactoprot te Leezen, Duitsland





ZLD bij een truck wash installatie met
externe afvalwaterverwerking:
Drijfveren en oplossingen

Vlaams-Nederlands Webinar Watertechnologie

2021 09 16



> 1450 werknemers



> 150 MEUR omzet



20 kantoren in 11 landen



Deltas, Coasts and Rivers



Infrastructure and Mobility



Built environment



Energy, Water and Environment





Problematiek: truck wash en externe afvalwaterbehandeling

Inkomend afvalwater:

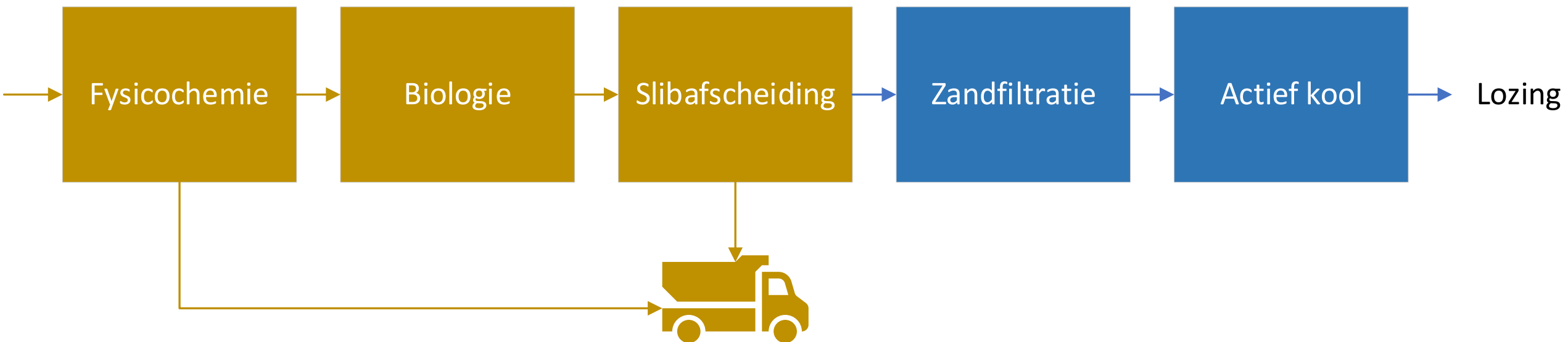
- Wisselende samenstelling, moeilijk behandelbaar, kleine volumes
- Complex acceptatiebeleid (economisch niet haalbaar alle parameters te meten)

Gezuiverd effluent:

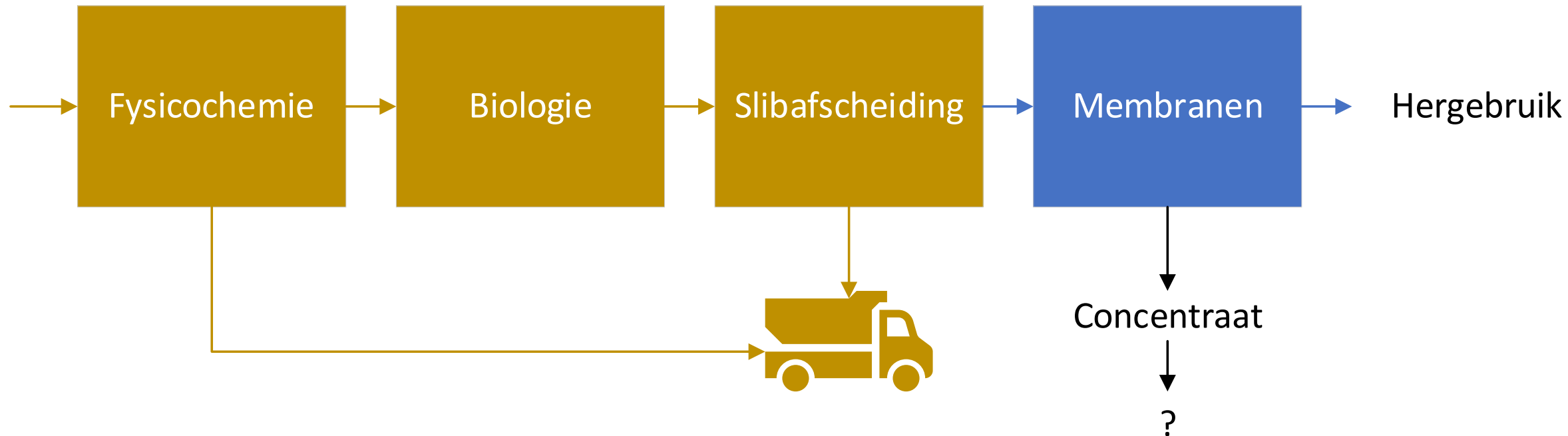
- Huidige behandelingstrein meestal ontoereikend
- Uitgebreide lijst lozingsnormen
- Ongelimiteerde lijst gevaarlijke en opkomende stoffen – onzekere bedrijfsvoering

→ Nood aan robuuste behandelingstechniek

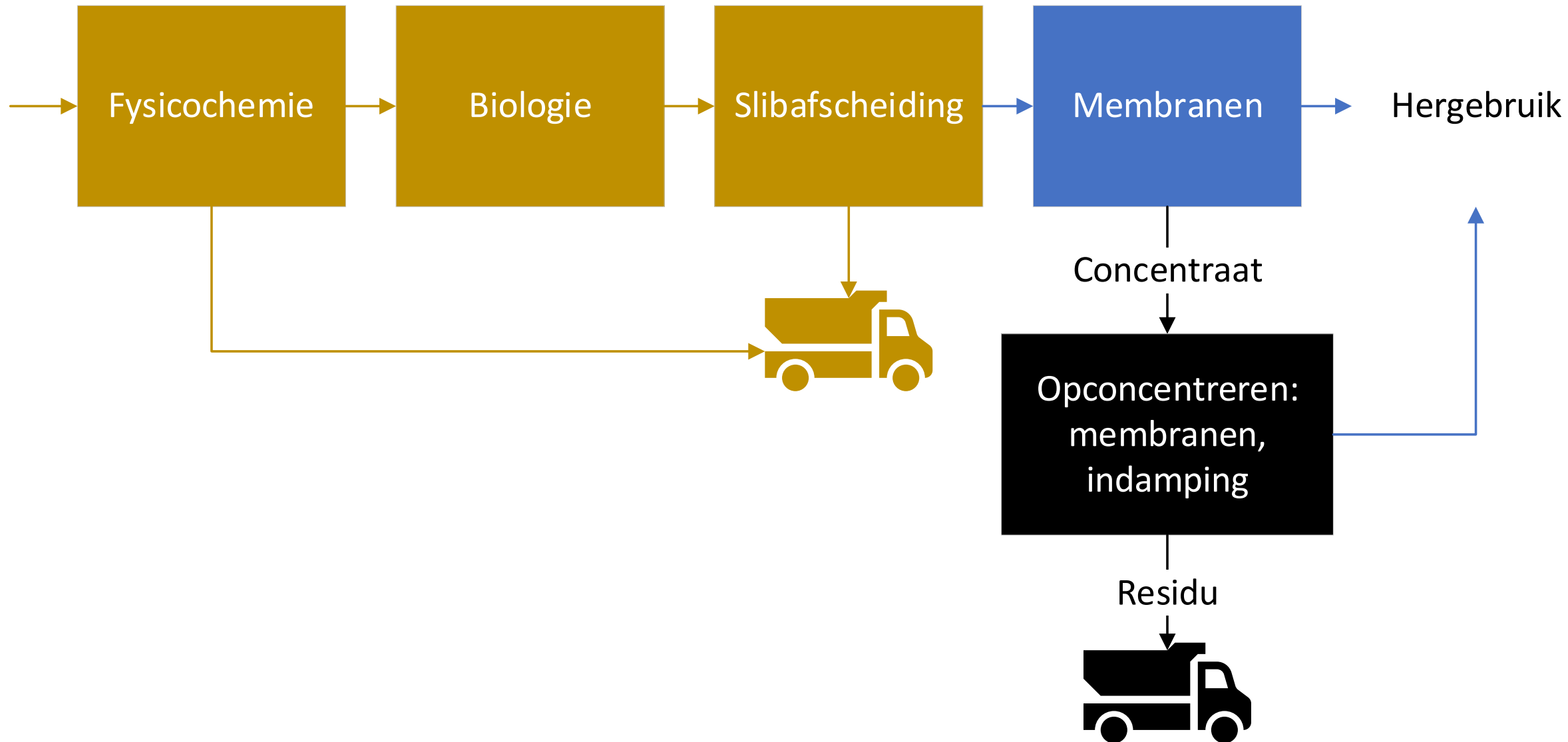
Typische behandelingslijn sector



Zero Liquid Discharge



Werkwijze pilotprojecten



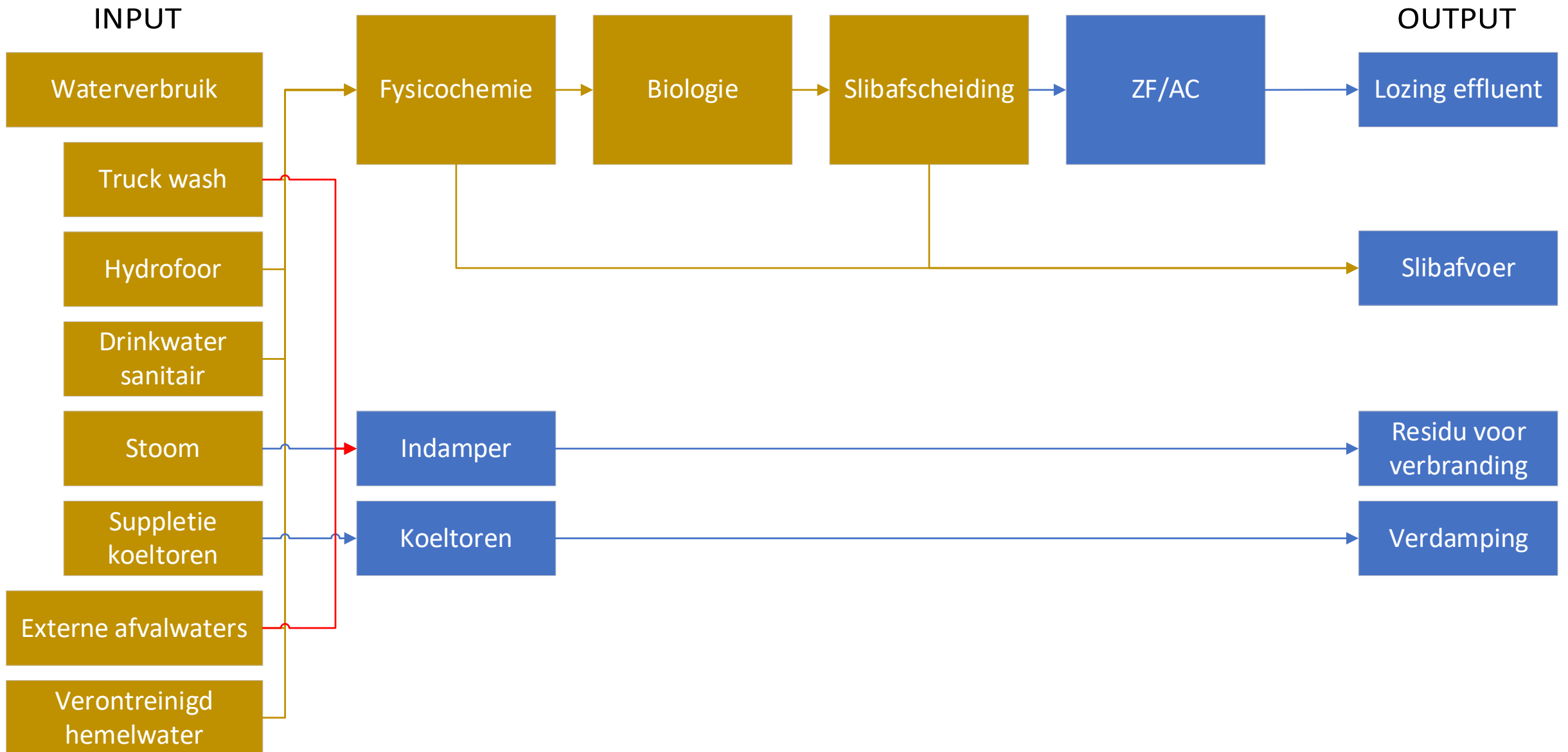
Doelstelling:

- Aantonen retentie microverontreinigingen door membranen
- Aantonen membraanvervuiling beheersen ondanks variërende inkomende afvalwaters
- Evalueren welke opconcentratie technisch haalbaar is met membranen en vervolgens indamping
- Evalueren economische consequenties (ratio membraan/indamping, verwerking indampresidu)

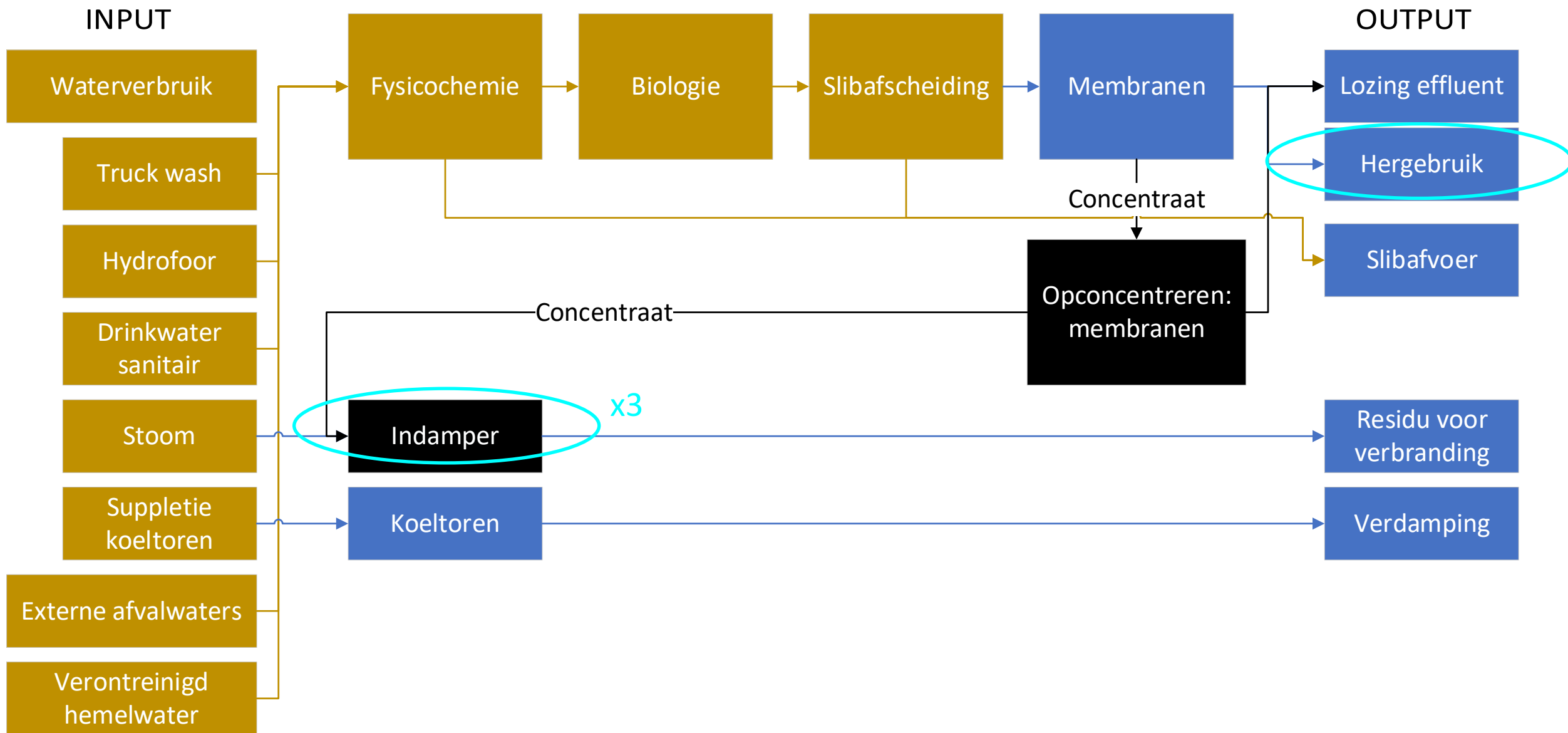
Methode:

- Technische opties: meertraps RO, CCRO, NF-RO, ... + indamping
- Pilootproject 1: MBR – CCRO – indamping

Pilootproject 1: huidige waterbalans

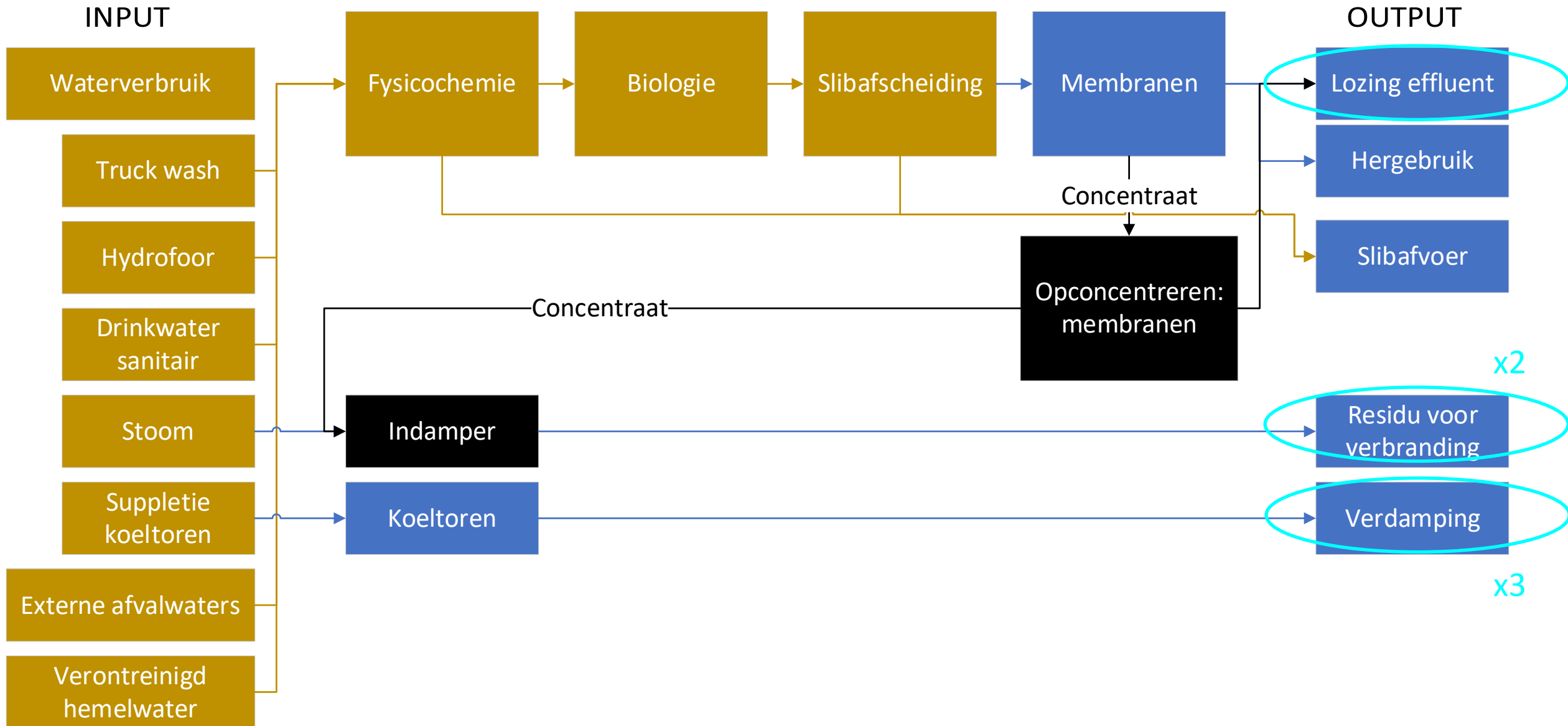


Pilootproject 1: waterbalans met ZLD



Pilootproject 1: waterbalans met ZLD

Daalt met 80%
Hoge kwaliteit



Witteveen+Bos biedt expertise in:

- Wetgeving
- Proces
- Engineering

Witteveen+Bos werkt samen met:

- Tal van technologieleveranciers
- Onderzoeksinstituten
- Overheid & industrie

dr. ir. Marlies Christiaens

Projectingenieur industriewater

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ir. Hugo Desmet

PMC-leider Sustainable Industrial Operations

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Vlaams-Nederlands Seminar DyVaR + Lactoprot Case

Reimond Olthof
co-founder (DWT-Group)

Welcome.





DACS®



DACS® Technology Characteristics:

- ✓ Carrier based Anaerobic Reactor
- ✓ Extreme waste water VFA/COD/pH/TDS
- ✓ Niche markets brewery/chem/pharmacy
- ✓ #24 turn-key references realized
- ✓ Projects realized varying: 1->110 t.COD/d load
- ✓ New DACS applications under development



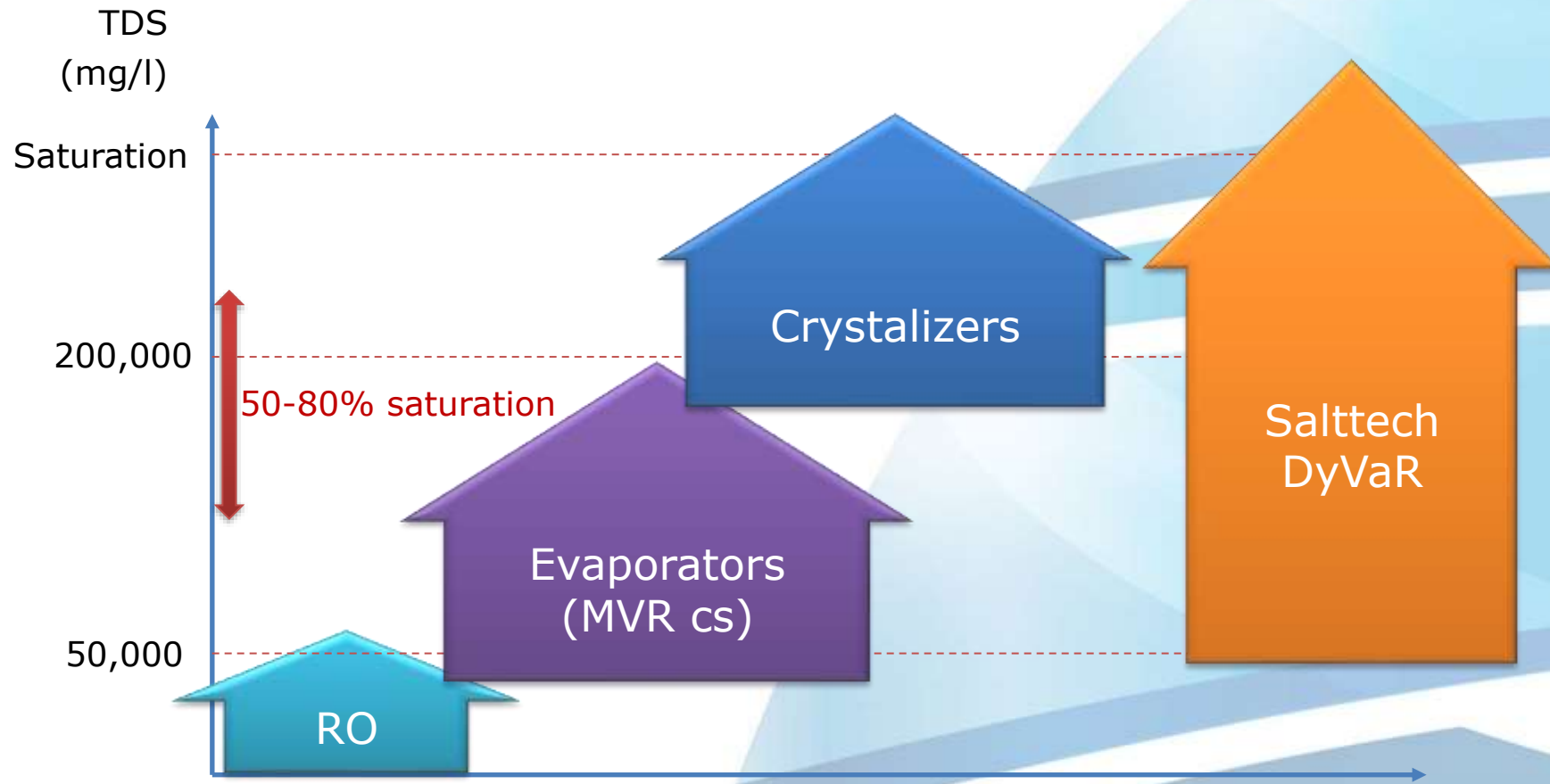
Application Niche's of DyVaR

TDS < 50.000 mg/l

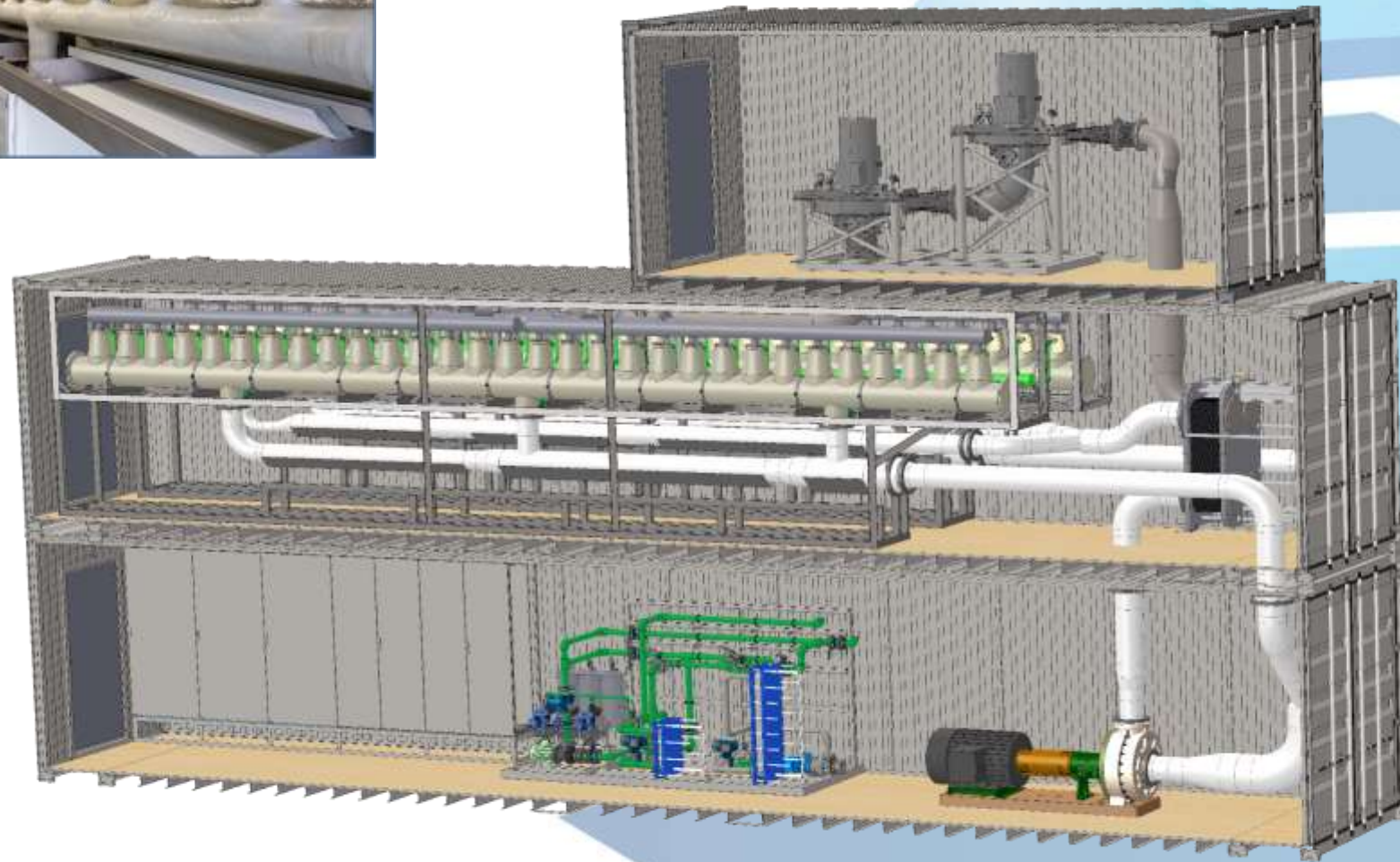


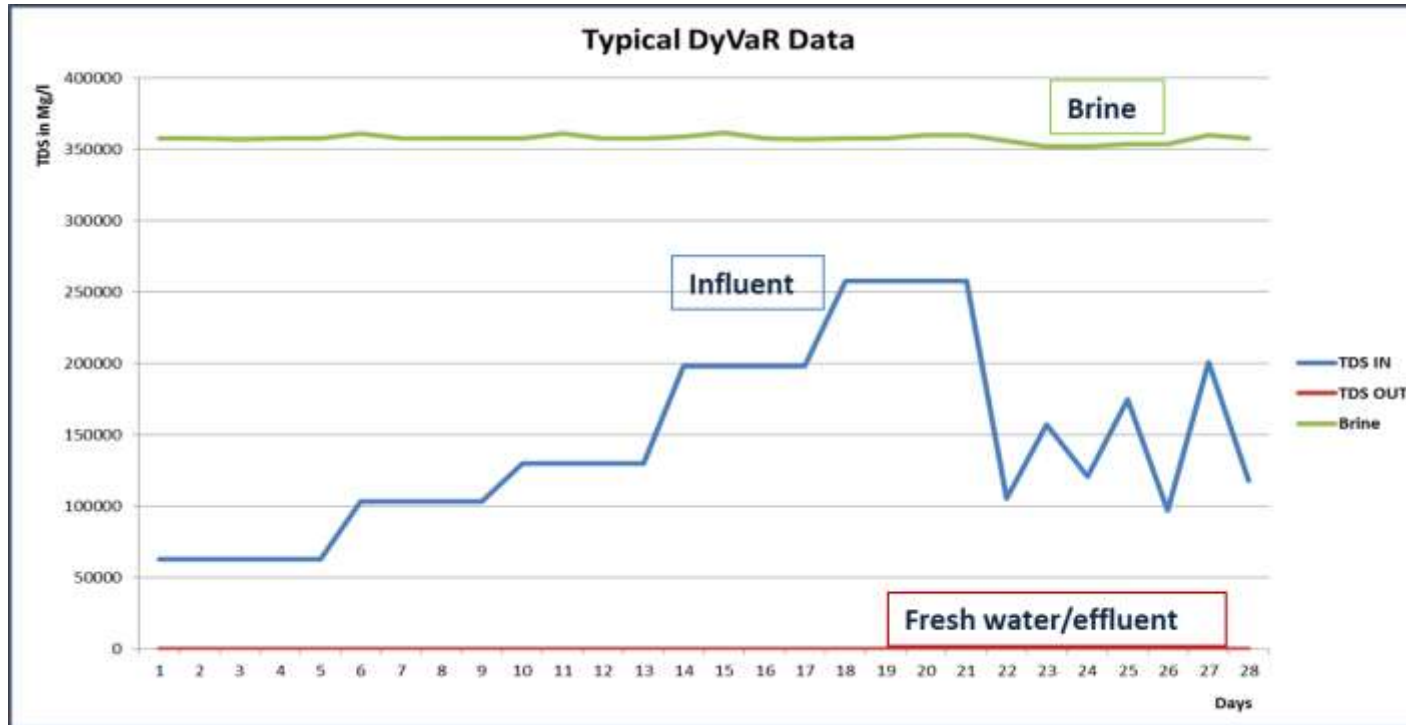
- ✓ Dairy Industry (RO-brines)
- ✓ Oil & Gas (Production water)
- ✓ Environmental (Leachate, Bottom Ashes)
- ✓ Cement (Cement Bypass Dust)
- ✓ Mining (RO-brines)
- ✓ Mining (Lithium concentration)
- ✓ Chemical (Salt/organic brines)
- ✓ Drinkwater (Ion Exchange)
- ✓
- ✓

Application Range of DyVaR



DyVaR-60 (72m³ condensate/d)





- ✓ Flexible for varying TDS Concentrations
- ✓ Flexible for varying inlet compositions (Salts & Organics)
- ✓ Stable brine and condensate output
- ✓ pH Range 2-12
- ✓ No Corrosion issues
- ✓ Energy consumption 50-60kWh/m³ condensate



- ✓ Leading Global Producer:
- ✓ Caseines (acid)
- ✓ Proteines

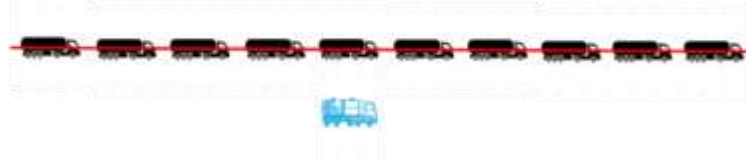


CTO Mr. Luft

Owner Mr. Rode

The Business Case:

- ✓ Increasing disposal costs for 85m³/h RO Retentat
- ✓ Re-use of milk salts as fertilizer (P, S, Mg, K, Ca)
- ✓ Minimizing truck loads (annual contingent)



The Challenge:

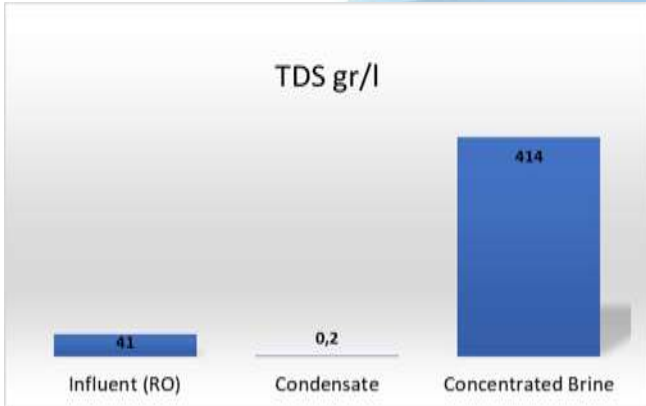
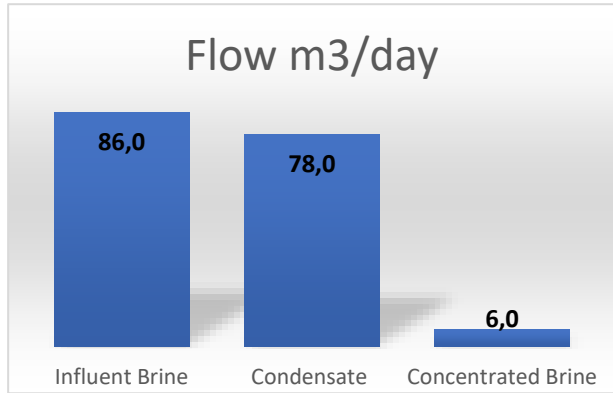
- ✓ High concentrations of chloride; -
- ✓ Different mixture and different concentration of elements like P, S, Mg, K, Ca;
- ✓ Relatively high and fluctuating COD concentration;
- ✓ Low pH between 1 and 4.

Extra Client Requirements :

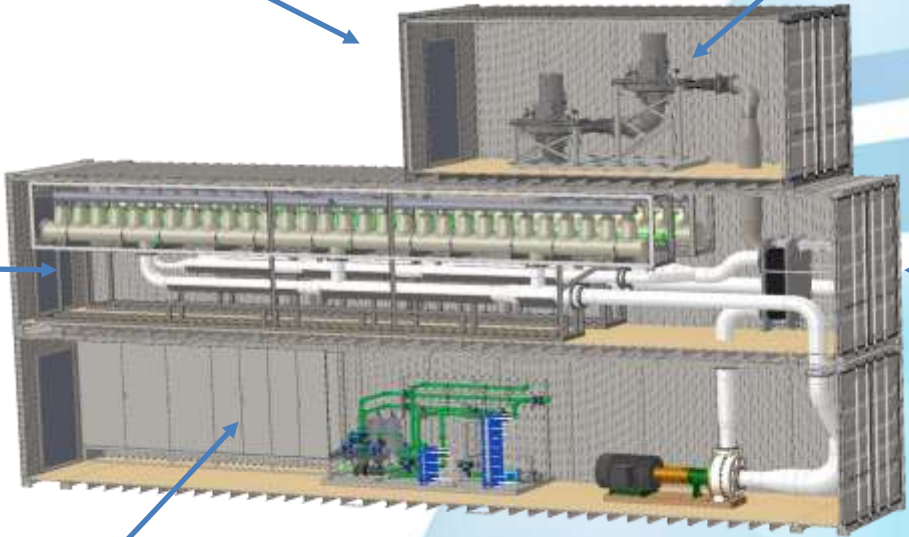
- ✓ Easy to operate Downtime for CIP & maintenance max 10%
- ✓ Energy consumption max 55 kWh/m³
- ✓ No continues steam addition
- ✓ Distance control & integration plant control
- ✓ Max noise emission <45 dBA.

✓ All achieved

Concentration Factor (CF) =10				
Parameter	Influent Brine	Concentrated Brine	Condensate	Unit
pH	3,6	1,72	3,4	
Conductivity	51.000	242.000	128	μS/cm
Ca	3.200	32.933	<50	mg/l
Mg	170	1.700	<50	mg/l
Cl	17.000	172.333	<50	mg/l
P	1.500	15.167	<50	mg/l
K	8.900	93.333	<50	mg/l
Na	2.200	23.333	<50	mg/l
So4	<50	422	<50	mg/l
COD	7.500	75.500	180	mg/l



DyVaR-60 (72m³ condensate/d)



DyVaR-60 Quick on-site assembly



Mobile Test unit (50 l/h, DyVaR-1)





Dank U.

Salttech BV

www.Salttech.com
r.olthof@salttech.com

5) Microverontreinigingen en hergebruik van industrieel afvalwater

Philippe Sauvignet, EPAS International - Results of a novel micropollutants treatment process combining AC adsorption and membrane filtration on pulp & paper effluent and its impact on a municipal WWTP

Christian Dinaux, NX filtration - Micropollutant removal from Municipal Wastewater effluent at Waterschap Aa en Maas, in Asten, NL & Wastewater effluent reuse at Cross Jeans Co. in Turkey



Extracting micro-pollution from industrial wastewater

Microverontreiniging halen uit industrie afvalwater

Philippe Sauvignet – Veolia DEST

EPAS International NV
Dok Noord 4 C bus 003 – 9000 GENT – Belgium
Tel: +32 9 381 51 30 – Fax: +32 9 221 82 18
Visit us at: www.epasconsultancy.com

Background and Challenges

Climate change and water scarcity

Rules and regulations :

Tighter regulation on micropollutants with local authorities (SIBA) well aware of the issue

Pulp & paper Mill wastewater :

Grit & grease removal; Physico-chemical clarification; Biofilter
UV disinfection

Direct discharge at Sea : Bathing water

Sea water discharge

Sensitive environnement :

Sensitive marine environment

Shellfish production (Oysters)

Definite will from the authorities to protect the Bassin d'Arcachon

United Nations

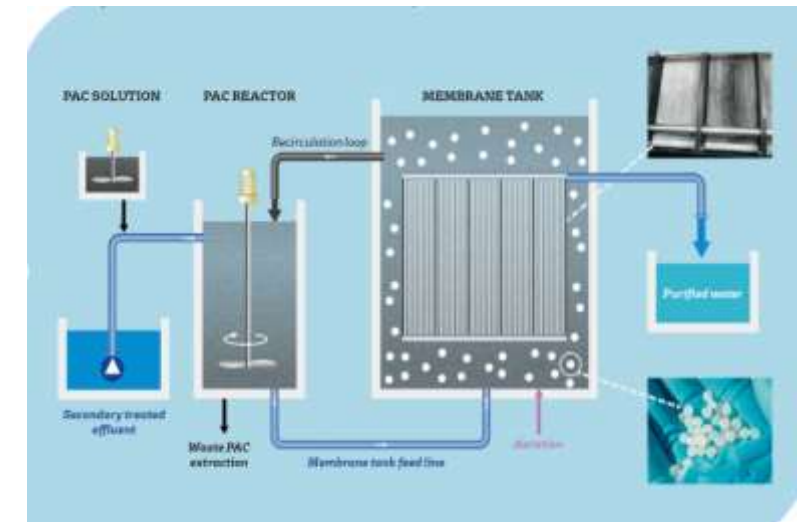
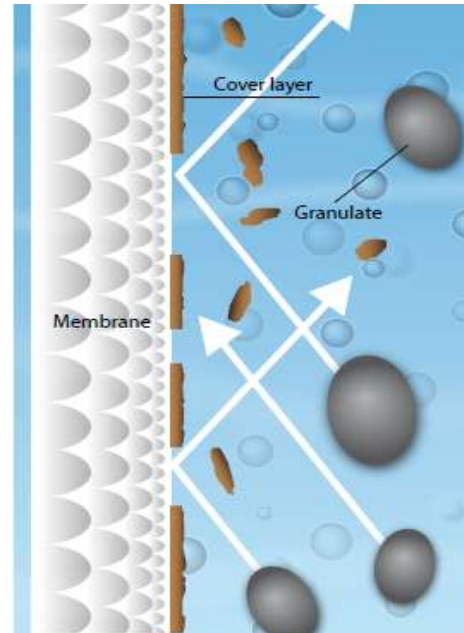
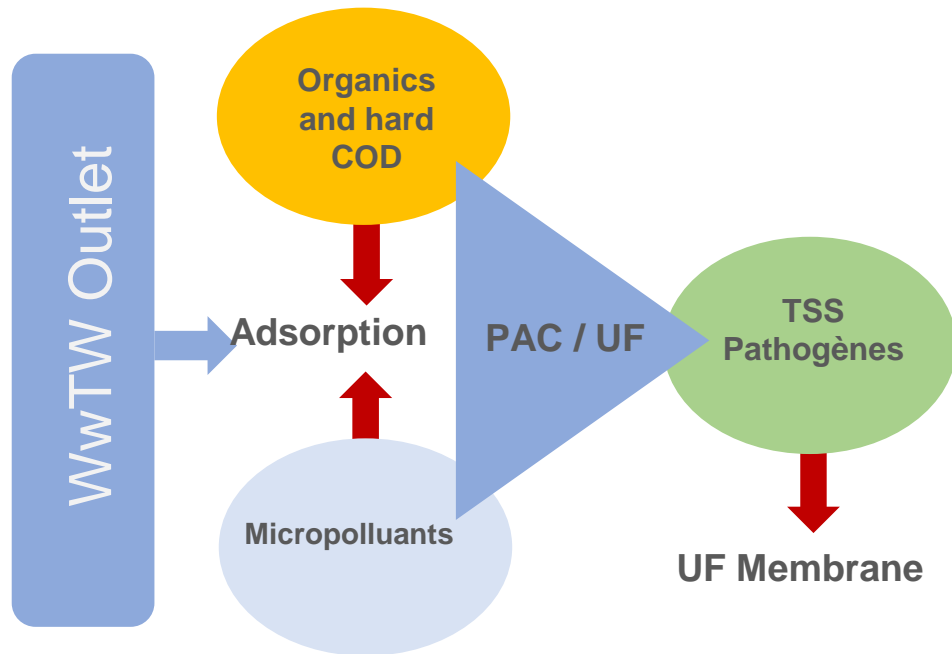
Sustainable Development Goals 2030

=> Ensure availability and sustainable management of water and sanitation for all



INNOVATIVE TREATMENT : PAC combined with S-UF

Opaline C+ : Patented process by Veolia filed 2013



- PP beads prevent sludge cake formation
- Filtration flux increase
- PAC slurry 1 to 5 g/l for hard COD and micropollutants removal

Objectives of the trials

Swiss legislation as target (80% removal)

Validate performances :

test 24/7 on a real full scale prototype unit in a industrial environment

Using REMPARG data :

Work carried out by SIBA during REMPARG (500 molécules micropolluants analysed)

Test four innovative configurations:

With and without dedicated contact tank

With and without Ozone

With μ Gac instead of PAC

Validate operational performances of Membrane:

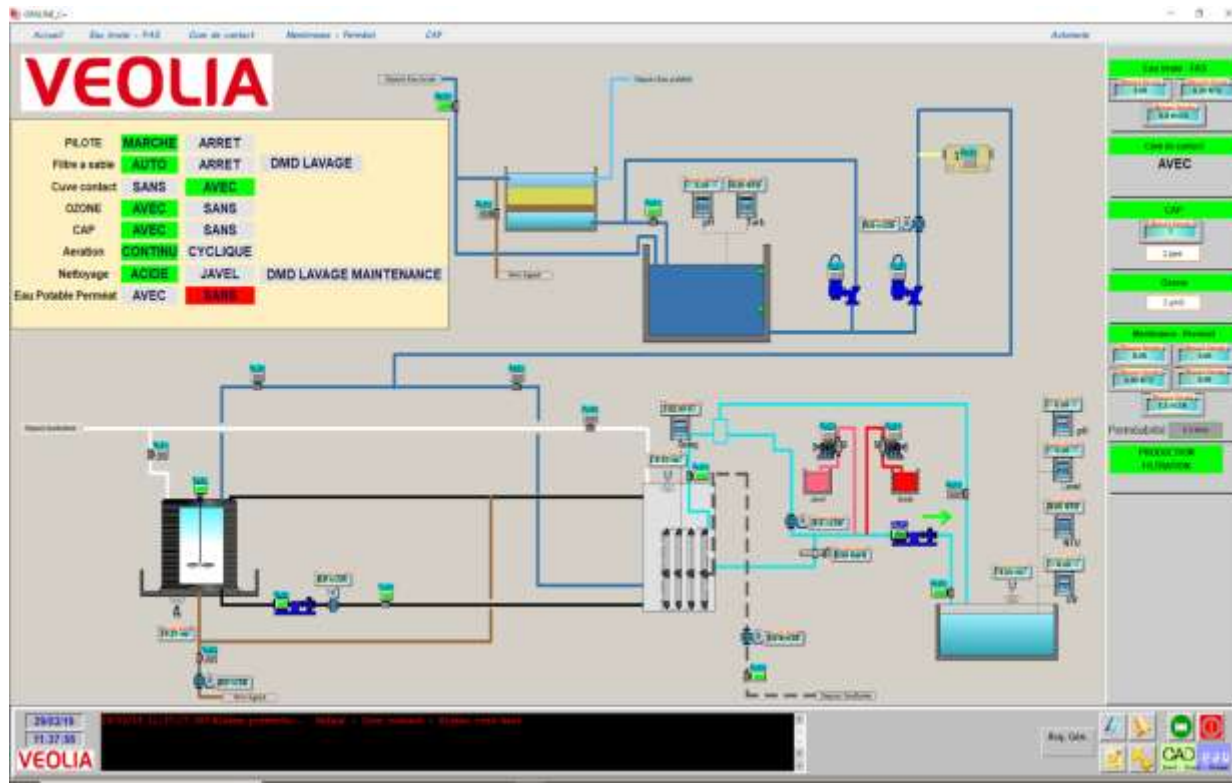
Mann + Hummel S-UF flat sheet

Compounds	Additional parameters
Liste initiale	2-Ethylhexyl-4-methoxycinnamate
17-Béta- Estradiol	2-Aminobenzimidazole
Amisulpride	5-Methyl-1H-benzotriazole
Benzotriazole	Acebutolol
Candesartan	Amitriptyline
Carbamazépine	Oxazepam
Chlorure de Benzyle	Octocrylène
Citalopram	Tramadol
Clarithromycine	Triclosan
Diclofénac	Valsartan
Diuron	
Hydrochlorothiazide	
Ibuprofène	
Irbesartan	
Mecoprop	
Métoprolol	
Sulfaméthoxazole	
Terbutryn	
Venlafaxine	

Opaline C+

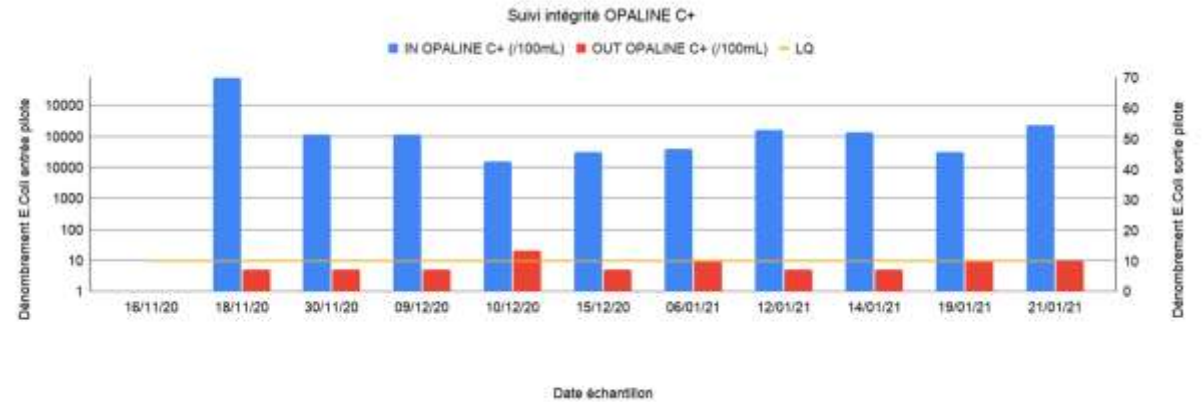
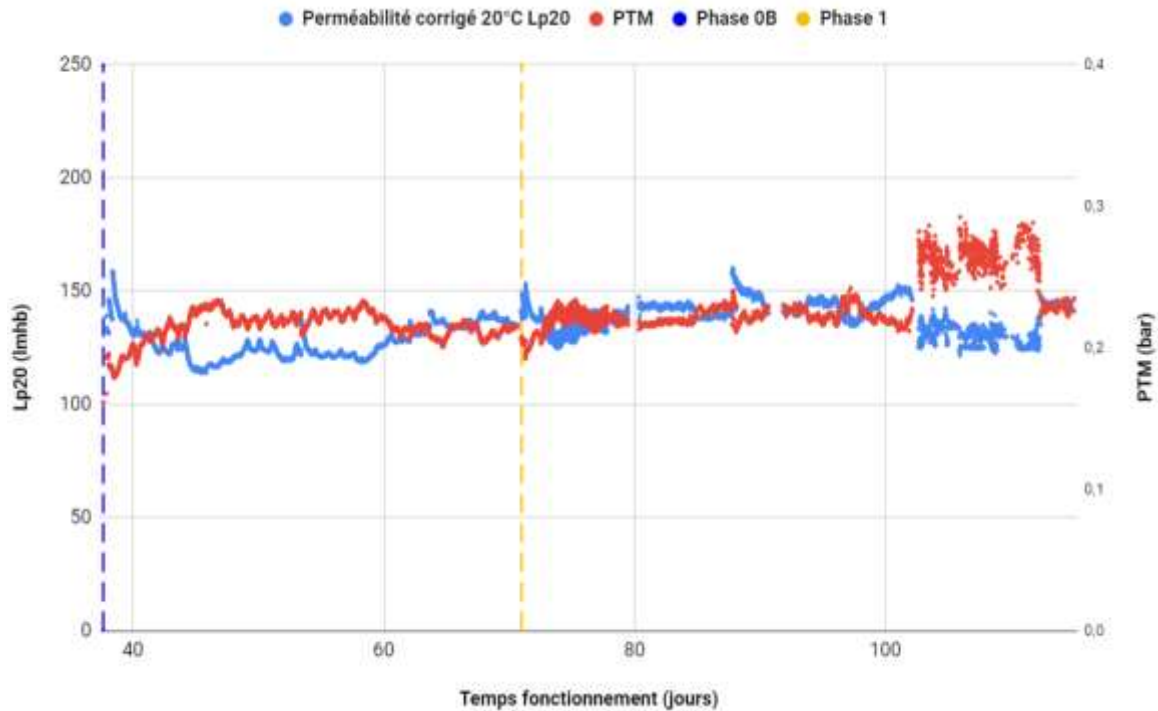
Industrial Prototype

- Fully automated unit
- Integrated with full scale plant
- Remotely controlled with a dedicated lab technical for sampling & analysis



Robust and reliable process

Swiss legislation



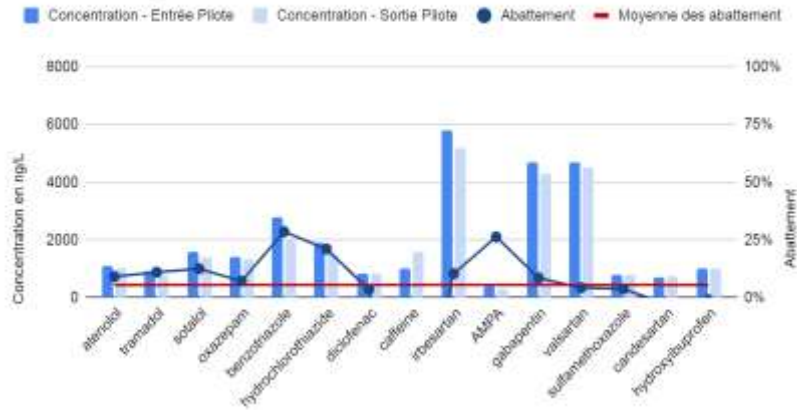
Summary of 18 months operation :

- Reliable process in a industrial environment
- Integer Membrane
- High and stable permeability

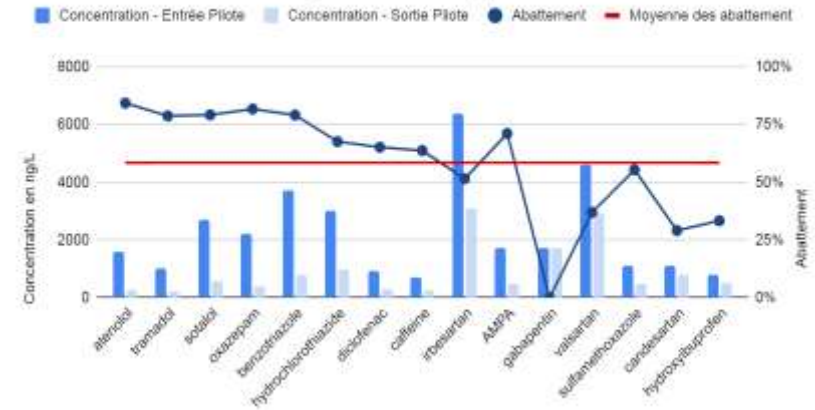
Objectives of the trials

Micropollutants removal - results

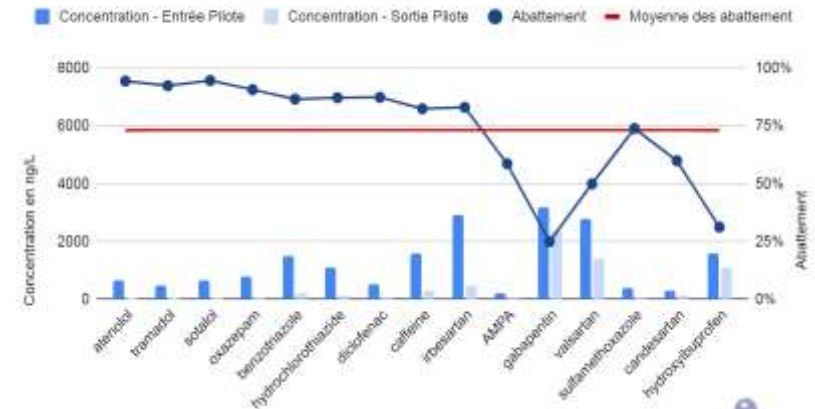
Configuration 1 : Sans charbon - sans cuve - sans Ozone



Configuration 2 - 30 ppm CAP



Configuration 3 : 15ppm CAP- 3ppm Ozone



As a summary :

- without PAC less than 5% removal
- With PAC more than 60% removal
- With PAC and O3 over 80% removal

Objectives of the trials

Micropollutants removal - chemical print vs chemical analysis



Target: wide spectrum of micropollutants

Detection of métabolites

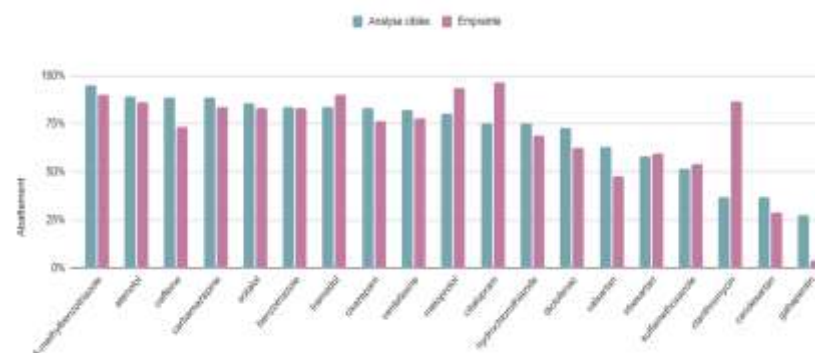
Screening

- *Over 4000 molecules in data bank*
- *Good correlation with global removal*

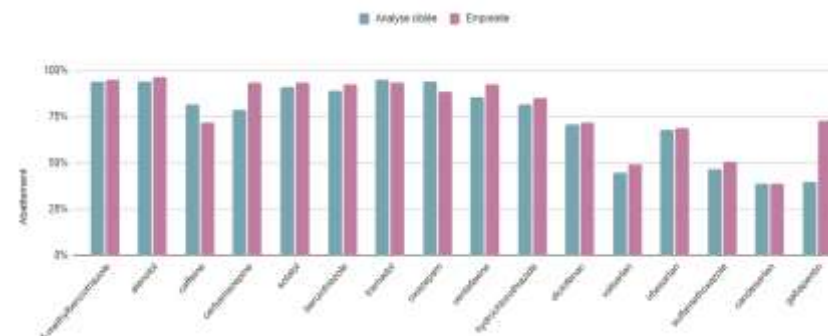
As a summary :

- without PAC less than 5% removal
- With PAC more than 60% removal
- With PAC and O3 over 80% removal

15 ppm CAP



15ppm CAP – 3 ppm O3



Conclusions and further work



The prototype treatment process can produce water of very high quality, free of micropollutants such as pesticides and drug residues. If required, it can meet the requirements of drinking water regulations.



A 18-month industrialisation program resulting in various patents and ready to roll out to market.



Capitalisation of a lot of data on pathogens, micropollutants, microplastics, enabling to demonstrate the suitability of effluent for water REUSE.



Further considerations: use of a μ GAC that can be reactivated, agronomic value of the effluent for urban farms or even **recreational use**.

*Many thanks for your
attention*

Philippe.sauvignet@veolia.com

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Dok Noord 4 C bus 003 – 9000 GENT – Belgium
Tel: +32 9 381 51 30 – Fax: +32 9 221 82 18
Visit us at: www.epasconsultancy.com

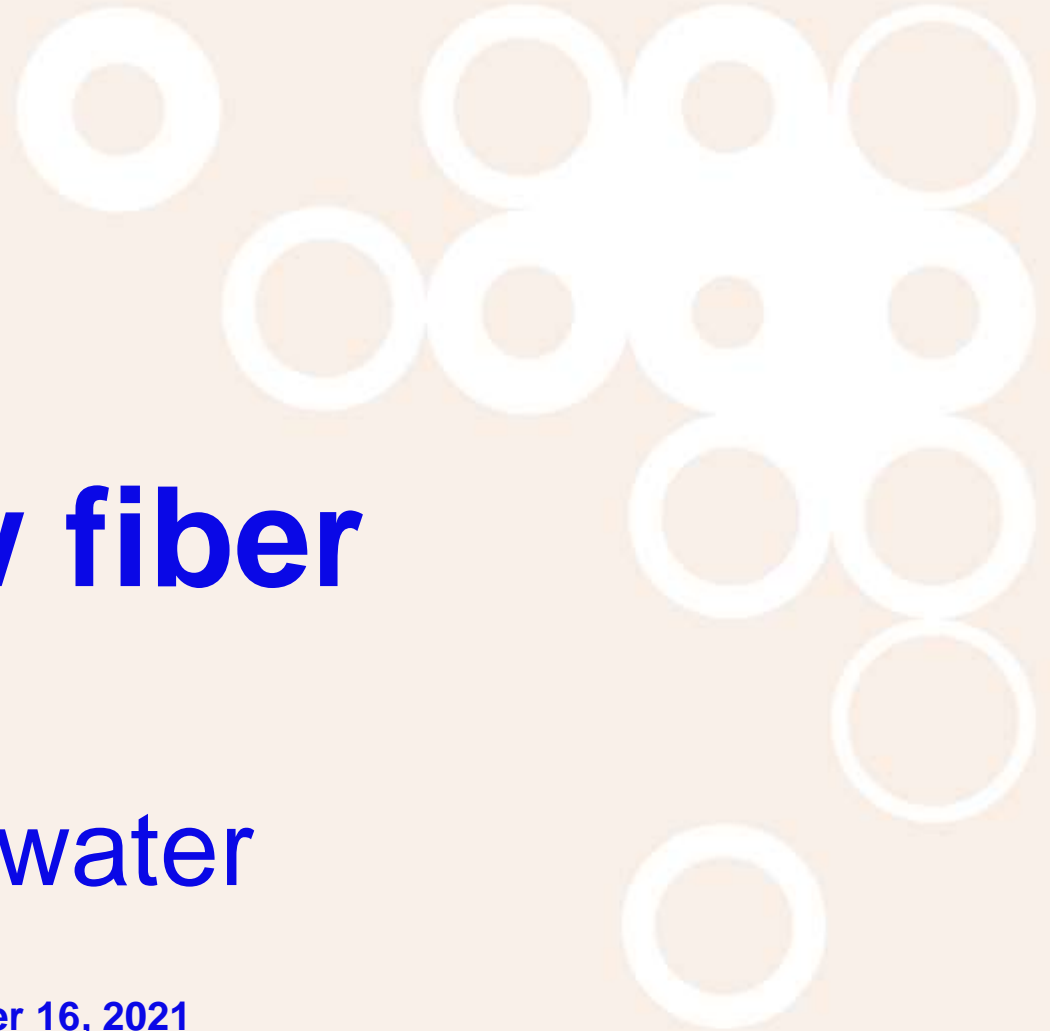
nx

filtration

Advanced hollow fiber membranes

for pure and affordable water

Water Alliance / Vlaams – Nederlandse Webinar / September 16, 2021





NX Filtration: your membrane partner

Manufacturer of innovative hollow fiber membrane products for nanofiltration, ultrafiltration and microfiltration applications

Founded in 2016 as a spin-off from the Twente University of Technology and combining over 100 years of membrane experience

NX Filtration is listed on the Euronext in Amsterdam after its successful IPO of June 11, 2021

Today:

- Headquartered in Enschede, The Netherlands
- Approx. 50 FTE with unique and extensive experience in high-end membrane technology
- Industrial scale production facilities with scalable and flexible production processes based on green chemistry

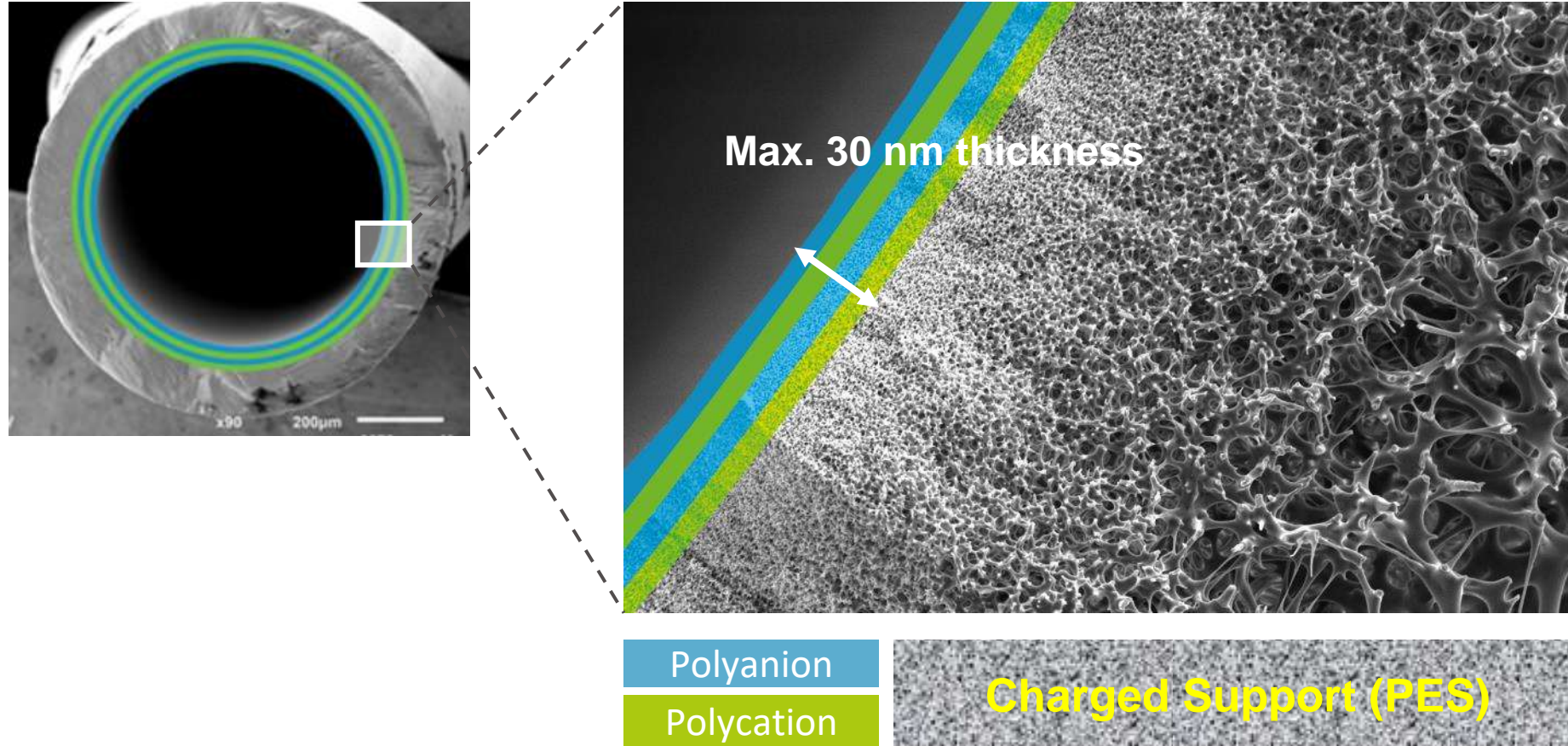
Next to multiple pilot/demo projects, several full-scale systems (up to 5,000 m³/day) are in operation in the US, Sweden, Indonesia, Philippines.

Direct Nanofiltration (dNF) hollow fiber membrane

Filtration objective	Nano		Ultra <small>HYDRAcap™ series by NX</small>		Micro	
	dNF40	dNF80	UF010	UF150	MF100	MF500
Suspended solids and micro plastics	○	○	○	○	○	○
Bacteria	○	○	○	○	○	○
Viruses	○	○	○	○		
Protein and colloidal silica	○	○	○			
Micropollutants, color and nano plastics	○	○				
Selective salt, softening and pharmaceuticals	○					
Cut off	400Da	800Da	10kDa	105kDa	100nm	500nm
Typical flux (Lmh)	20-40	20-50	50-100	59-145	25-100	25-100
MgSO ₄ rejection ¹	90%	80%	n/a	n/a	n/a	n/a

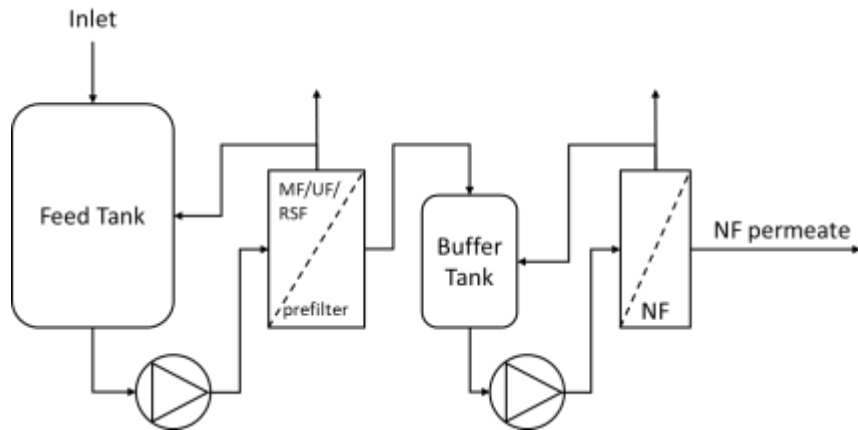
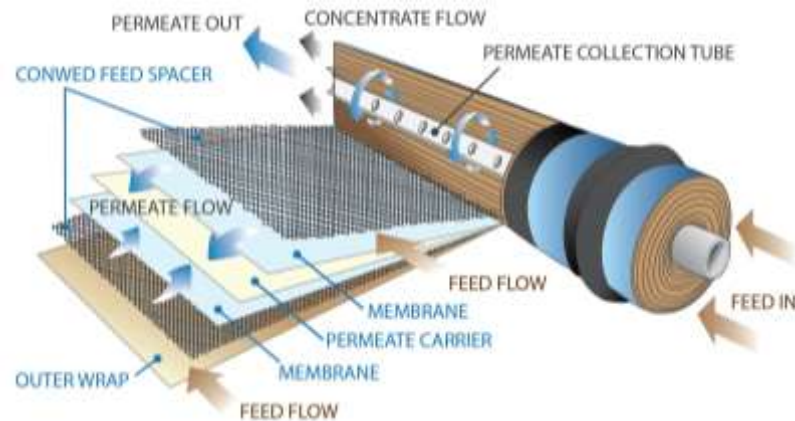
¹ Test conditions: 5.0 mMol/L MgSO₄, 3.0 bar (43.5 psi), 25°C (77°F), v=0.5 m/s (1.6 ft/s)

Unique Layer-by-Layer Coating

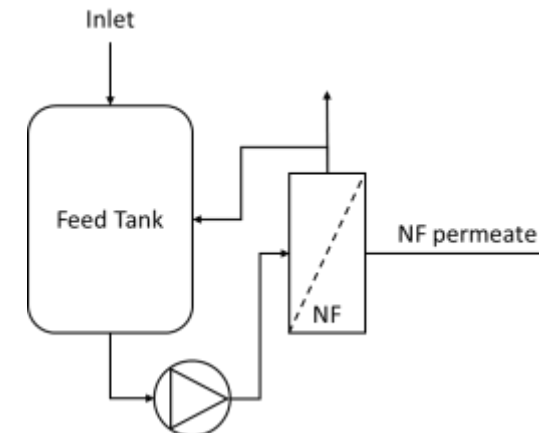
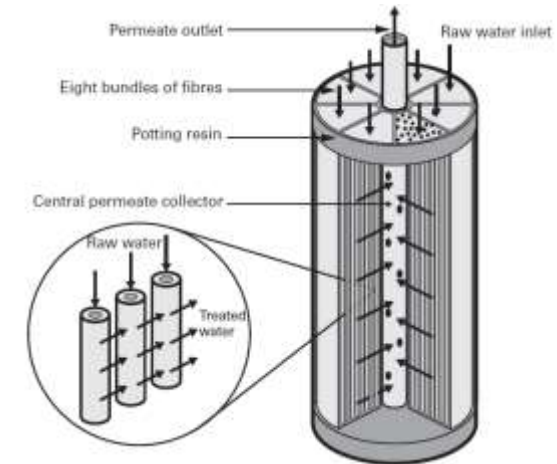


direct Nanofiltration – Innovative coating creates robust materials and enables simple process

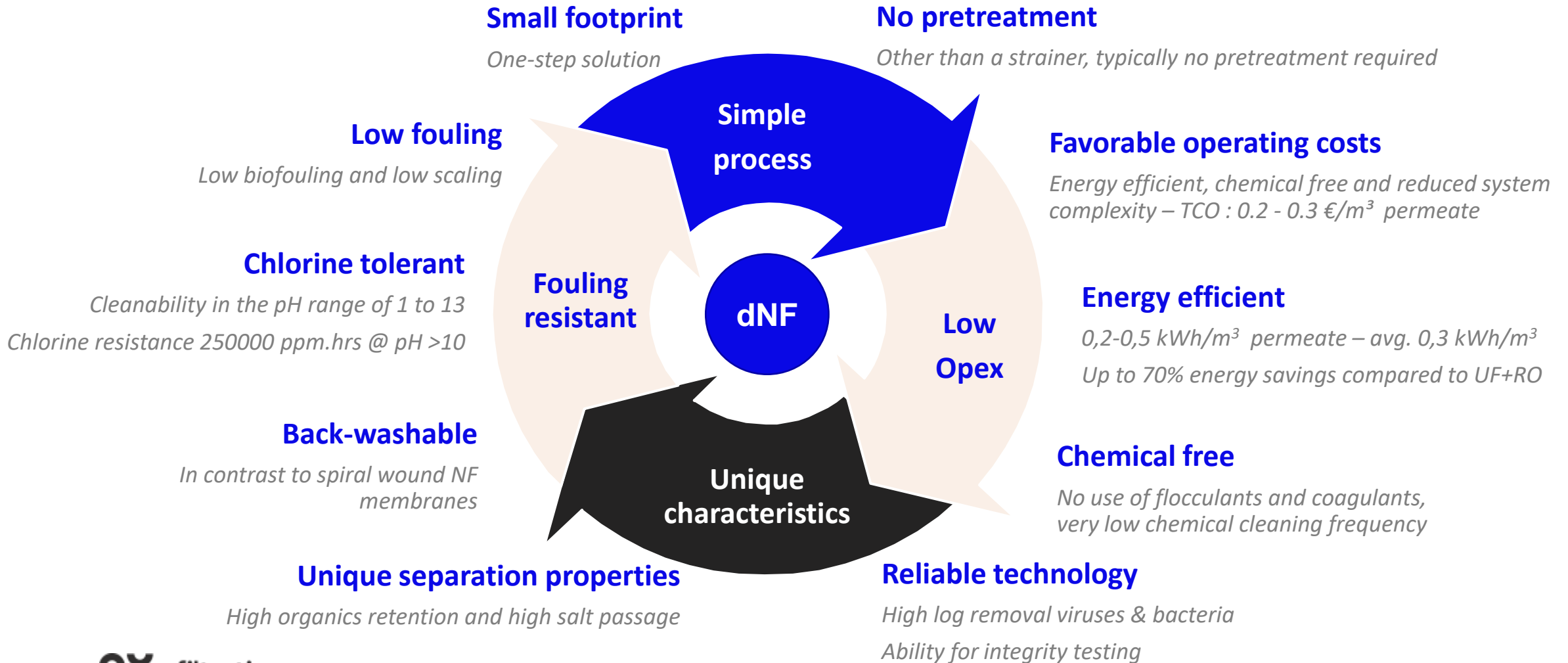
Traditional NF scheme



Hollow fiber dNF scheme



Unique features of our dNF nanofiltration membrane



Removal of micropollutants from municipal wastewater after biological treatment (1/6)

The customer's query

A Dutch Waterboard operating several wastewater treatment plants in the Netherlands, is looking for a solution to remove micropollutants from the wastewater effluent at one of its site for reuse purposes.

A demonstration system was started in May 2021 and is planned to end in October. The purpose of the demonstration system is to show the potential of combining nanofiltration with a downstream UV/H₂O₂.

Our approach

A Mexpert pilot unit using dNF80 nanofiltration membrane is treating directly the wastewater effluent from a 3-steps conventional treatment process with primary sedimentation, biological treatment and secondary sedimentation.

The pre-treatment of the feed water feed prior to the membrane process requires only an automatic backwashable 200 µm strainer.



25

LMH flux

>85%

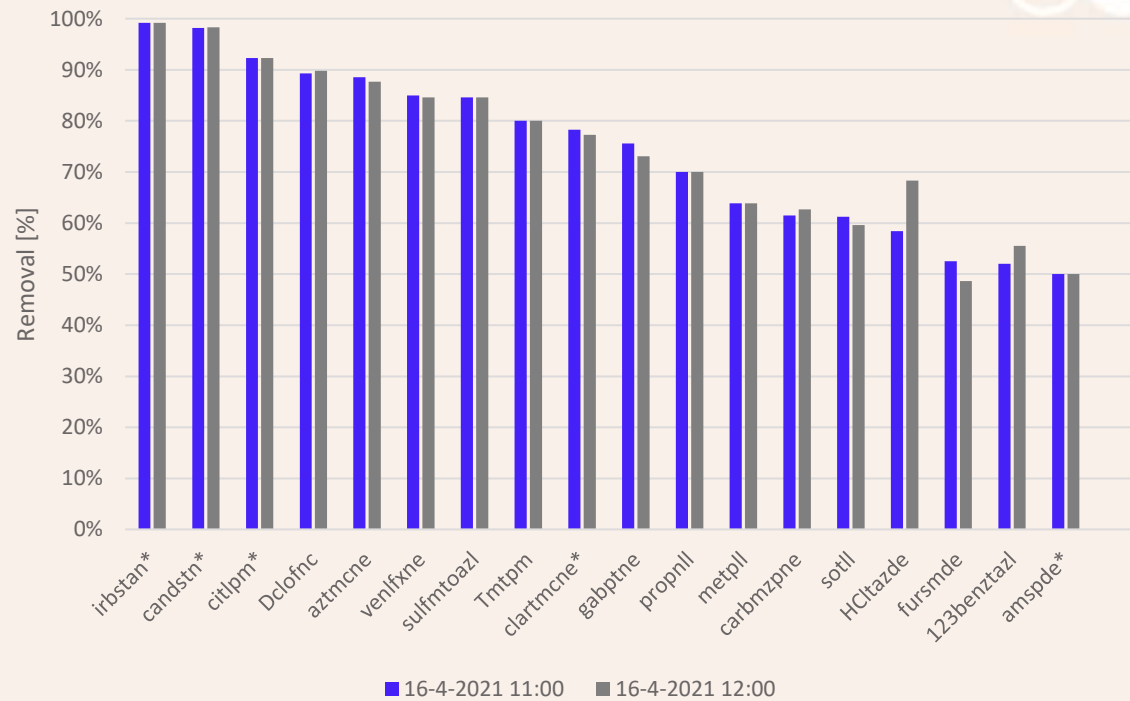
rejection of COD

50-99%

rejection after **dNF80** on a cocktail of micropollutants, mainly pharmaceuticals, see next slide

Removal of micropollutants from municipal wastewater after biological treatment (2/6)

Removal of micropollutants with **dNF80**



Removal of micropollutants from municipal wastewater after biological treatment (3/6)

Other Analytical Parameters

Parameters	Unit	Feed water	Permeate	Comments
COD	mg O ₂ /L	38	5.7	
DOC	mg/L	11,3	2	
N_{tot}	mg/L	5,1	1,8	
P_{tot}	mg/L	1.7	0.2	
UV transmittance	%	35	93,5	
Conductivity	µS/cm	800-1600	600-1400	
Ca²⁺	mg/L	68	43	
Mg²⁺	mg/L	13	7.5	
SO₄²⁻	mg/L	41.4	7.4	
HCO₃¹⁻	mg/L	250	180	
Cl¹⁻	mg/L	176	130	
Na¹⁺	mg/L	96	67	
E.Coli	CFU/100 mL	6800-8800	60*	* - below DL



Removal of micropollutants from municipal wastewater after biological treatment (4/6)

Operating parameters as optimized until now

Parameters	Unit	Value
Flux	LMH	25
Recovery	%	80
Cross-flow velocity	m/s	0.5

Parameters	Type		Unit	Value
Filtration cycle			Minutes	60
Hydraulic cleaning	Backwash and AirScour	during bad weather conditions	Seconds	45
	FF + BW	normal operation	Seconds	45

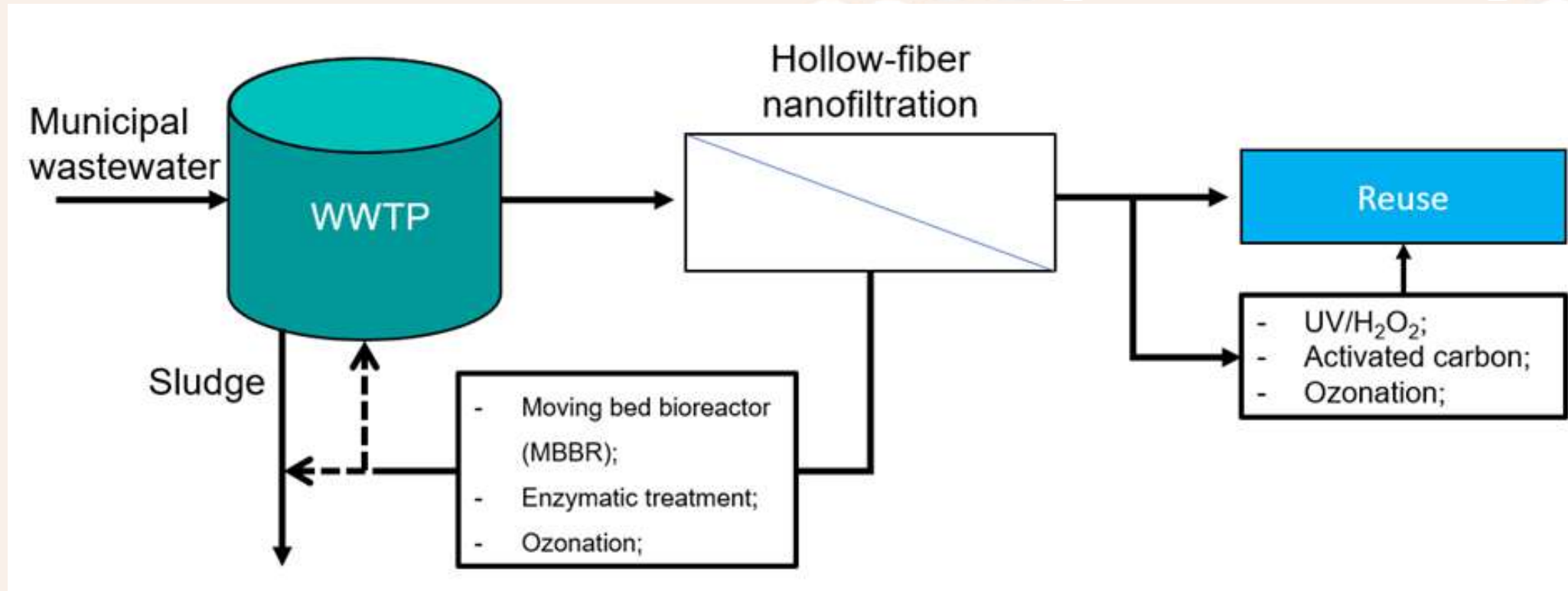
Cleaning type	Chemicals	Concentration	Cleaning cycles	Frequency
		ppm		
High pH (pH=10.5/11)	NaOH	-	20 minutes in recirculation – 0.3 m/s	every day
	NaOCl	200		
Low pH (pH=2,5/3)	Citric acid	0.7%	20 minutes in recirculation – 0.3 m/s	every two days



Mexpert containerized pilot unit
Test period 05/21 to 10/21

Removal of micropollutants from municipal wastewater after biological treatment (5/6)

NX solution for the 'fourth step'



Removal of micropollutants from municipal wastewater after biological treatment (6/6)

Final Comments

NX Filtration has performed long term piloting on other sites treating wastewater treatment effluent using its dNF40 membrane with a tighter MWCO, namely: 400 Dalton. This has given even better results on removal efficiencies for a large variety of micropollutants.

The purpose of the long-term piloting as presented in the previous slides is to identify the potential benefits of combining technologies for this application: in this case, dNF80 with an 800 Dalton MWCO in combination with UV/H₂O₂.

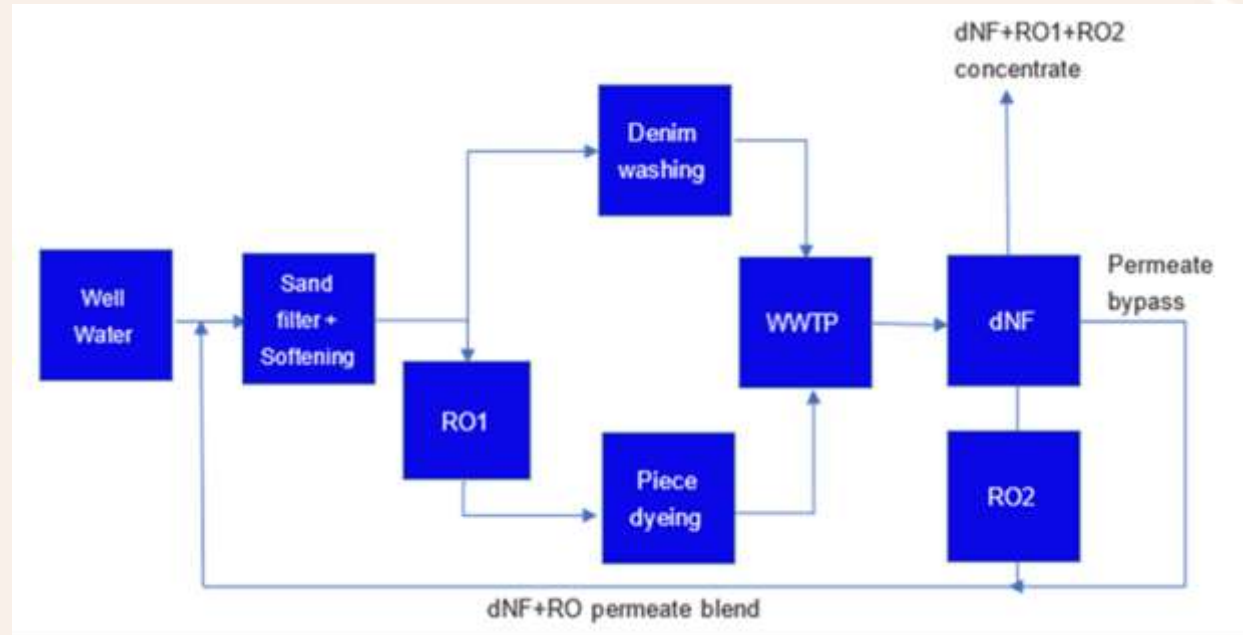
As the tests will be going on until end October 2021, we will communicate in due time about the findings of the combination of these technologies.



Wastewater Reuse Textile Industry - Turkey (1/6)

The customer's queries:

- Improve water quality for its process usage
- Reuse wastewater effluent



20 LMH flux

75% Recovery

> 50% Reduction of ground water usage

Wastewater Reuse Textile Industry - Turkey (2/6)

Operating parameters resulting from pilot plant optimization for final project

Parameters	Unit	Value
Flux	LMH	20
Recovery	%	75
Cross-flow velocity	m/s	0.5

Parameters	Type	Unit	Value
Filtration cycle		Minutes	120
Hydraulic cleaning	Forward Flush + Air Scour	Seconds	30

Cleaning type	Chemicals	Concentration	Cleaning cycles	Frequency
		ppm	minutes	
High pH (pH=10.5)	NaOH	-	30	every 84 hours
	NaOCl	150		
Low pH (pH=2)	Citric acid	0.5%	30	every 84 hours



Mexperience pilot unit
Test period 12/20 to 07/21

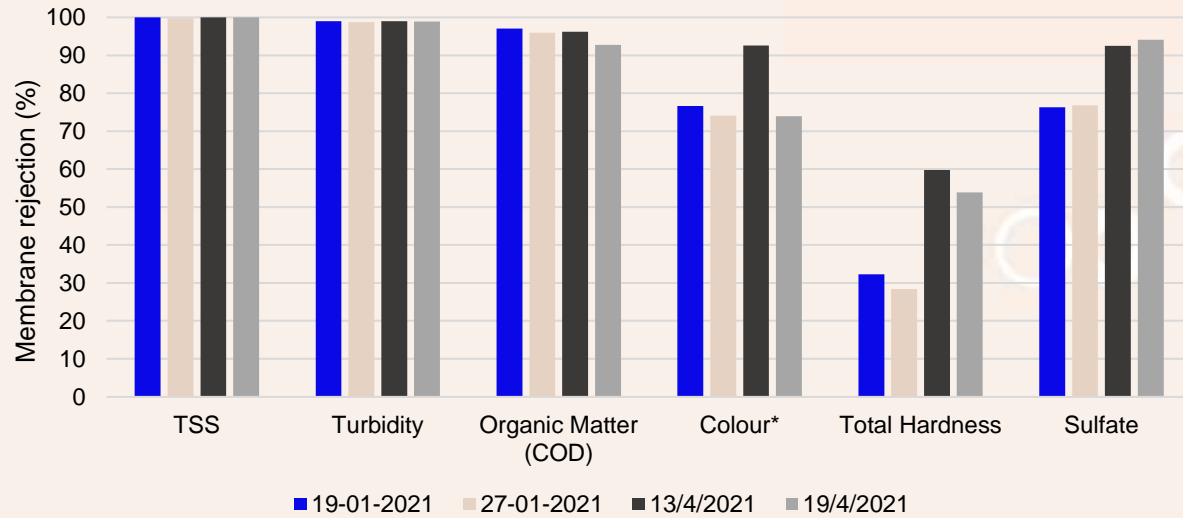
Wastewater Reuse Textile Industry - Turkey (3/6)

Analytical Parameters during piloting with dNF40

Parameters	Unit	Feed water	Permeate	Comments
TSS	mg/L	88.3	2.9	
Turbidity	NTU	52.9	2.0	
COD	mg/L	122.5	13.3	
Colour	Pt-Co	*	23.8	* - not measurable
Conductivity	µS/cm	2300 (avg)	2100 (avg)	
Total Hardness	mg/L	163.8	118.5	
Alkalinity	mg/l CaCO ₃	144.9	96.1	
SO ₄ ²⁻	mg/L	191.1	38.9	
Ca ²⁺	mg/L	55.6	41.9	
Mg ²⁺	mg/L	8.4	6.2	



Wastewater Reuse Textile Industry - Turkey (4/6)



Rejection of major components in the wastewater (bars show minimum retention).

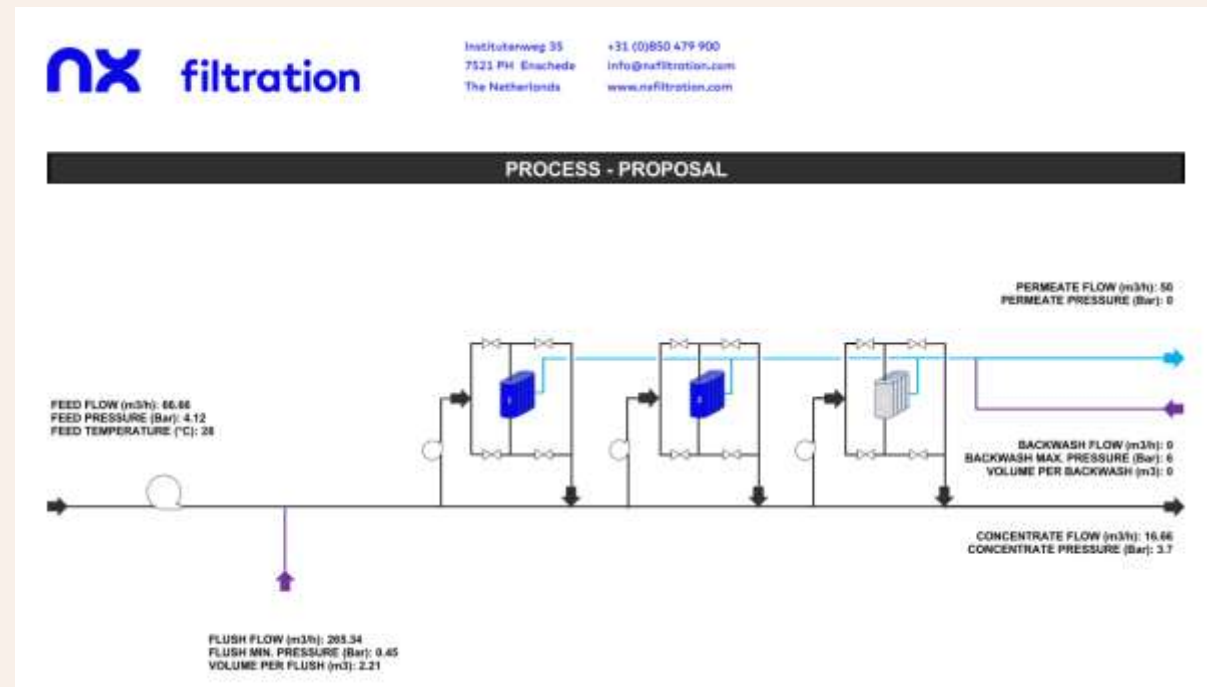


Sample of feed (left), concentrate (centre) and permeate (right)

Wastewater Reuse Textile Industry - Turkey (5/6)

Final design – A two-stage Feed & Bleed Solution

Parameters	Unit	Value
Design recovery	%	75
Filtration availability	%	96.8
Net permeate / Feed efficiency	%	72.5
Specific energy consumption	kWh/m ³ permeate	0.35



Wastewater Reuse Textile Industry - Turkey (6/6)

Final Comments

NX Filtration has performed long term piloting to optimize the operating parameters for this application.

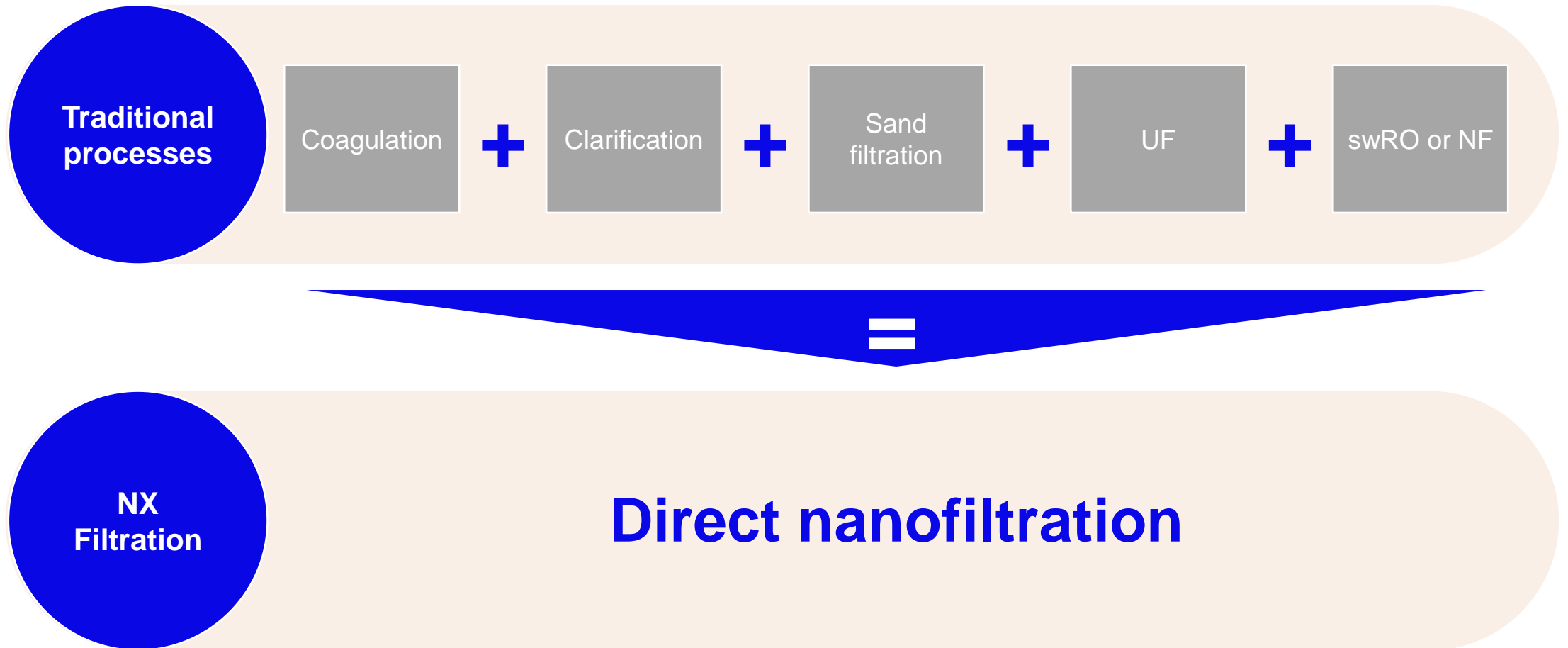
The results achieved are allowing the end customer to optimize its global water strategy, namely: improving the water quality in its process but more important improving its water footprint by reducing its ground water usage by more than 50%.

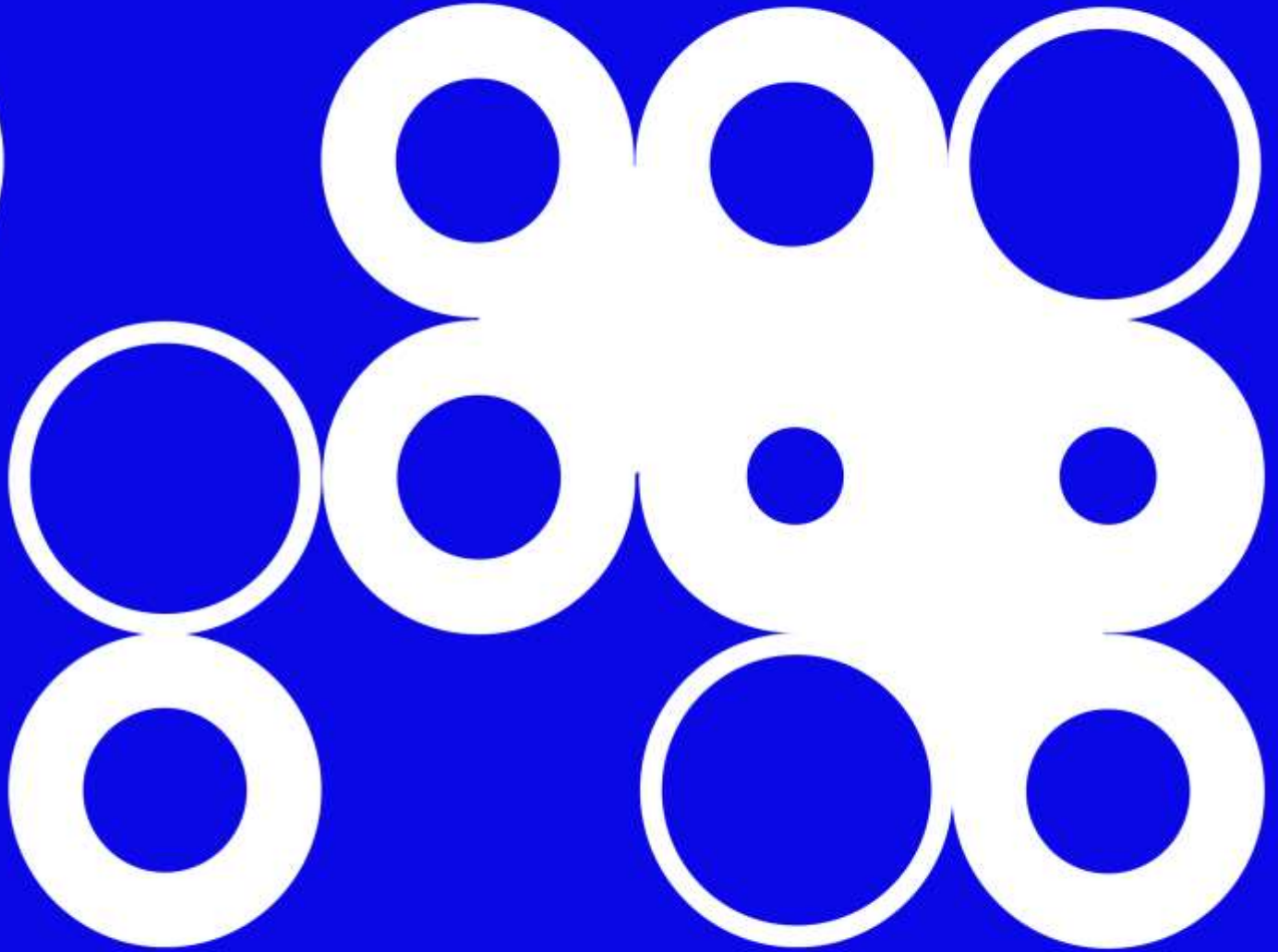
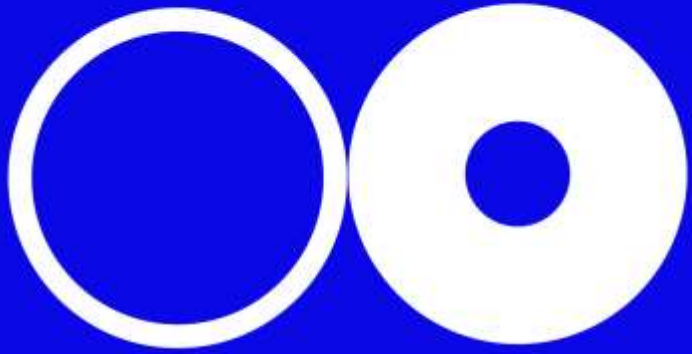
In this case, dNF membrane technology combined with other water treatment steps enables achieving the a.m. goals.

The industrial project in relation to the a.m. piloting is currently being engineered in Turkey.



Hollow fiber nanofiltration enables simplification of multistage treatment down to one-step alternative





Thank you

nx
filtration

6) Koelwaterbehandeling

Christophe Vandenkerchove, Lubron Belgium - Water- en product besparing bij gebruik van klassieke verdampingscondensators/open koeltorens en/of industriële vloeistofkoelers

Mark Boeren, Pathema - Circulair koelwater teruggewonnen uit afvalwater aardappelverwerker



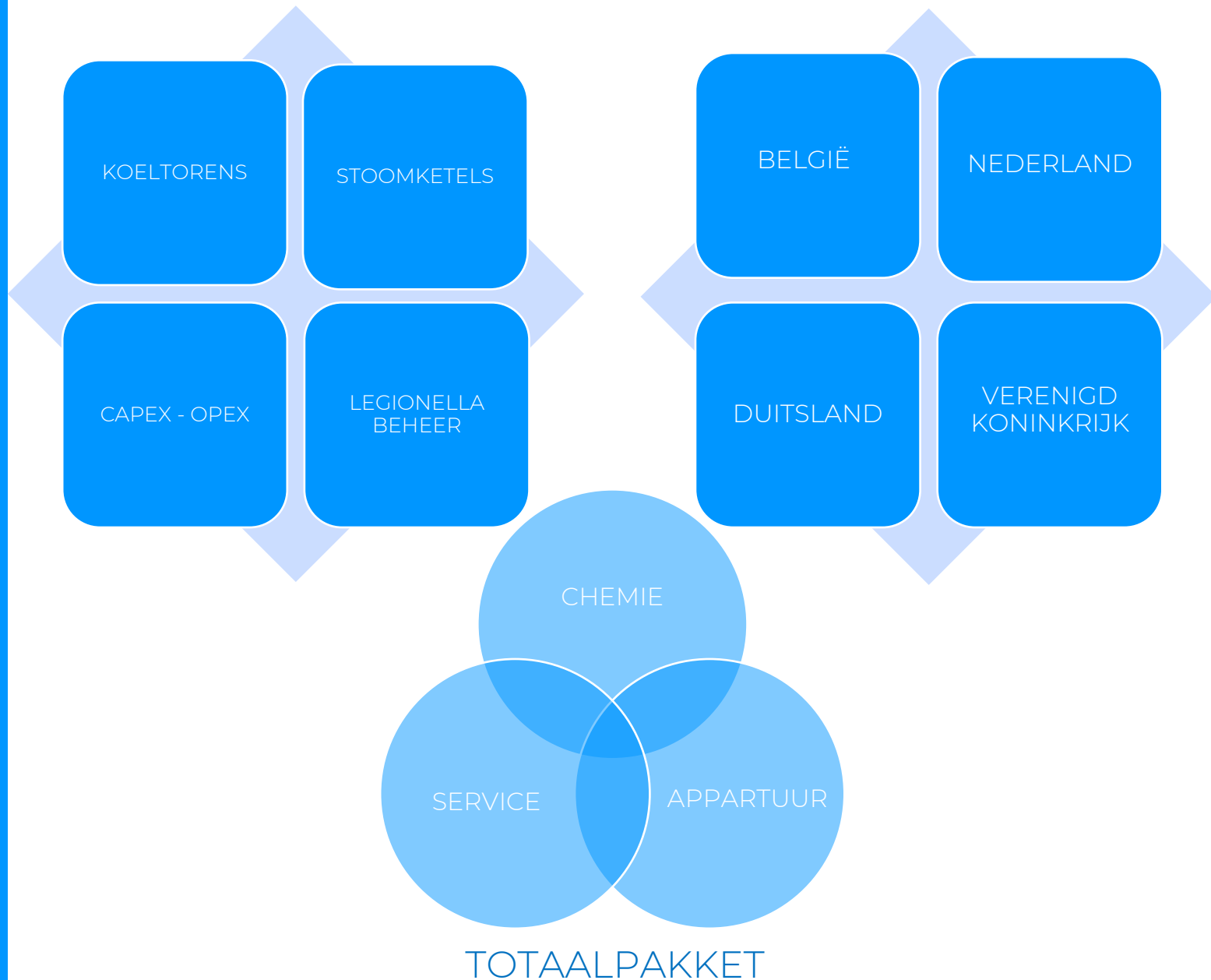
LUBRON
WATERTECHNOLOGIES



INHOUD

- LUBRON - ALGEMEEN
- WAT LEEFT ER IN DE MARKT?
- OPLOSSINGEN HIERVOOR
- CASES
- VRAGEN

LUBRON ALGEMEEN



CHEMIE – APPARATUUR –
SERVICE



WAT LEEFT ER IN DE
MARKT?

- REDUCEREN WATERVERBRUIK
- REDUCEREN CHEMICALIËNVERBRUIK
- PASSIVATIE : COMPLEX : HOE EENVOUDIGER MAKEN?

OPLOSSING

- MEMBRAANTECHNOLOGIE

Maar...SLIMME MEMBRAANTECHNOLOGIE



Lubron 4-Cooler-RO solution

OPLOSSING



CASE 1 - PHARMA

Pharma – 4 open koeltorens - 7 mW koeling

2015

- Gebruik van bronwater
- pH correctie middels zwavelzuurdosering
- Indikking van maximaal 2
- Waterverbruik/jaar : circa 49.870 m³
- Kosten water –en productverbruik/jaar : 81.850 euro (all-in)

Eind 2016

- Investering in Lubron 4-COOLER- RO als voorbehandeling
- Anti-scalent + RO unit: Capex: 43.450 euro

Vanaf 2017

- Indikking van 10
- Anti-kalk/corrosie dosering: gereduceerd tot 20% (1/5)
- Waterverbruik/jaar : 34.375 m³
- Kosten behandeling/jaar : 46.750 euro (all-in)

Terugverdientijd: < 1,5 jaar

Besparing / jaar : > 35.000 euro (water, product)

Gedetailleerde info op aanvraag en in samenspraak

CASE 1 - PHARMA



CASE 2 - VOEDING

VOEDING – 1 Verdampingscondensator – 1.400 kW

2019

- 1 BAC v. condensator & en luchtgekoelde installatie
- Gebruik van stadswater met max indikking van 2
- Waterverbruik/jaar : circa 33.800 m³
- Kosten water –en productverbruik/jaar 114.250 euro (all-in)

Overweging

- ~~Enkel nog luchtgekoelde → hogere TCO~~
- ~~Combo luchtgekoeld & verdampingscondensator~~
- ~~Adiabatische koeling → hogere TCO~~
- Enkel nog verdampingscondensator

Vanaf 2020 : Lubron 4 – Cooler RO + buffer + pompset

- Indikking van 10
- Waterverbruik/jaar : 19.580 m³
- Kosten behandeling/jaar : 76.750 euro (all-in, incl. afschrijving app, onderhoud installatie, reject RO,..)

Afschrijving op 3 jaar voorzien

Besparing / jaar : > 30.000 euro (water, product)

Gedetailleerde info op aanvraag en in samenspraak

CASE 2 - VOEDING



CASE 3 - AARDAPPELVERWERKING

Frietbedrijf – 4 nieuwe condensors – 7.200 kW

Nieuwe units – overweging

- Werken op stadswater met indikking 2 & passivatie met Lubron BPS Plus 2
- Extra investeren in Lubron 4- Cooler RO en 'natuurlijk' passiveren

Conclusie

- Investering in Lubron 4-COOLER RO bleek beste keuze
- Meerkost passivatie kwam op circa 15.000 euro
- Ruime besparing mogelijk op water –en productverbruik

Besparing door investering:

- Ruim 35% waterbesparing
- Ruim 80% (!) besparing op anti-kalk/corrosie product

Extra voordelen

- Verzinkte batterij blijft veel beter beschermd tegen white rust vanwege gunstigere pH en lage TAC
- Geen intensieve passivatie met specifieke behandelingsproducten
- Geen jaarlijkse herconditionering nodig

CASE



SAMENVATTING

Investering in membraantechnologie als voorbehandeling van verschillende type koeltorens kan leiden tot:

- Waterbesparing
- Productbesparing
- Langere levensduur van de installatie
- Eenvoudigere initiële passivatie verdampingscondensors en vloeistofkoelers

CONCLUSIE: WATER –EN
PRODUCT BESPARING

Case per case te bekijken - afhankelijk van

- Beschikbare waterkwaliteit en haalbare indikkingsfactor
- Kost per m³ afname en per m³ lozing
- Kost per kWh elektriciteitsverbruik
- Toepassing water
- Koelvermogen en te verwachten belasting/jaar
- Kosten product dosering
- Type materiaal dat gebruikt wordt

Samen tot compleet vergelijk komen
=> capex - opex

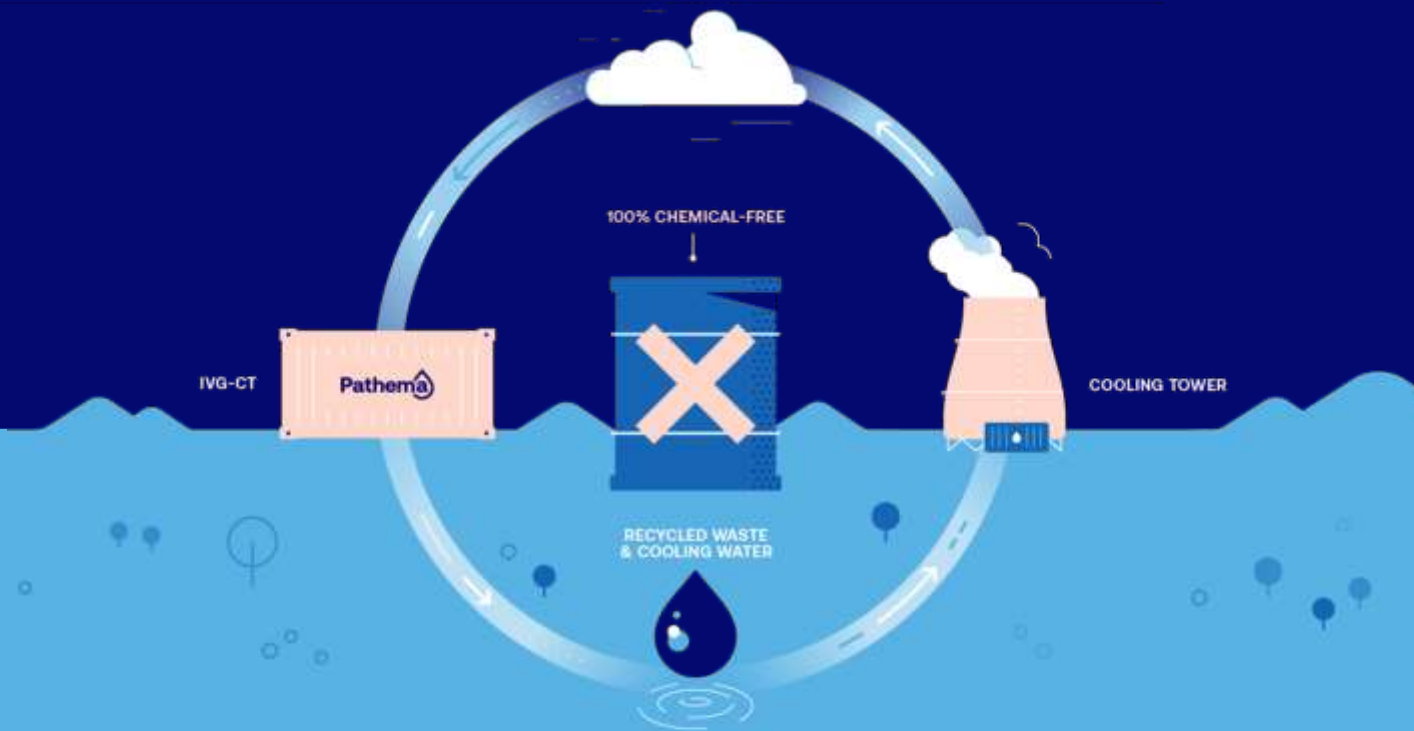
LUBRON

WATER IS
NOOIT
ZOMAAAR
WATER

www.lubron.eu

Circular cooling

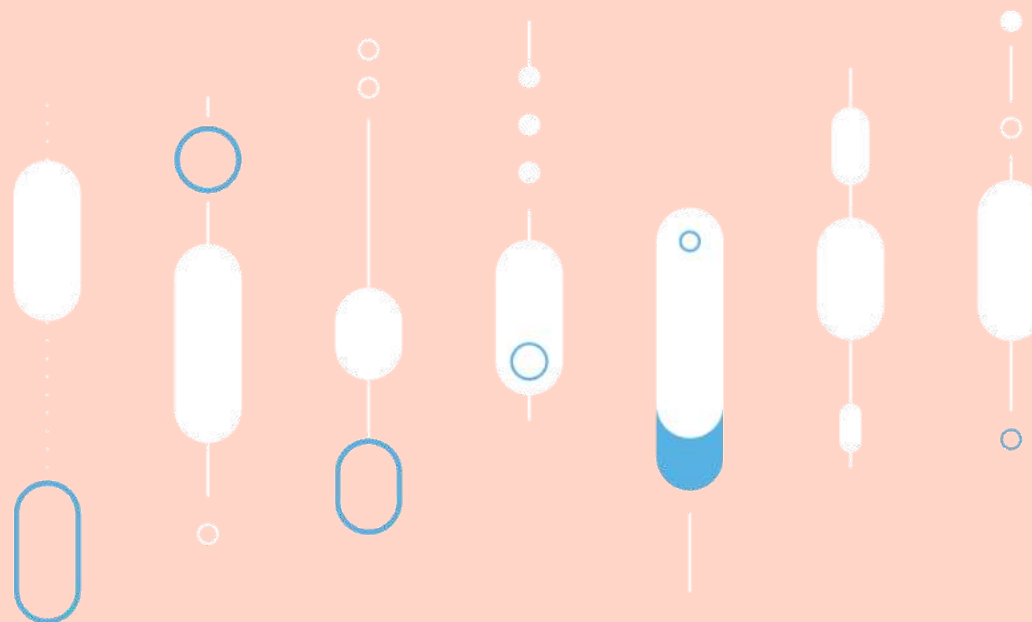
Simple by nature



Koelen

Circulaire of lineaire koelwaterbehandeling?

Het koelen van restwarmte in de industrie is het meest efficiënt en energiezuinig door middel van waterverdamping. Dit proces is in principe circulair; verdampt water komt schoon terug via de waterkringloop. Helaas maken veel bedrijven voor hun koelproces nog gebruik van chemicaliën, die onze waterkringloop vervuilen. Door deze vervuiling wordt dit - van nature circulaire - proces, een lineair en eindig proces van Take, Make & Waste.





YouTube link animation circular cooling water
<https://youtu.be/JmoAeQtbBq4>

TAKE, MAKE, WASTE

Circular cooling;
simple by nature

REDUCE, REUSE, RECYCLE

Uitdaging en beperkingen

1

Door uitbreiding van productie meer Verdampingscondensors

2

Koelwater inname leidingwater verwacht winter 14-24m³/hr

Koelwater inname leidingwater verwacht zomer 24-49,5 m³/hr

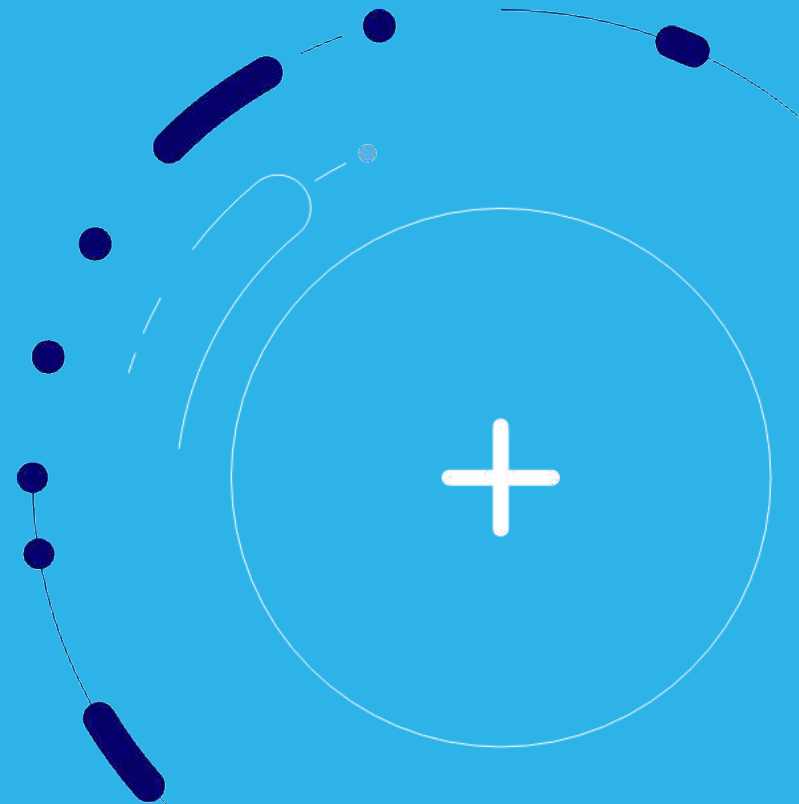
Stoom productie inname leidingwater verwacht gemiddeld 12m³/hr

3

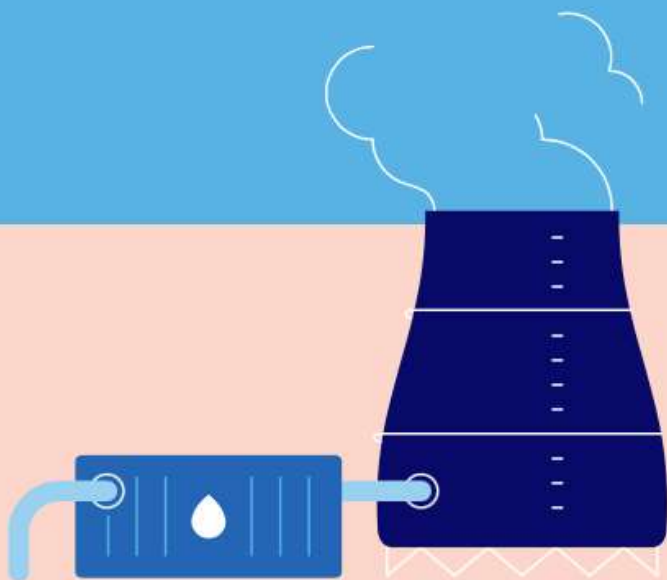
Maximale inname 48m³/hr door waterleiding bedrijf

4

Klant uit de aardappelverwerking wil koelen met zo min mogelijk water en min mogelijk chemicaliën



REDUCE



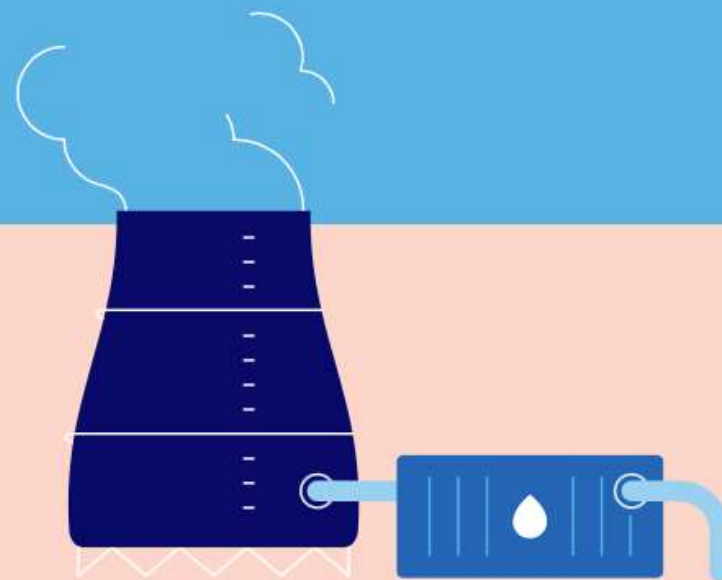
**1. Voor
filtratie**

REUSE

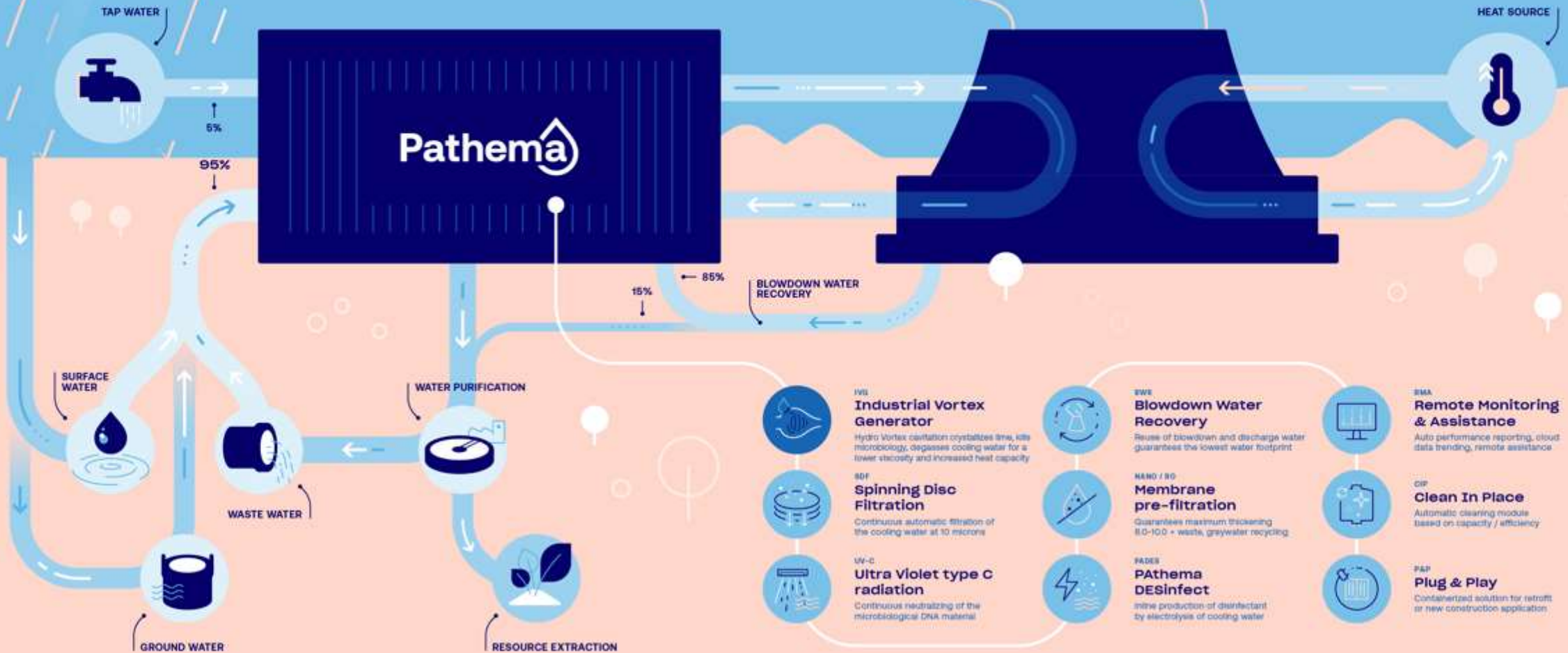


**2. Koelwater
behandeling**

RECYCLE



**3. Recovery &
support**



IWS Industrial Vortex Generator
Hydro Vortex cavitation crystallizes lime, kills microbiology, degasses cooling water for a lower viscosity and increased heat capacity



SDF Spinning Disc Filtration
Continuous automatic filtration of the cooling water at 10 microns



UV-C Ultra Violet type C radiation
Continuous neutralizing of the microbiological DNA material



BWR Blowdown Water Recovery
Reuse of blowdown and discharge water guarantees the lowest water footprint



MAFS Membrane pre-filtration
Guarantees maximum thickening 8.0-10.0 + waste, graywater recycling



PAFS Pathema DESinfect
In-situ production of disinfectant by electrolysis of cooling water



RMA Remote Monitoring & Assistance
Auto performance reporting, cloud data trending, remote assistance



CIP Clean In Place
Automatic cleaning module based on capacity / efficiency



P&P Plug & Play
Containerized solution for retrofit or new construction application

INDUSTRIAL VORTEX GENERATOR – Cooling Tower – Waste Water Recovery

IVG-CT WWR Containerised



• SDEF



• UV-C



• PADES



• NANO



• IVGG



• CIPP



• RMA^M

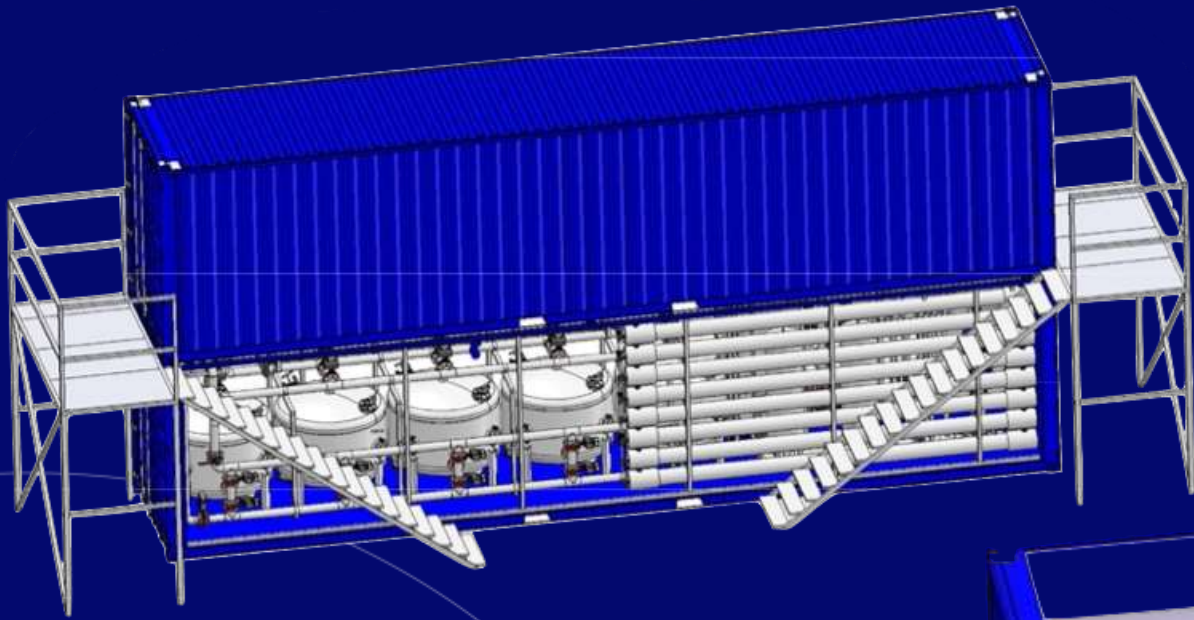


• P&P

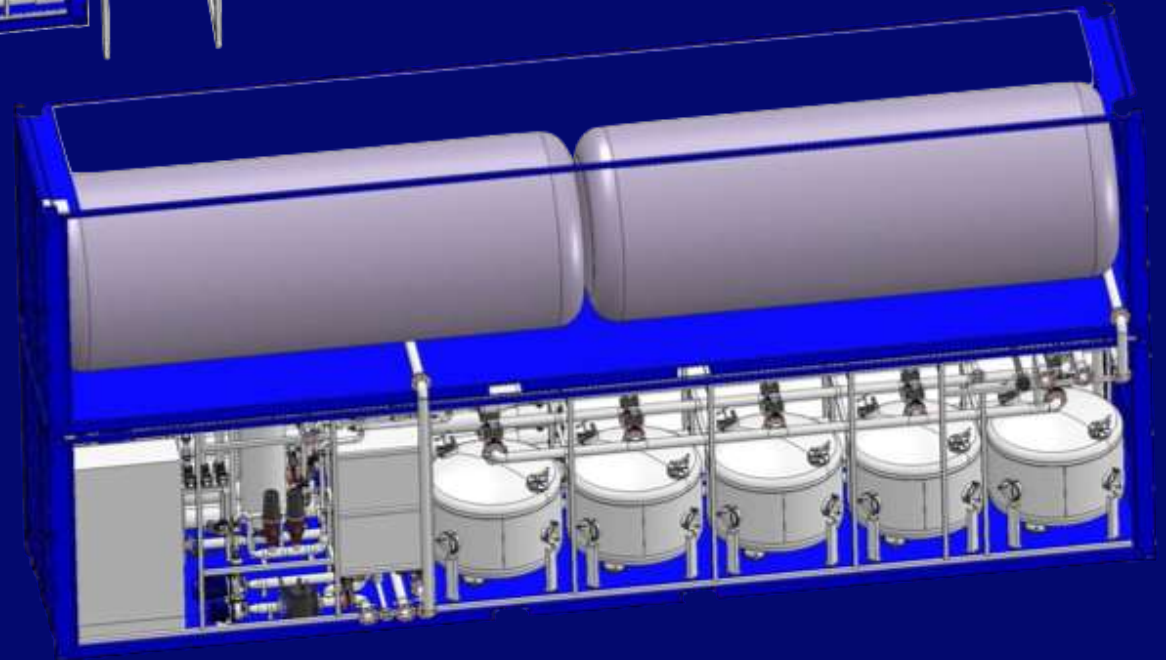


• BWR/R





IVG20 WWR30 containerized



Problem Case

Aardappel verwerking

IVG INSTALLATIE	VOOR	NA
Verdampend vermogen in MW	24	24
WATERVERDAMPING in M ³ /h	37,20	37,20
WATERVERBRUIK in M ³ /h	68,20	42,51
Indikking koelwater	2,2	10
Chemicaliën verbruik in kg / jaar	28.644	0
Lozing spui water op	Riool RWZI	



LEIDINGWATERVERBRUIK

-94%



RETURN ON INVESTMENT

2,7



CHEMIEVERBRUIK

-100%



CO2 BESPARING

-63%








Reduce, Reuse & Recycle

Circular cooling, simple by nature!

Mark Boeren | MVA
013 - 78 202 01
www.pathema.nl

 sales@pathema.nl
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 [pathema bv](#)



7) Q&A en afsluiting



B2Match

- Matchmaking platform voor virtuele meetings.
- B2Match heeft een eigen oplossing voor videoconferenties, dus het is niet nodig om extra software te downloaden.
- De matchmaking is nu geopend en u kunt beginnen met het plannen van vergaderingen. Vergaderingen kunnen elke dag worden gepland van 09:00 tot 17:00, **tot en met September 29**.
- Zie de pagina 'How it works?' op de B2Match website (<https://digitale-vlaams-nederlandse-matchmaking.b2match.io/>) voor een uitgebreide uitleg over virtueel matchmaken.
- Als u problemen heeft met het plannen van vergaderingen of tijdens de vergaderingen, neem dan s.v.p. contact op met: Valerie.Verjans@watercircle.be / +32 (0) 473 56 58 67 of l.omvlee@wateralliance.nl / +31 613363434

