Royal HaskoningDHV
*Enhancing Society Together*

# Ephyra®

## Introduction into a state-of-the art, plug-flow AD technology

Danny Traksel

Presentation for WRF | 16th March 2021

**Restricted distribution**

# Overview presentation

## Introduction

- objective of presentation
- our solutions and people

## Ephyra® technology

- key elements
- development and performances
- references

## Q&A

# Company profile

Royal HaskoningDHV
*Enhancing Society Together*

## Independent international engineering and consultancy firm

- expertise and experience of almost 6,000 colleagues in over 150 countries
- top 50 engineering companies worldwide with annual turnover € 600+ million (2019)
- leadership in sustainability and innovation
- combining global expertise with local knowledge
- offers excellent, high quality and professional consultancy services
- combined with state of the art, patented products and technologies
- unique partnering arrangements with academic and research institutions
- continuously research into better, sustainable and innovative solutions

# Our solutions

Nereda® a product of Royal HaskoningDHV

Ephyra® a product of Royal HaskoningDHV

Themista® a product of Royal HaskoningDHV

Crystalactor a product of Royal HaskoningDHV

kaumera nereda® gum

OPIR by Aquasuite® a product of Royal HaskoningDHV

BURST by Aquasuite® a product of Royal HaskoningDHV

FLOW by Aquasuite® a product of Royal HaskoningDHV

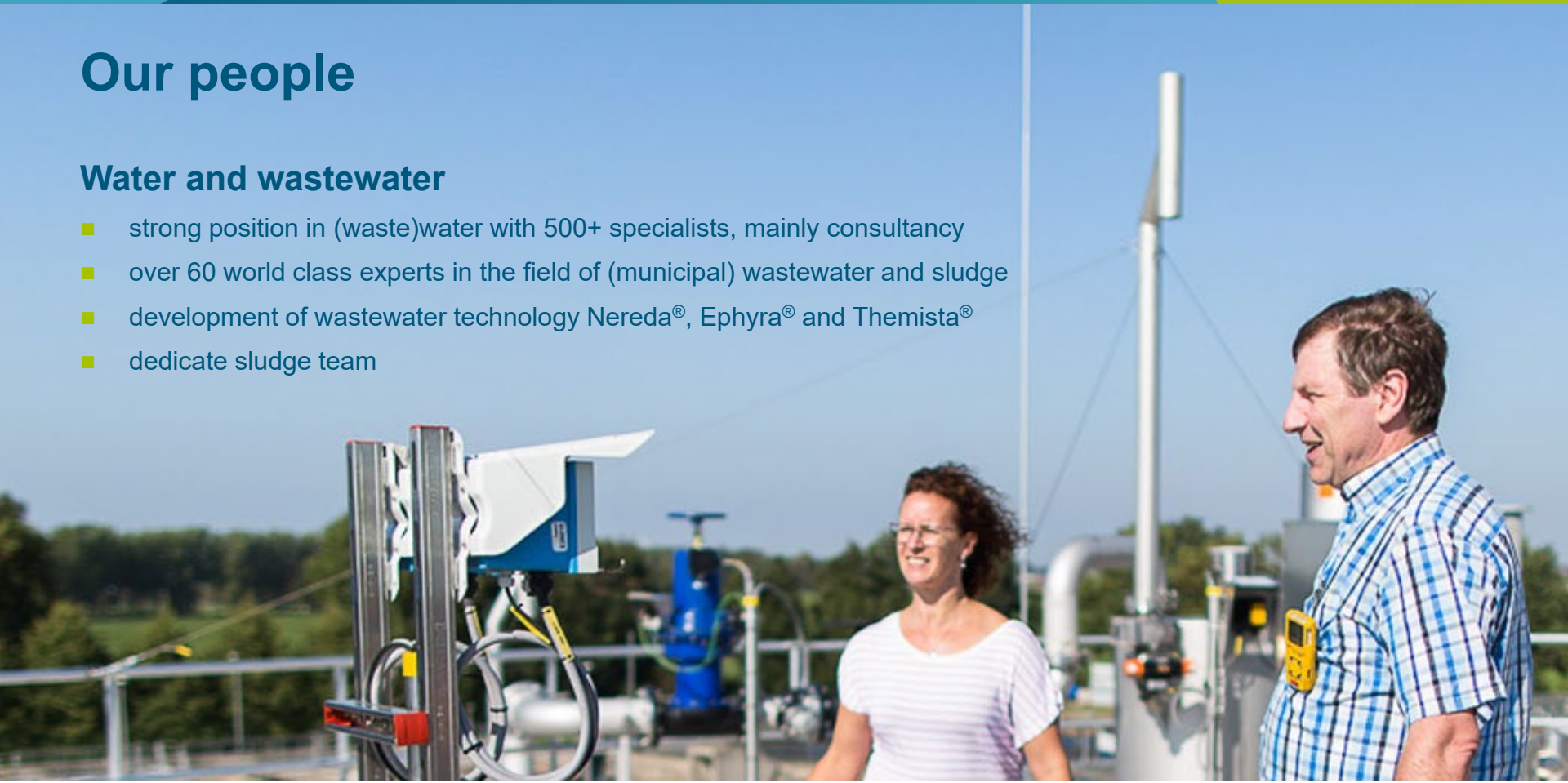
PURE by Aquasuite® a product of Royal HaskoningDHV

MINE by Aquasuite® a product of Royal HaskoningDHV

# Our people

## Water and wastewater

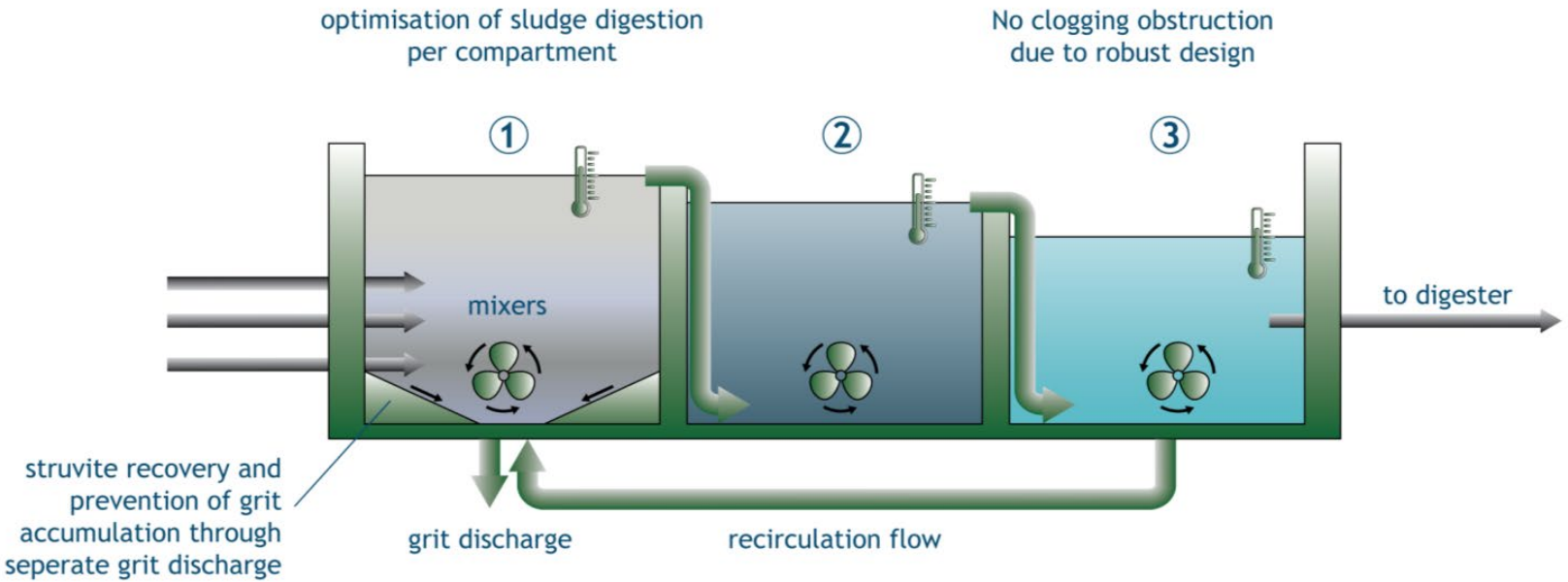
- strong position in (waste)water with 500+ specialists, mainly consultancy
- over 60 world class experts in the field of (municipal) wastewater and sludge
- development of wastewater technology Nereda®, Ephyra® and Themista®
- dedicate sludge team



# Our sludge team

(not on picture are Eline, Ellen and Sigrid)

# Ephyra® technology



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# Ephyra® overview

## Features

- high-rate plug flow digestion
- multiple reactors in series (2 – 4)
- integrated reactor concept or separate reactors
- both greenfield, extension and retrofit application
- applicable as mesophilic and thermophilic digestion
- allow for short retention time as low as 6 to 8 days
- predictive Ephyra® Controller, Aquasuite® MINE

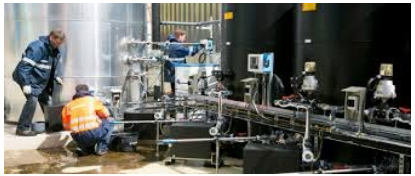
# Ephyra® development

**2010** **Technology development and lab scale experiments**



**2015** **Pilot scale (12 $m^3$) testing**





**2017** **First full scale (1,500 $m^3$) in operation**



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# Expansion Tollebeek WWTP, NL (2017)

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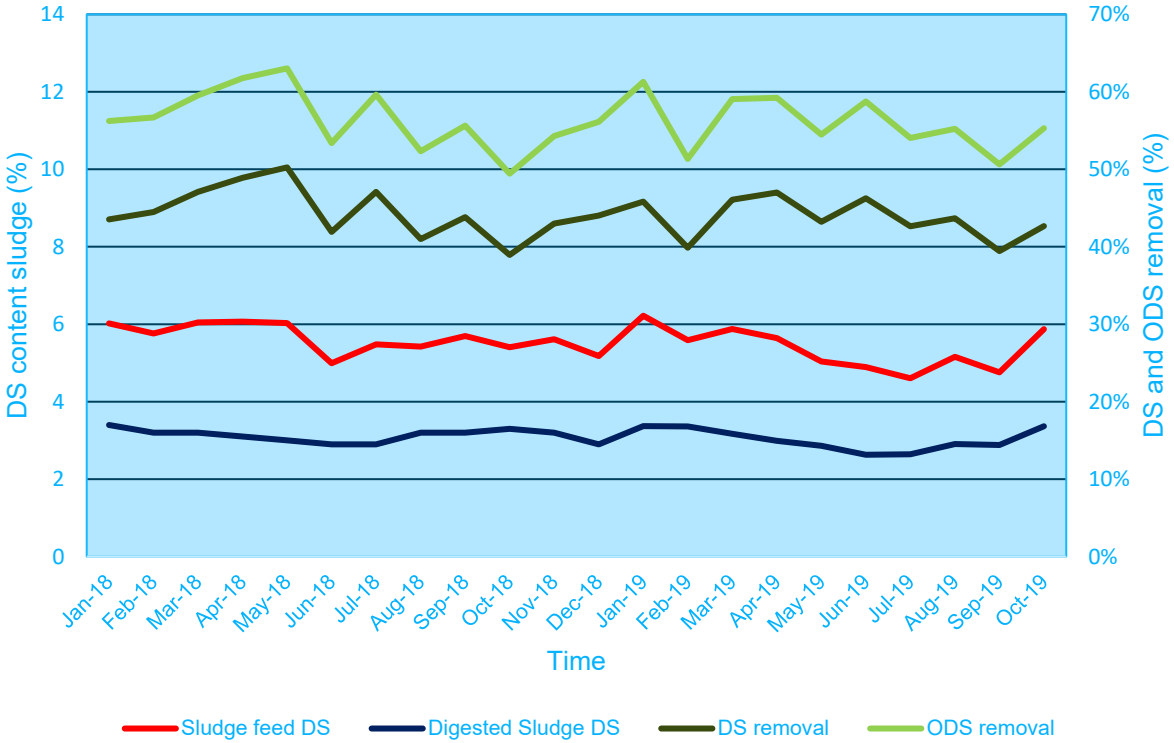
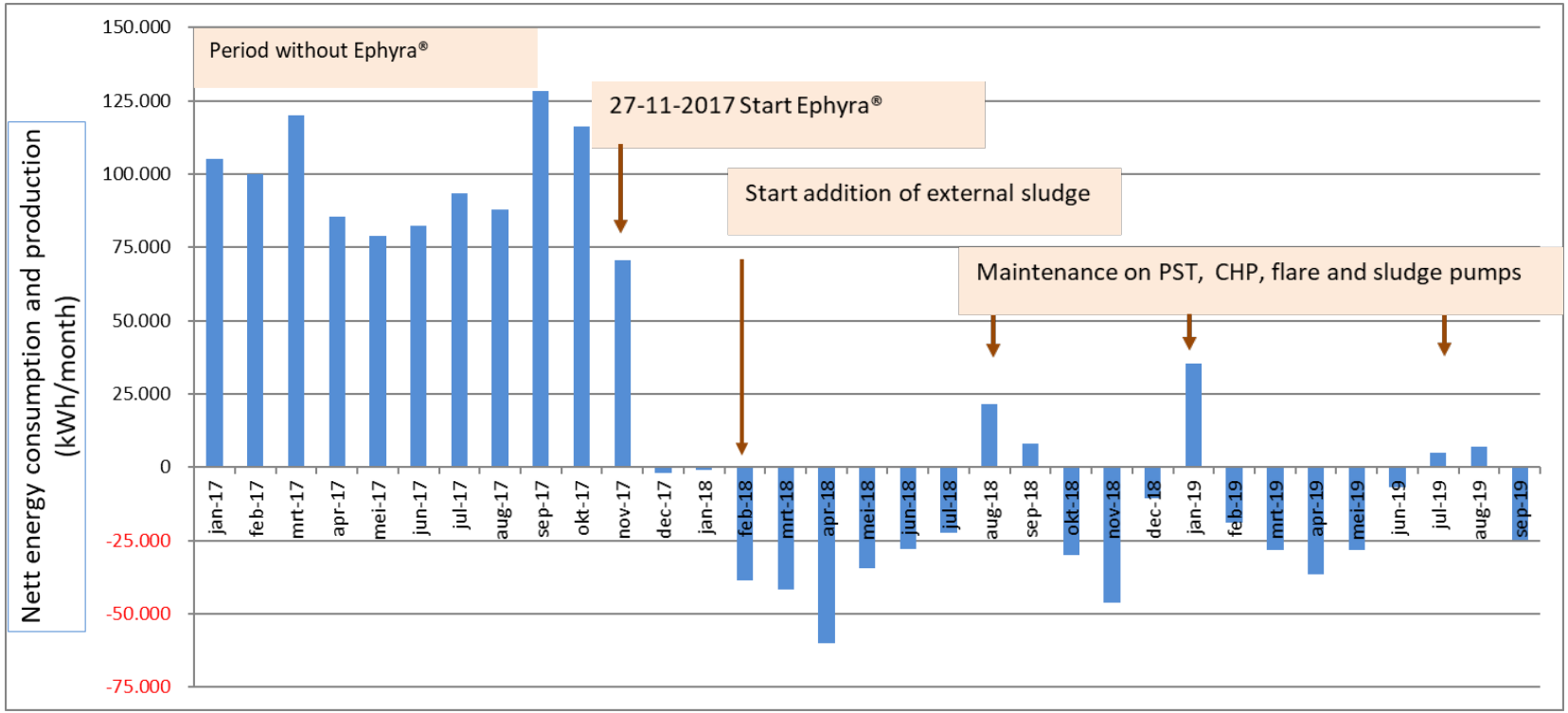
# Digester performance WWTP Tollebeek

(results provided by the Water Authority Zuiderzeeland)




# Nett energy performance at WWTP Tollebeek



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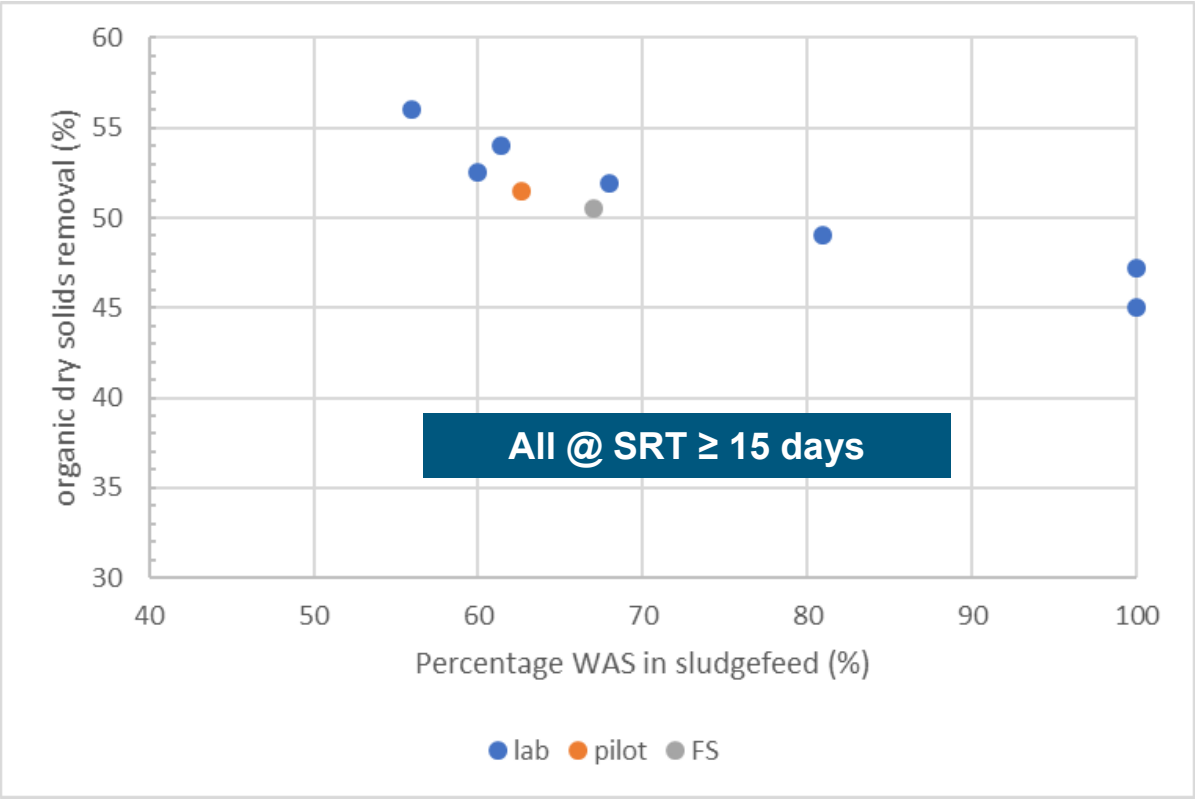
# Ephyra® lab, pilot and full-scale performance



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# Ephyra® performance

## Benefits and improvements*

- more sludge degradation (+20 to +30 %)**
- higher biogas production (+15 to +25 %)
- better sludge dewatering (+1 to +3 %)
- much shorter SRT
- lower chemical consumption (-20 %)
- option for P-recovery (struvite) and Biosolids Class A solids for agriculture

*compared to alternative, competitive digestion technologies

** average ODS removal Ephyra 56 % compared to average ODS removal single stage tank (in NL) is 36 – 44 %

# Ephyra® comparison

## Advantages Ephyra® compared to conventional mesophilic digestion

- expansion of sludge processing capacity (50 – 80 %) without adding reactor volume
- phase separation of the different processes allowing optimization of each process
- more favorable sludge degradation kinetics/quicker degradation of sludge
- more effective sludge retention time (SRT) distribution
- up to 20% improvement of total energy balance
- modular engineered for plug-and-play solution
- standard (or custom) reactor design
- easy installed in existing system(s)
- better dewatering properties

# Drivers for Ephyra® as sludge technology

## CAPEX savings

- reduction construction costs (smaller digesters)
- no need for additional digesters (space constrains)

## OPEX savings

- lower sludge volumes (better dewatering, higher ODS degradation)
- less energy consumption
- less chemical usages

## Revenues

- maximum biogas production by means of digestion for gas-to-grid (upgrading) or electricity
- high quality sludge (grade Biosolids class A or Enhanced quality) for land application (50 % in USA, 80% in UK)

## Other drivers

- reduction carbon footprint, lower GHC emissions (circular economy, energy transition, climate)
- focus on centralised sludge facilities

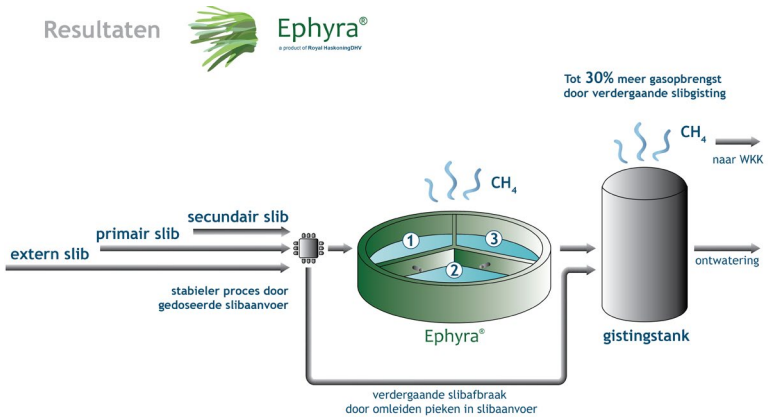
# Greenfield Sleeuwijk WWTP, NL (2019)

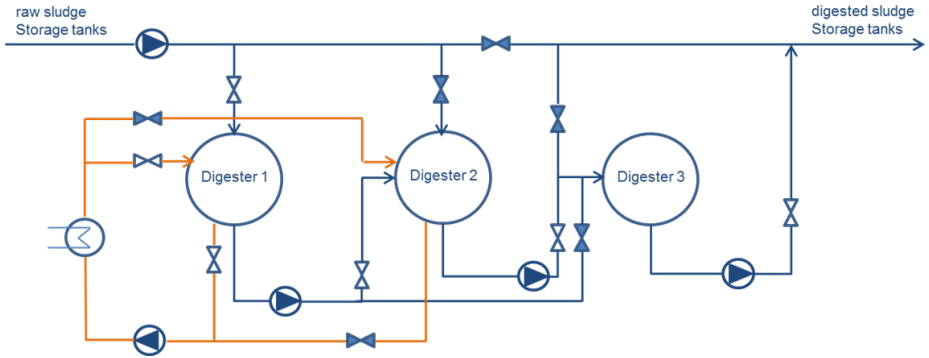
# Greenfield Energiefabriek West, NL (2020)

# Retrofit Soreq WWTP, ISR (2019 – 2021)

# Ephyra® developments and new projects

**From 7½ days SRT + post digester** → **7½ – 15 days SRT with / without post digester**




**1500 m³ Ephyra (3 x 500 m³) + 2000 m³ navergister**

**Ephyra® (3 x 6000 m³)**



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# Pilot Waterloo WWTP, CAN (2021)




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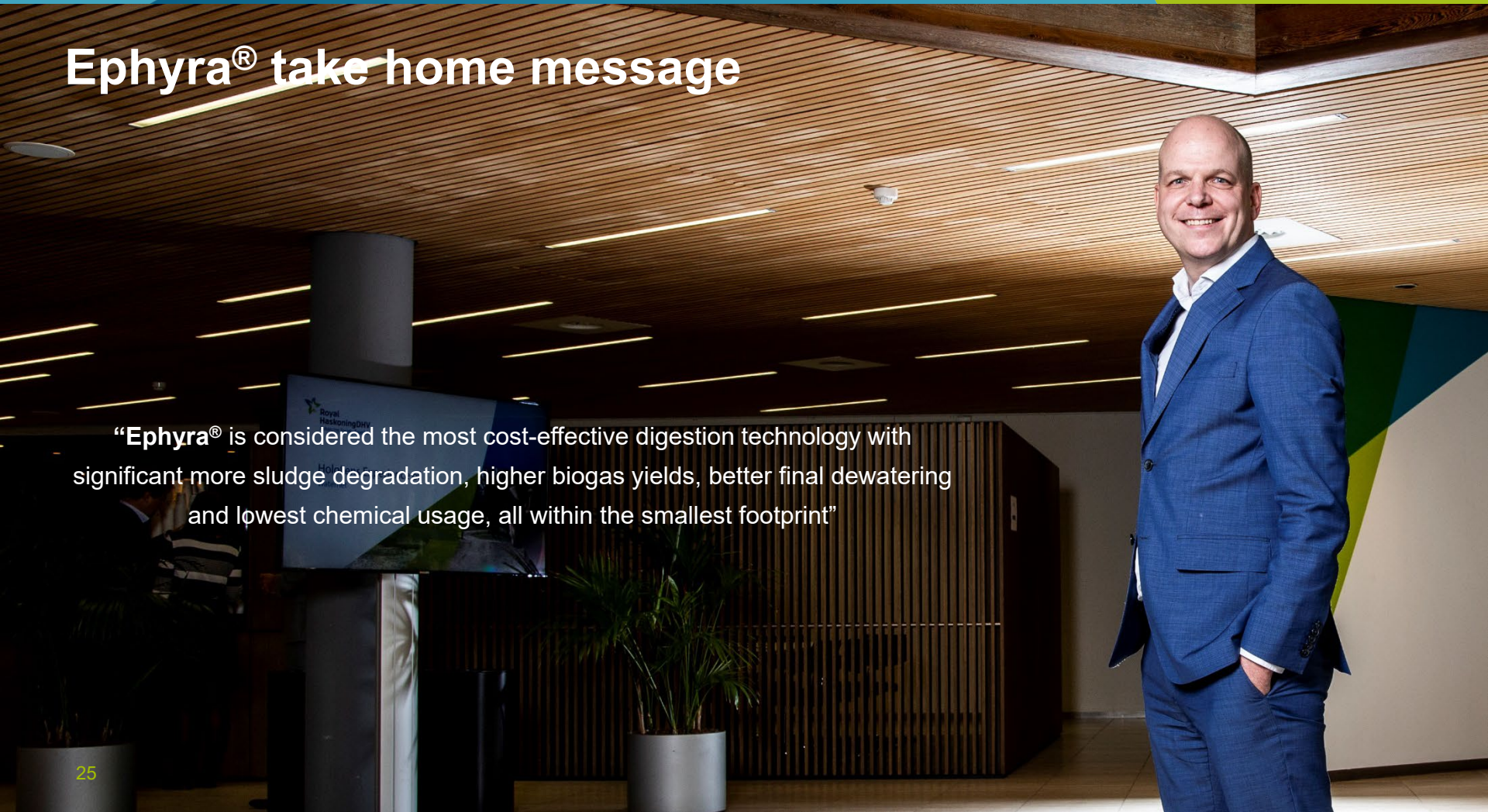
# Retrofit Ringsend WWTP, IRL (2021 – 2023)

# Q & A session

# Ephyra® take home message



**“Ephyra®** is considered the most cost-effective digestion technology with significant more sludge degradation, higher biogas yields, better final dewatering and lowest chemical usage, all within the smallest footprint”

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## Contacts

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