ULTRAKOMPAKT BIOLOGISK NITROGENFJERNING VED BRUK AV FORTETTET BIOMASSE

Spredningskonferanse: Fremtidens renseanlegg

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Thomas Bugge, SUEZ

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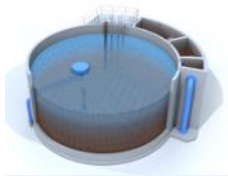
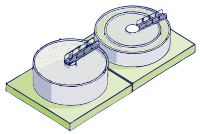
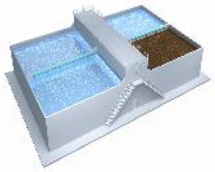
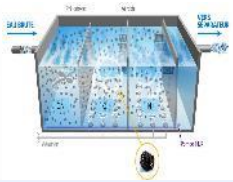
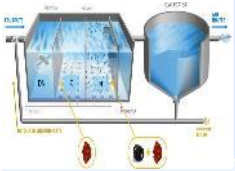
SUEZ' biological processes for nitrogen removal

Cyclor	Cyclor Turbo	Indense	Cleargreen Mainstream	Ultrafor	Biofor	Meteor MBBR	Meteor IFAS
							
	Suspended biomass				Fixed Film Biomass		Mixed biomass
Sequenced batch reactor	Densified biomass		Nitrate Shunt	Membrane bioreactor	Biofiltration	Moving bed bioreactor	Suspended biomedia and biomass
	Sequenced continuous reactor	Activated sludge					
Greenfield	Mainly Greenfield	Greenfield or brownfield	Mainly Greenfield	Mainly Greenfield	Greenfield	Greenfield	Mainly brownfield
Compactness	Compactness	Hydraulic or organic increase of capacity	Energy savings / production	Better treated water quality / Reuse	Compactness	Compactness	Hydraulic or organic increase of capacity
		Improved settling			Flexibility	Flexibility	

Boosting biological treatments : Cyclor Turbo & Indense

USING Ddensified BIOMASS :

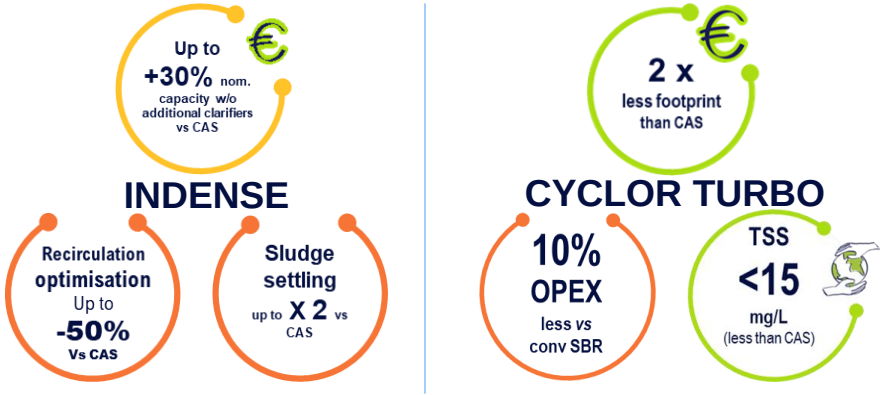
⇛ TO INCREASE THE CAPACITY OF WWTP

OR

⇛ TO REDUCE THE WWTP'S FOOTPRINT

CYCLOR TURBO

Sequenced reactor with **optimized footprint** and **fixed water level**

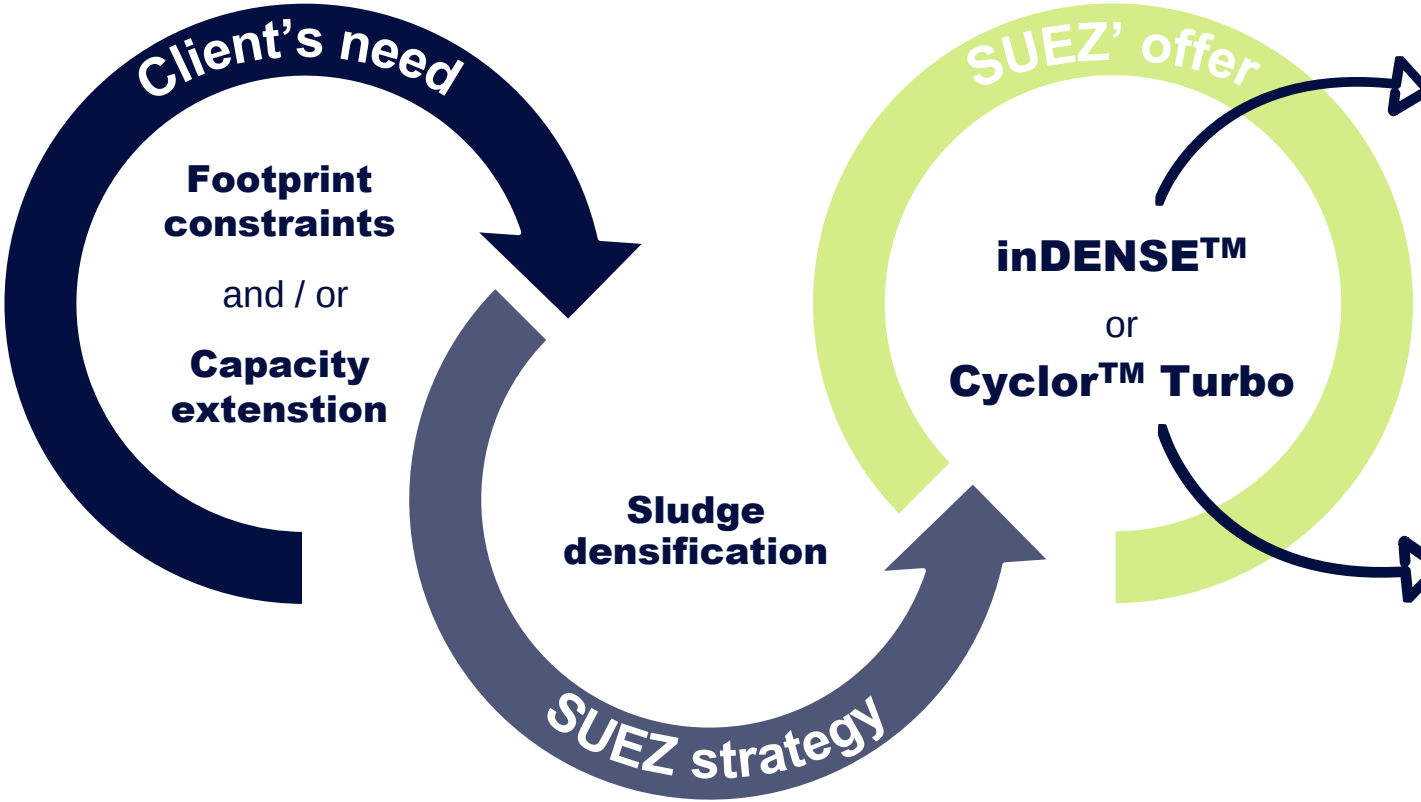


INDENSE

A **simple and robust** solution to **increase capacity** of conventional activated sludge

Densified sludge ? what for ?

A new solution for wastewater treatment



Add-on to conventional activated sludge system

EXTERNAL gravimetric selection

✓ New plant
✓ Existing plant

2 patents

Fixed level sequenced reactor

INTERNAL gravimetric selection

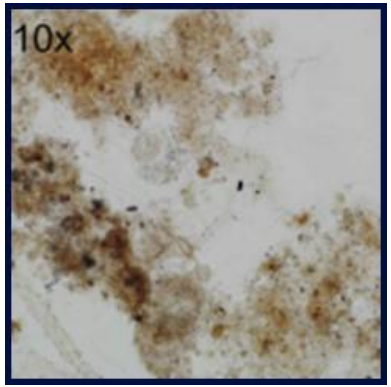
✓ New plant
✓ Existing plant

3 patents

Biomass densification

CONVERT

Conventional activated sludge

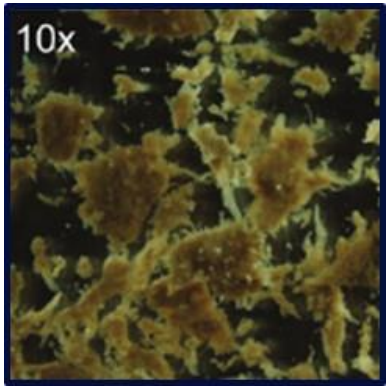


Floculated biomasse

INTO

Microbiome's modification

Densified sludge



Aggregated biomass

granulated

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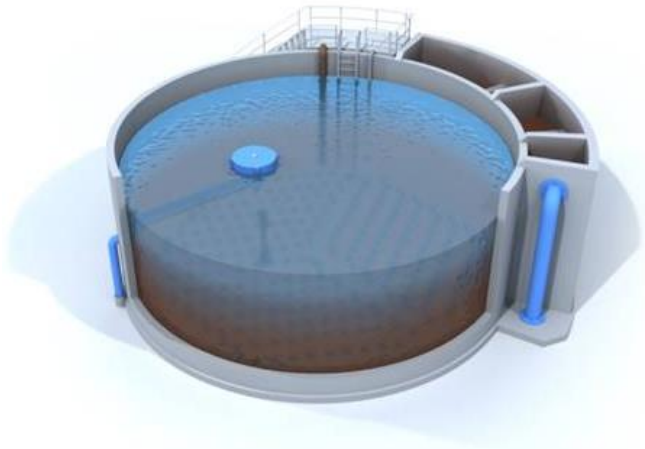
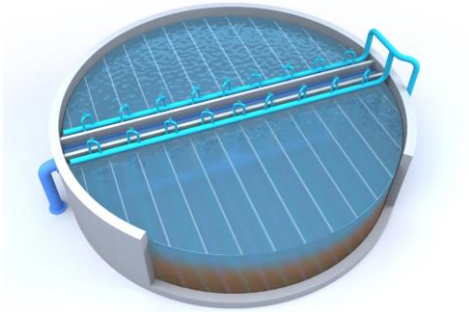
A BETTER TREATED WATER QUALITY WITH LESS CHEMICALS AND A SMALLER FOOTPRINT

From conventional SBR **to** **Cyclor™ Turbo**

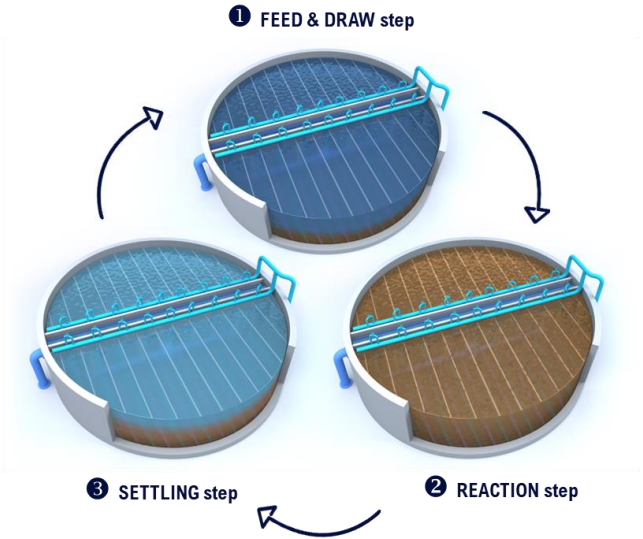




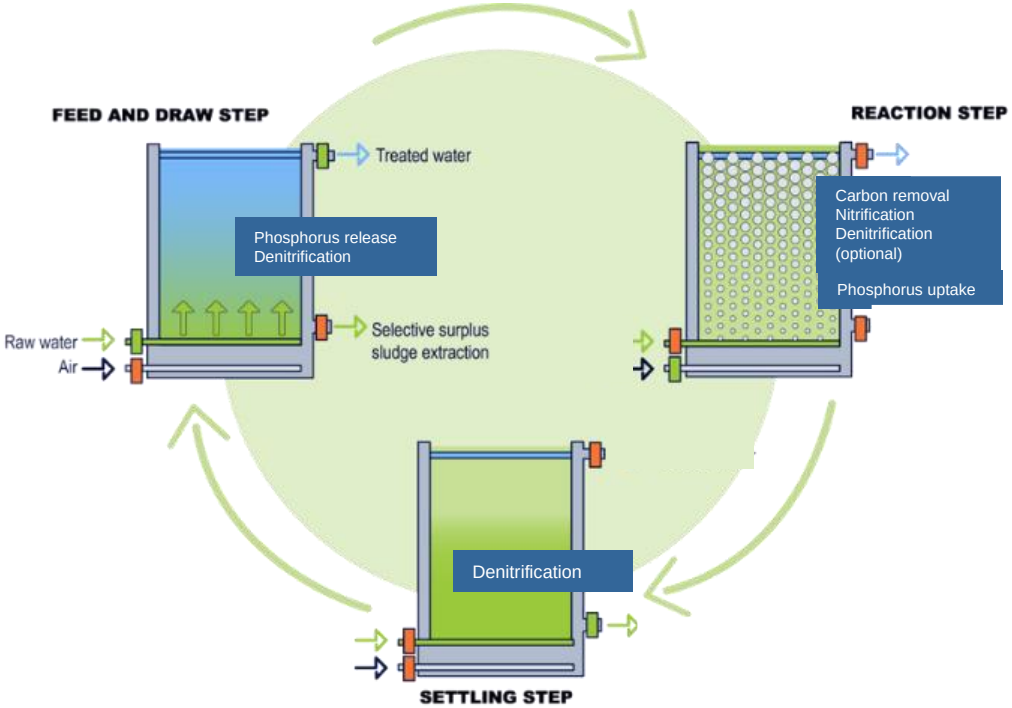
CYCLOR™ TURBO Operation

A CONSTANT LEVEL SEQUENCED REACTOR:

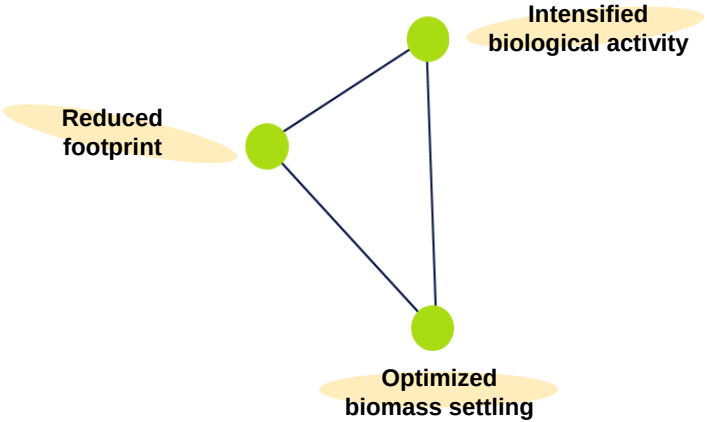
- Raw water inlet at the bottom of the reactor
- Simultaneous extraction of treated water by the top (pushed by via a piston flux by raw water)
- Intensification of denitrification and phosphorus biological removal by contact between raw water and sludge blanket
- Aeration subsequences to maximize nitrogen treatment and biological phosphorus removal
- Optimized settling phase
- New hydraulic conception



Cyclor Turbo : Fixed level sequenced biological reactor



Densified biomass selection without external equipment



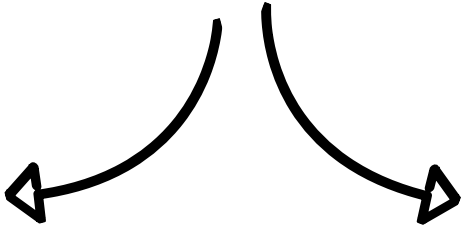
For greenfield and brownfield projects

OPEX saving

10% OPEX
Less vs conventional SBR

OPEX savings thanks to lower energy and chemical consumptions.

Chemicals



Energy

Reduction of metallic salts consumption for phosphorus removal.

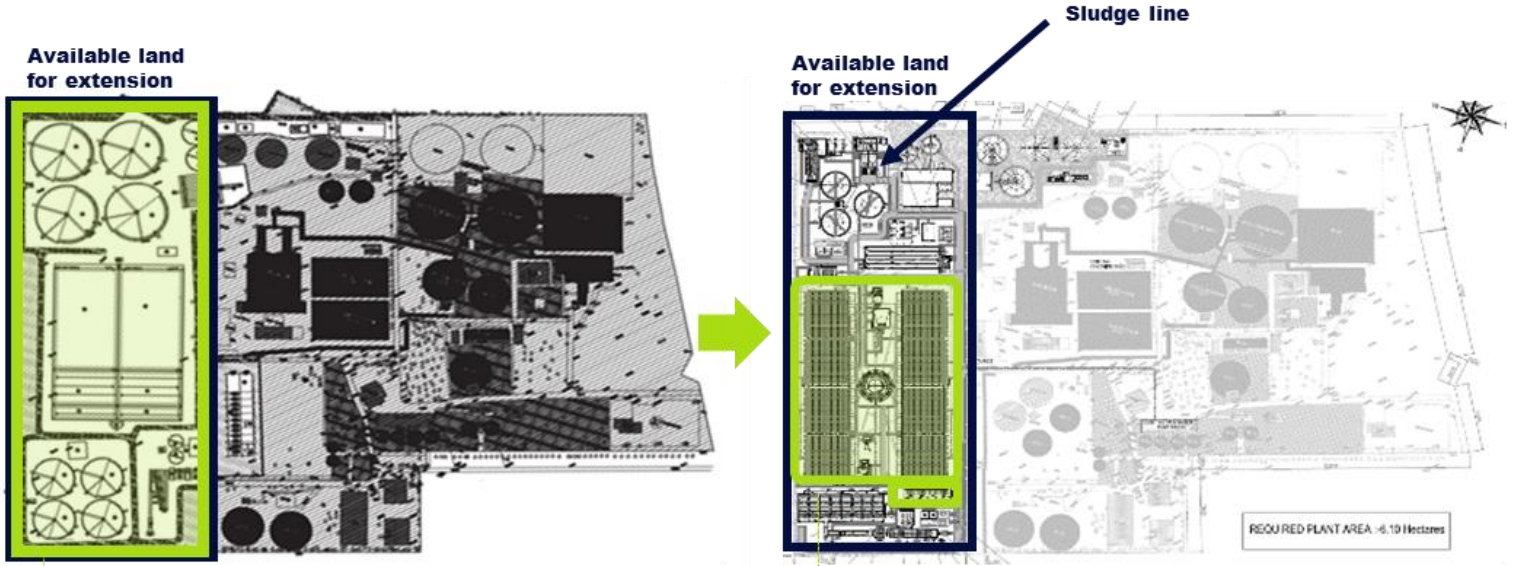
Reduction of sludge production thanks to lower metallic salts consumption.

Reduction of hydraulic headloss (- 3 meters) vs conventional SBR. Saving of 10 Watt/m^3

No recirculation needed

Footprint reduction

2 x
less footprint
than CAS



BASIC SOLUTION **with CAS***

water line footprint : 21,500 m²

No available area for sludge line

OPTIMIZED SOLUTION ***with Cyclor™ Turbo***

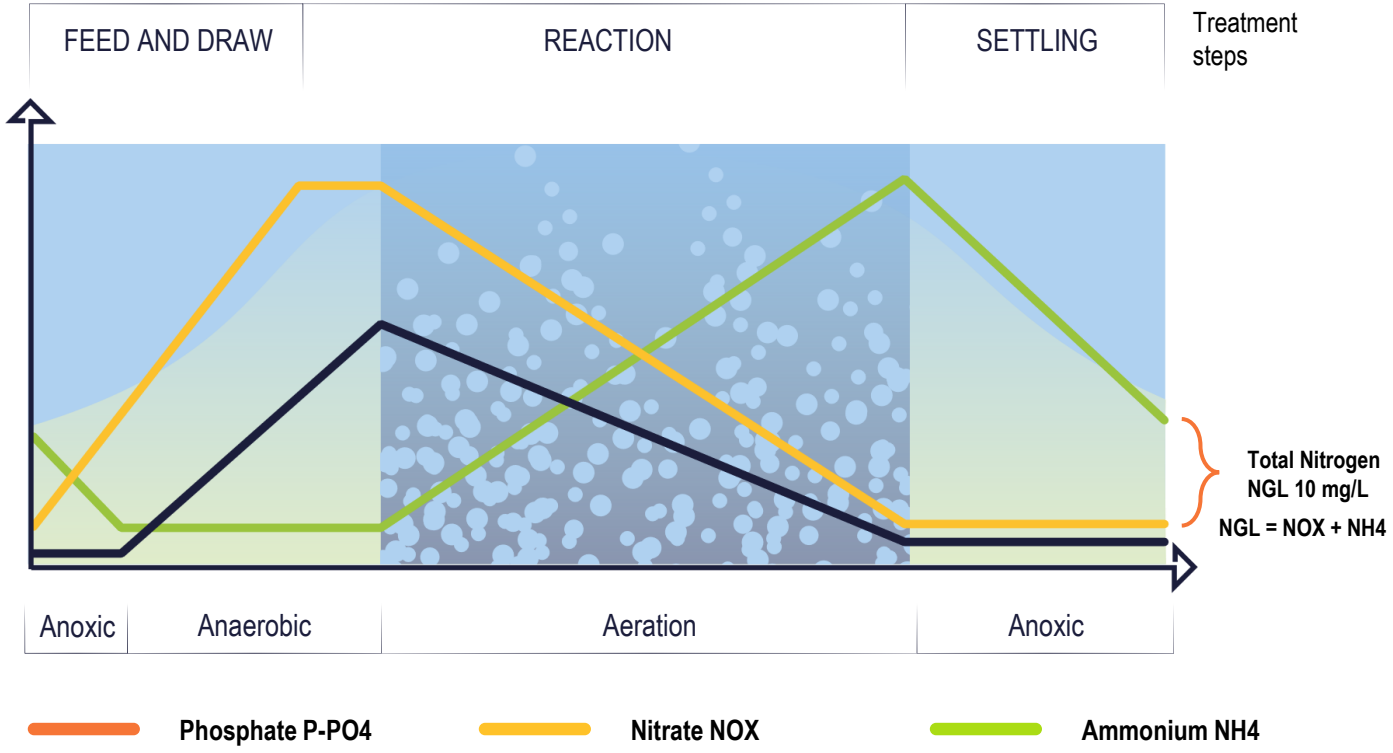
water line footprint: 11,280 m²

Available area for sludge line

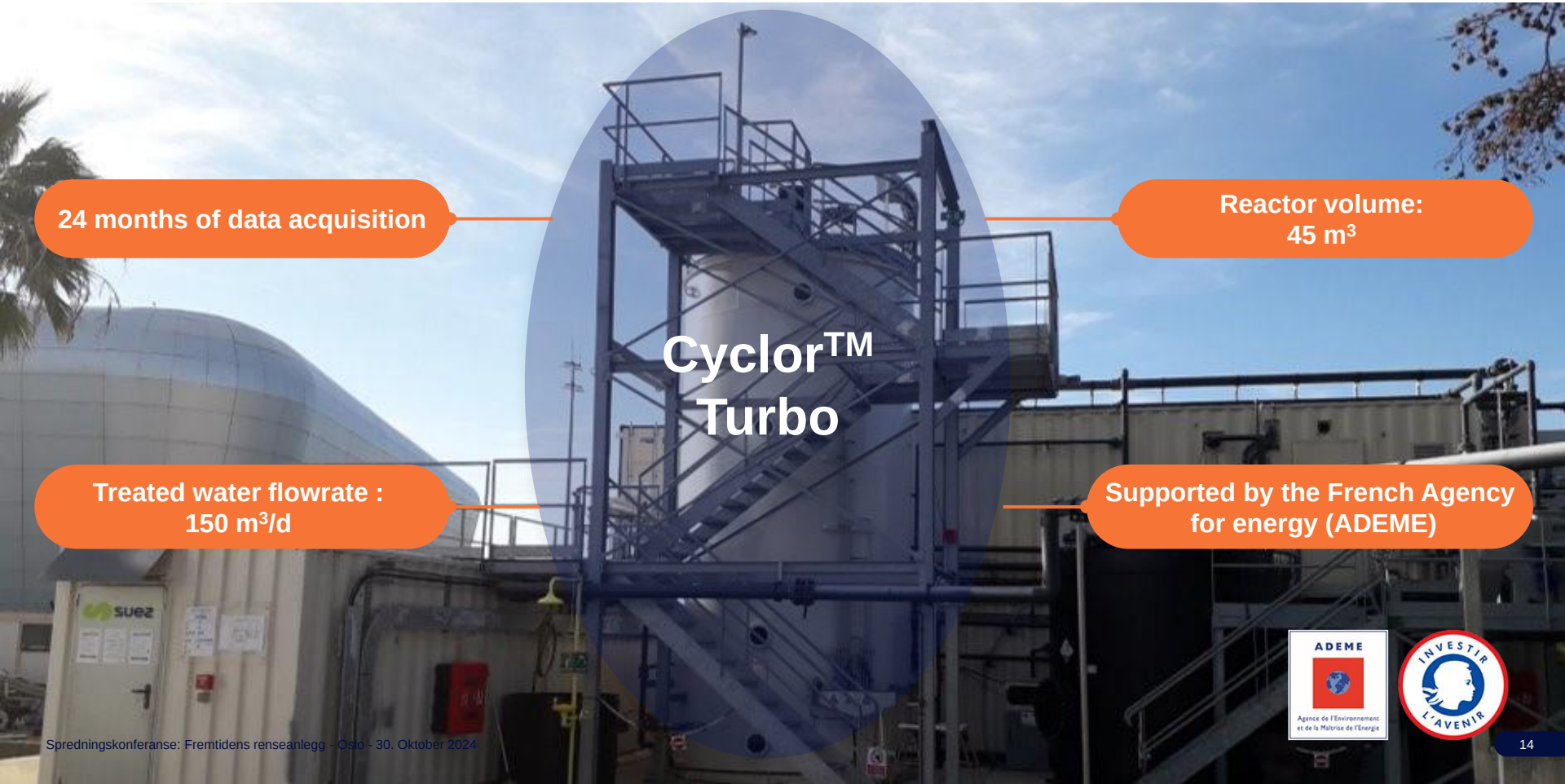
** Conventional Activated Sludge*

Pollutant concentration during the cycle

NGL
10
mg/L



One industrial demo plant



24 months of data acquisition

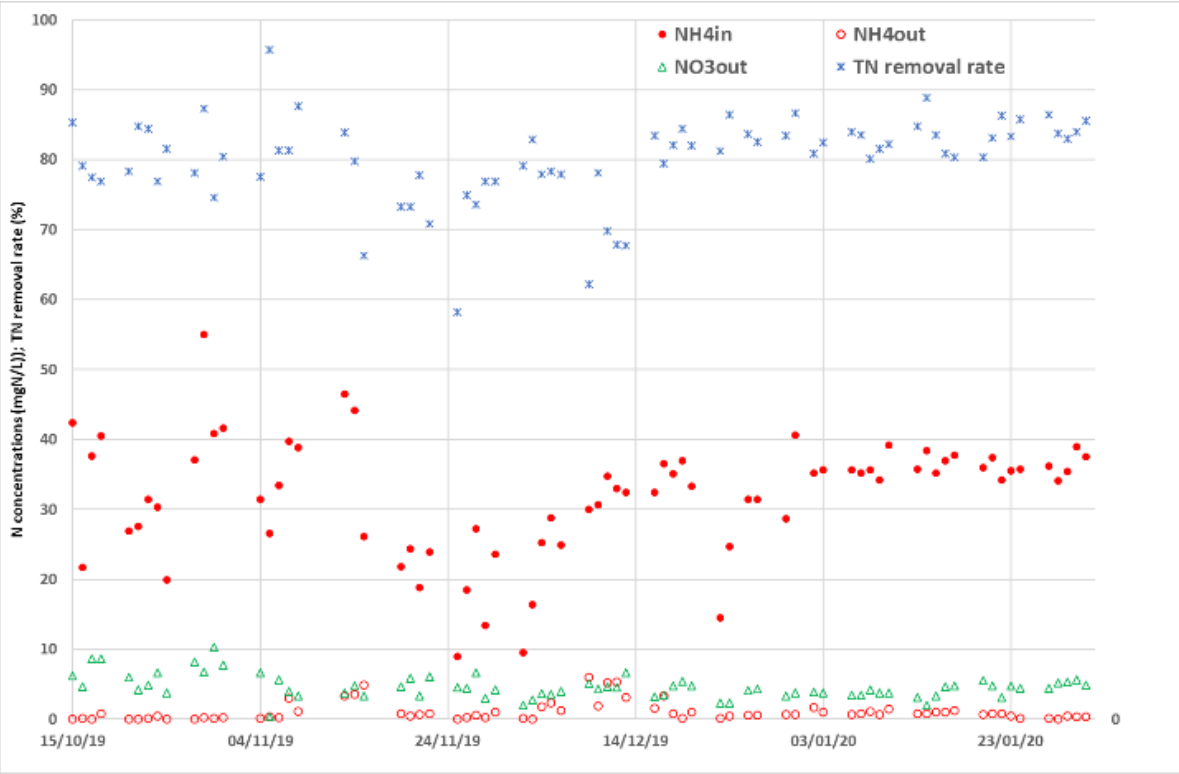
Reactor volume:
45 m^3

Cyclor™
Turbo

Treated water flowrate :
150 m^3/d

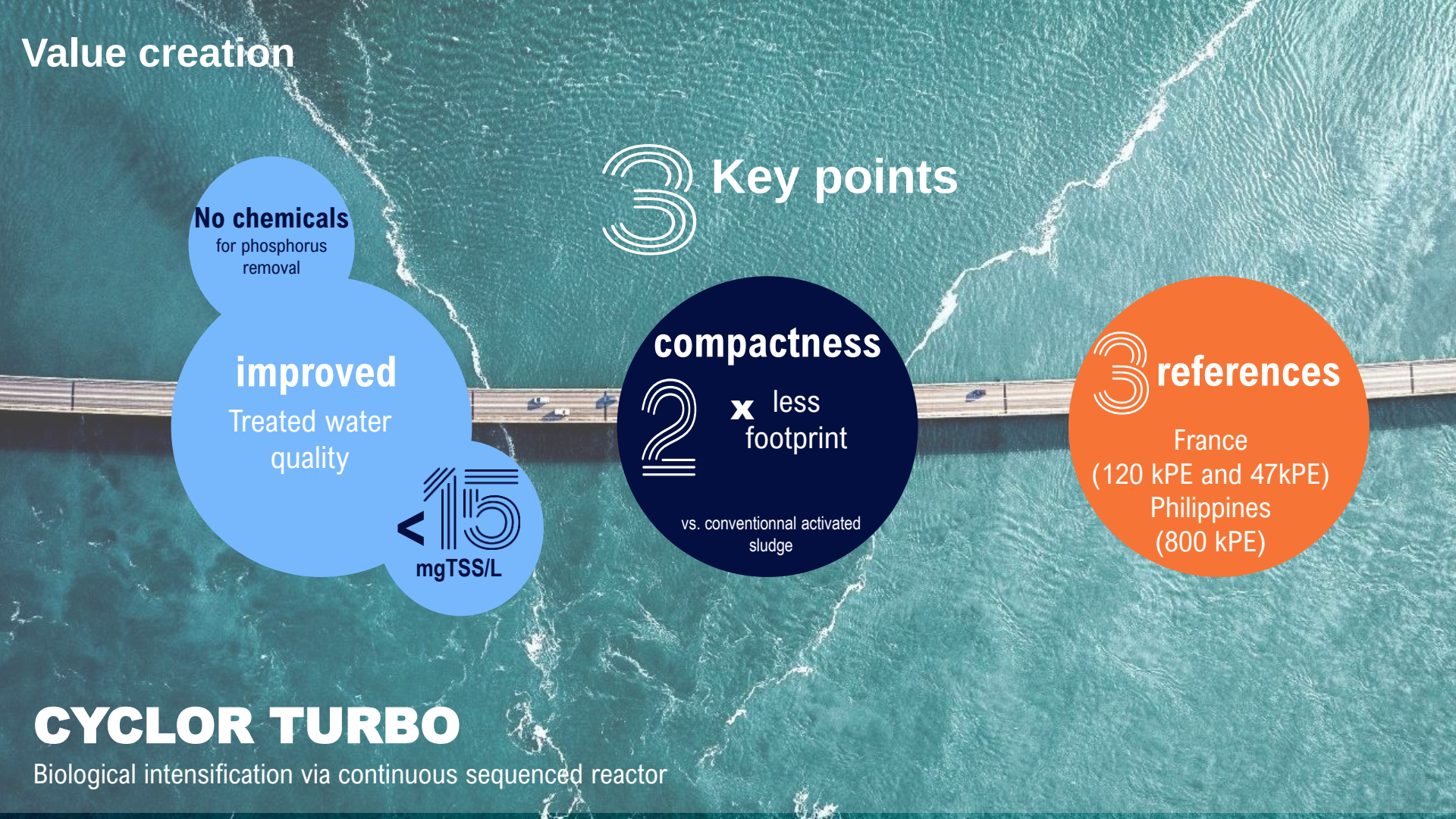
Supported by the French Agency for energy (ADEME)

Pilot results : removal performance



TN < 8 mgN/L

Value creation



3 Key points

No chemicals
for phosphorus removal

improved
Treated water quality

< 15 mgTSS/L

compactness

2 x less footprint

vs. conventionnal activated sludge

3 references

France
(120 kPE and 47kPE)
Philippines
(800 kPE)

CYCLOR TURBO

Biological intensification via continuous sequenced reactor

Libourne's WWTP

Client's needs and constraints

- Overloaded WWTP - 30 000 PE
- Demographic and regulation evolution
- Objective of biogas production

- Ecological corridors on-site
- Soil quality
- Continuity of service

Caracteristics

3 Cyclor Turbo cells
47 000 PE ; NGL 15 mg/L
11 000 m^3/d - 630 m^3/h peak

Flexibility and evolutivity
option : primary + methanization
without impact on number of cells

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Fokusområder for dette prosjektet

- UNDERSØKELSE AV MULIGHETEN FOR Å IMPLEMENTERE FORTETTING AV BIOMASSELØSNING PÅ AVLØPSANLEGGENE I DE 22 KOMMUNENE SOM INNGÅR I NORSK VANN-PROGRAMMET «FREMTIDENS RENSEANLEGG»
- IDENTIFISERING AV TRE SENTRALE SAKER FOR VIDERE UTREDNING:
  - LITEN (~1 000-10 000 PE)
  - MIDDELS (~20 000–50 000 PE)
  - STOR (> 100 000 PE)
- SIMULERINGSSTUDIE FOR Å VALIDERE YTELSEN TIL FORTETTET BIOMASSE UNDER DE FORHOLDENE SOM FORVENTES I NORGE (KALDT OG TYNT AVLØPSVANN)
- INGENIØRSTUDIE AV KONSTRUKSJONSDESIGN TILPASSET GJENNOMFØRINGEN MED FOKUS PÅ KORT GJENNOMFØRINGSTID OG LAVE BYGGEKOSTNADER PÅ GRUNN AV SVÆRT LAVT FOTAVTRYKK OG ENKEL DESIGN
- BENCHMARK FOR FORVENTET YTELSE OG ØKONOMISK VURDERING (CAPEX OG OPEX) SAMMENLIGNET MED TRADISJONELLE LØSNINGER FOR DE VALGTE TILFELLENE

RESULTATET AV DENNE INNLEDENDE PROSJEKTFASEN VIL VÆRE EN ANBEFALING FOR DE NESTE TRINNENE, SOM FORVENTES INKLUDERE ENDELIG PILOTTESTVALIDERING PÅ ETT ELLER FLERE AV DE STUDERTE ANLEGGENE OG HEREFTER FULDSKALA PERMANENT INSTALLASJON.

Thanks for your attention

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