



Treatment experience of industrial wastewater from rendering and bio-digestion industry

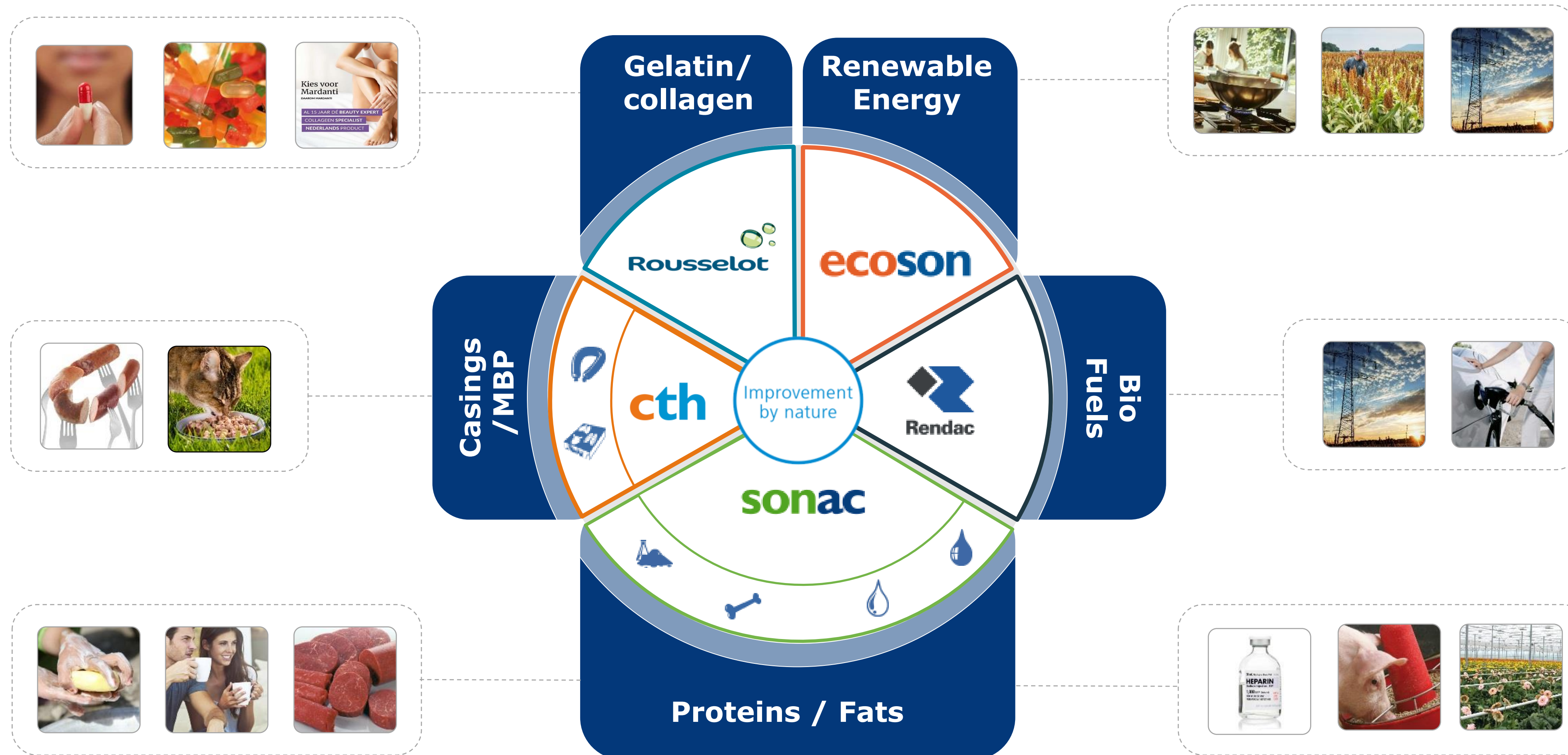
Arnt Vlaardingerbroek

November 8th, 2023

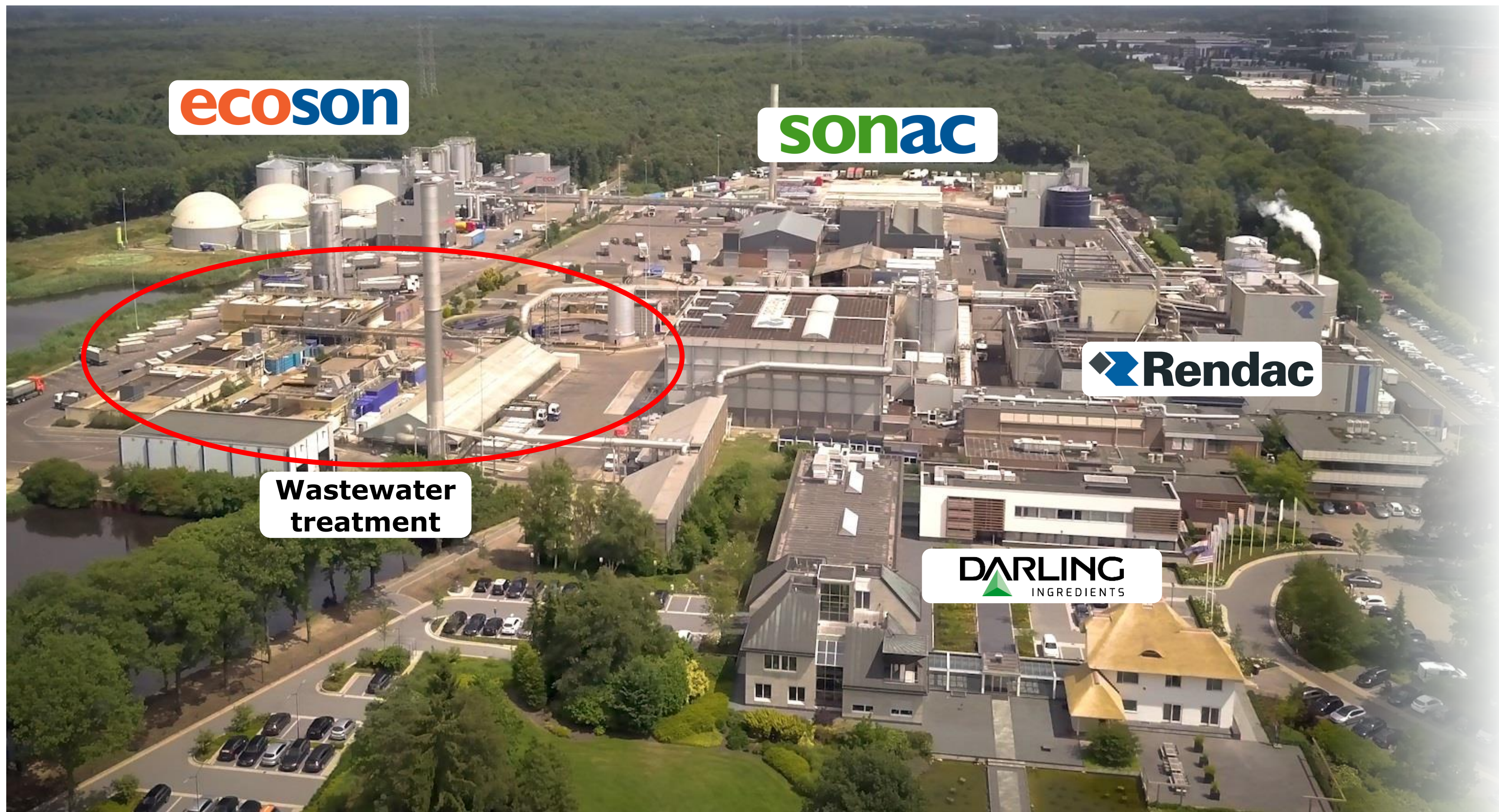
Introduction Darling Ingredients



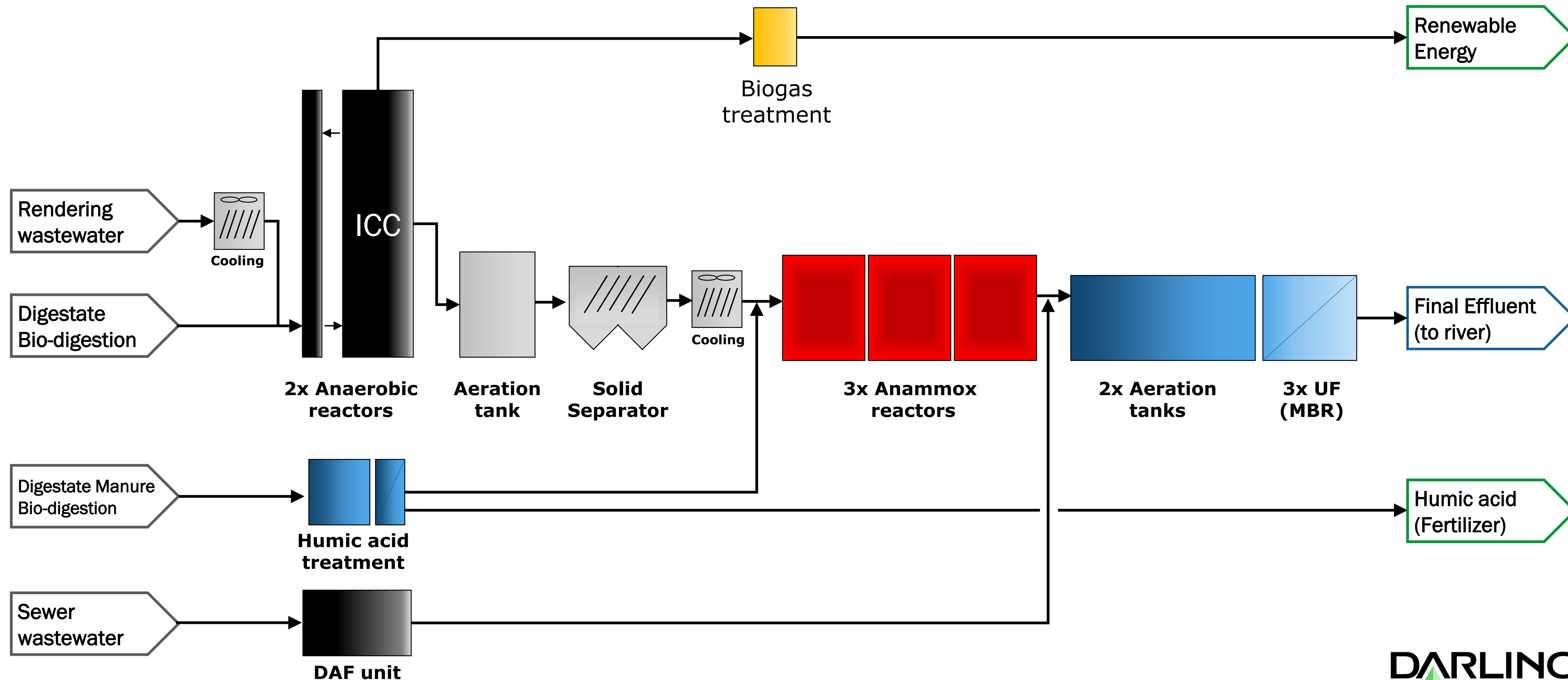
Introduction Darling Ingredients



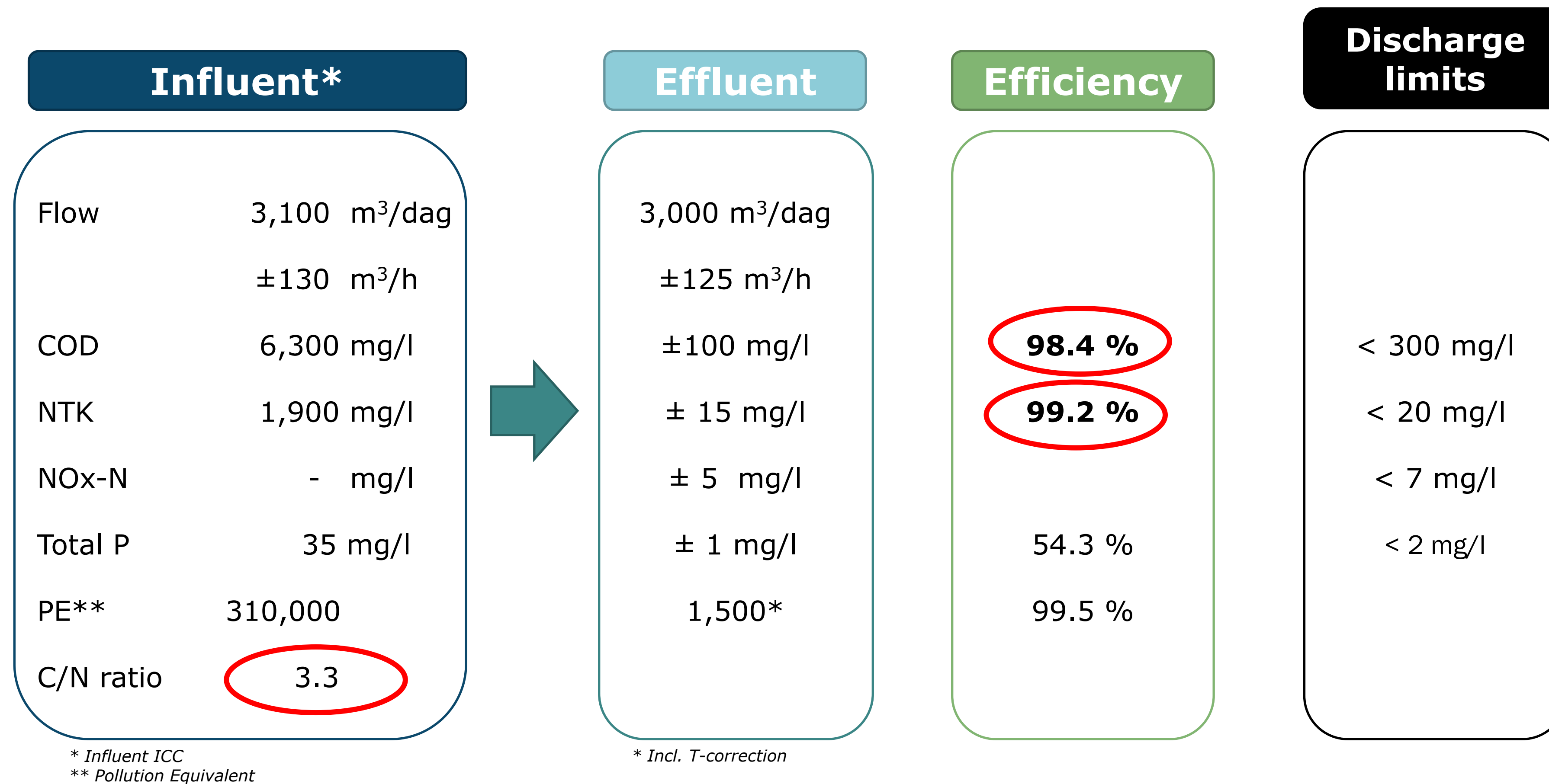
Location Ecoson, Rendac, Sonac (ERS) Son (Netherlands)



Industrial wastewater treatment

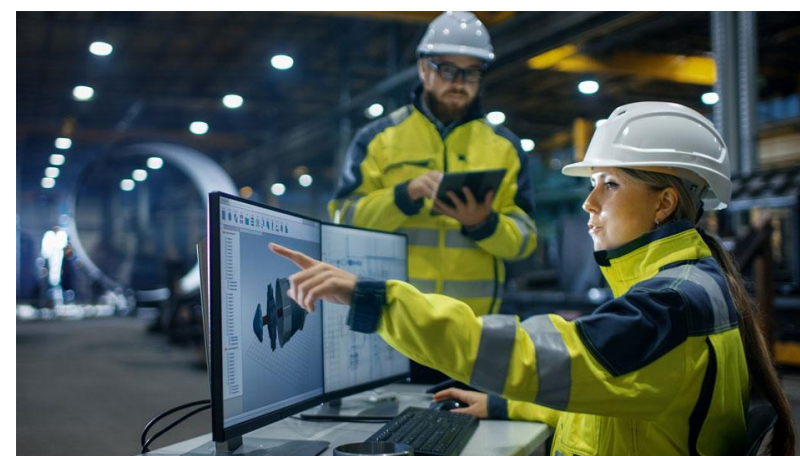


Treatment task



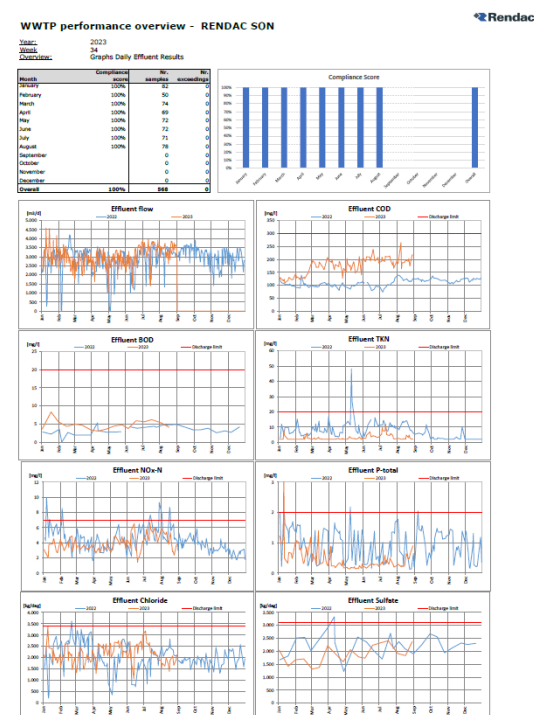
A very high treatment efficiency is needed to comply with the discharge limits!

Key components to achieve the treatment results



Personnel

Monitoring/
Data evaluation



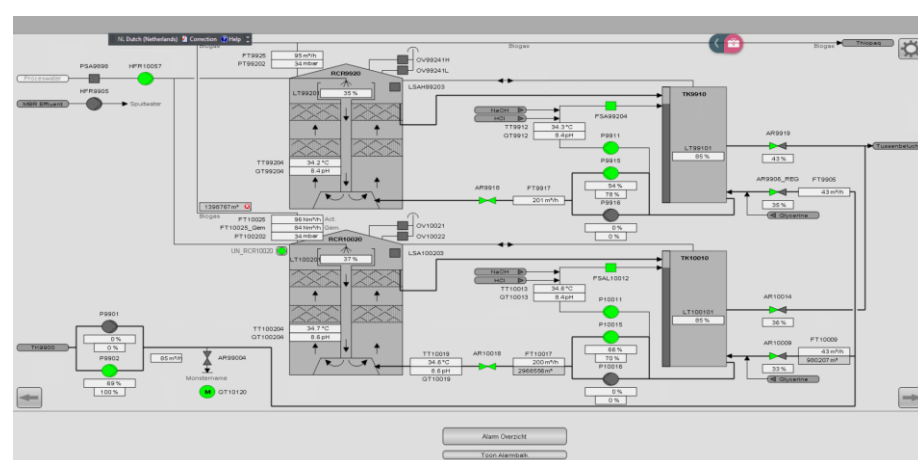
Training



AWZI
(BBT+)

Automation

Preventive
maintenance



Treatment step – Anaerobic treatment



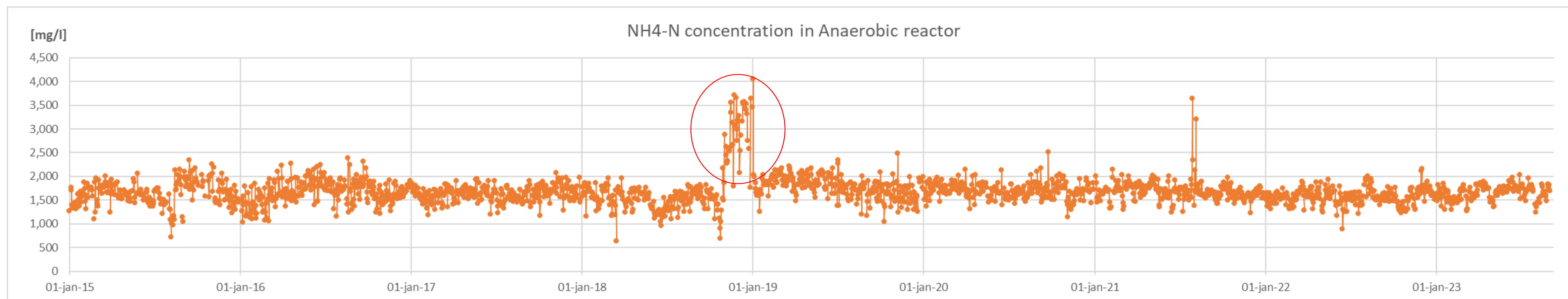
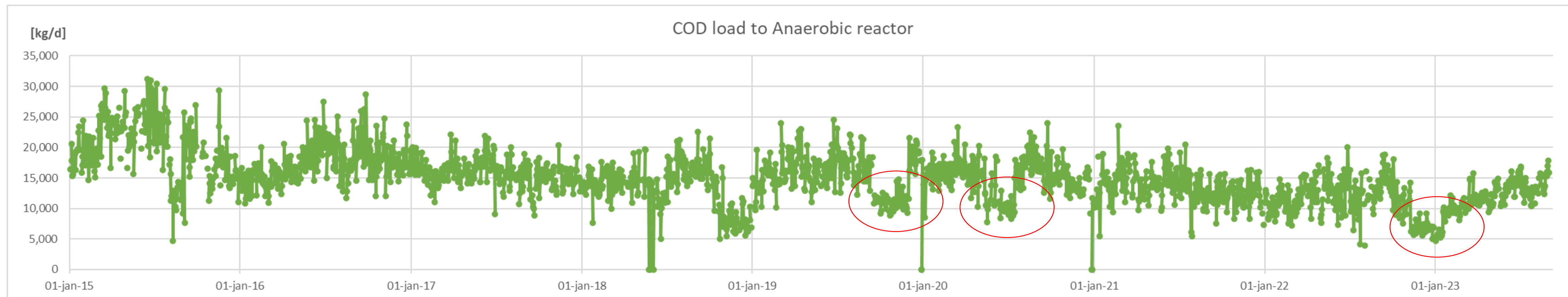
Key numbers

- 2 anaerobic ICC reactors
 - 1st reactor since 2013 in operation
 - 2nd reactor since 2021 in operation
- Limited to no sludge production
- COD load 8-12 kg/m³.d
- NH₄-N concentration ±1,800 mg/l
- COD removal 65-70%
- Methane concentration 90% CH₄
- H₂S biogas 4,000 -8,000 ppm
- Thiopaq for H₂S treatment

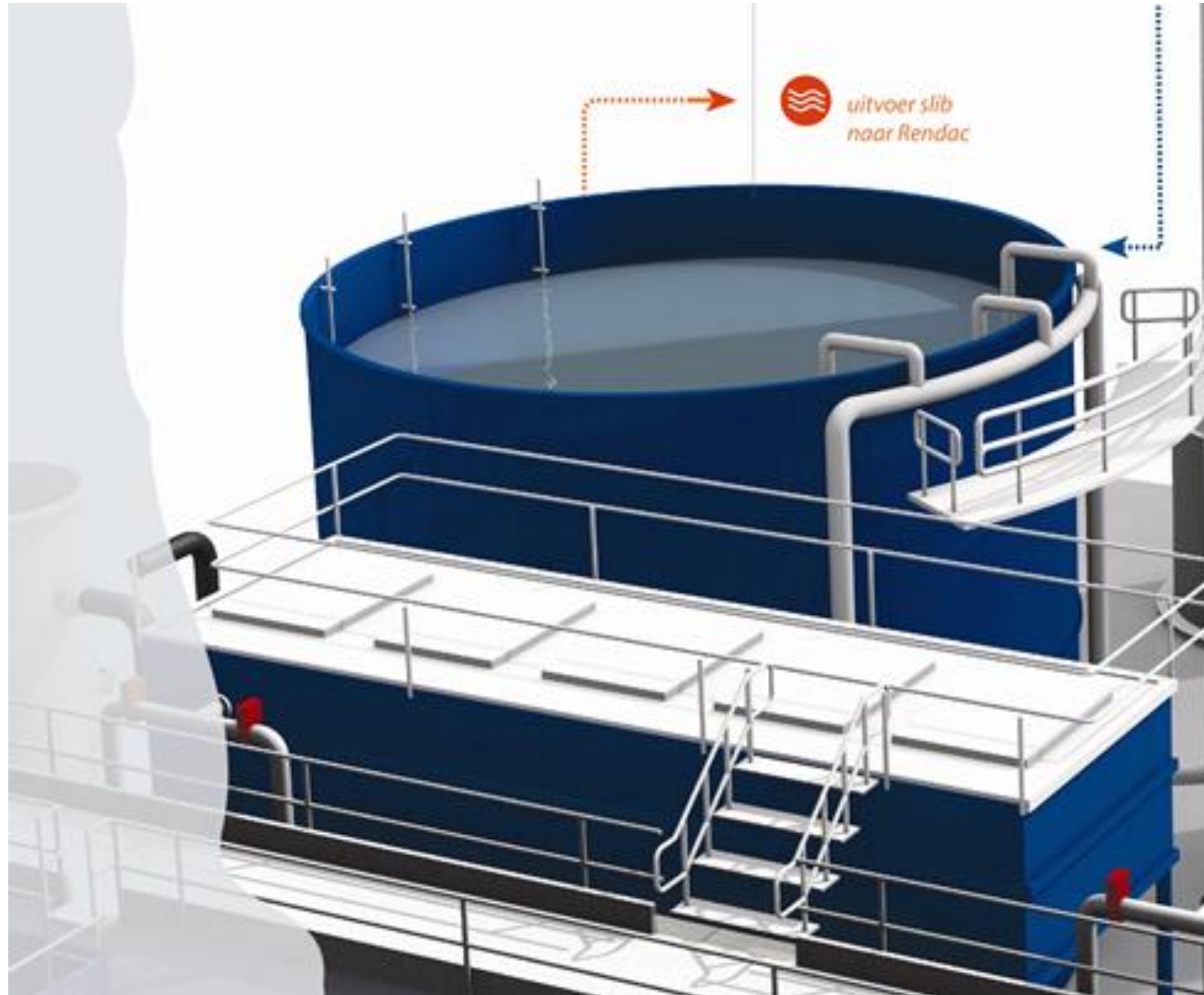
Savings compare to classical aeration

- Less sludge production (-75%)
- Energy production instead of consumption (+50%)
- Less external carbon (due to low COD/N ratio)

Treatment step – Anaerobic treatment



Treatment step – Intermediate aeration



Key numbers

- No biological sludge recirculation
- Hydraulic retention time \pm 9 hour
- COD removal 15-20%
- P removal 70% (with FeCl_3)
- Sulfide removal 100% (goal)

- Robust aeration system and reliable oxygen sensors is very important

Treatment step – Anammox treatment

Before 2018



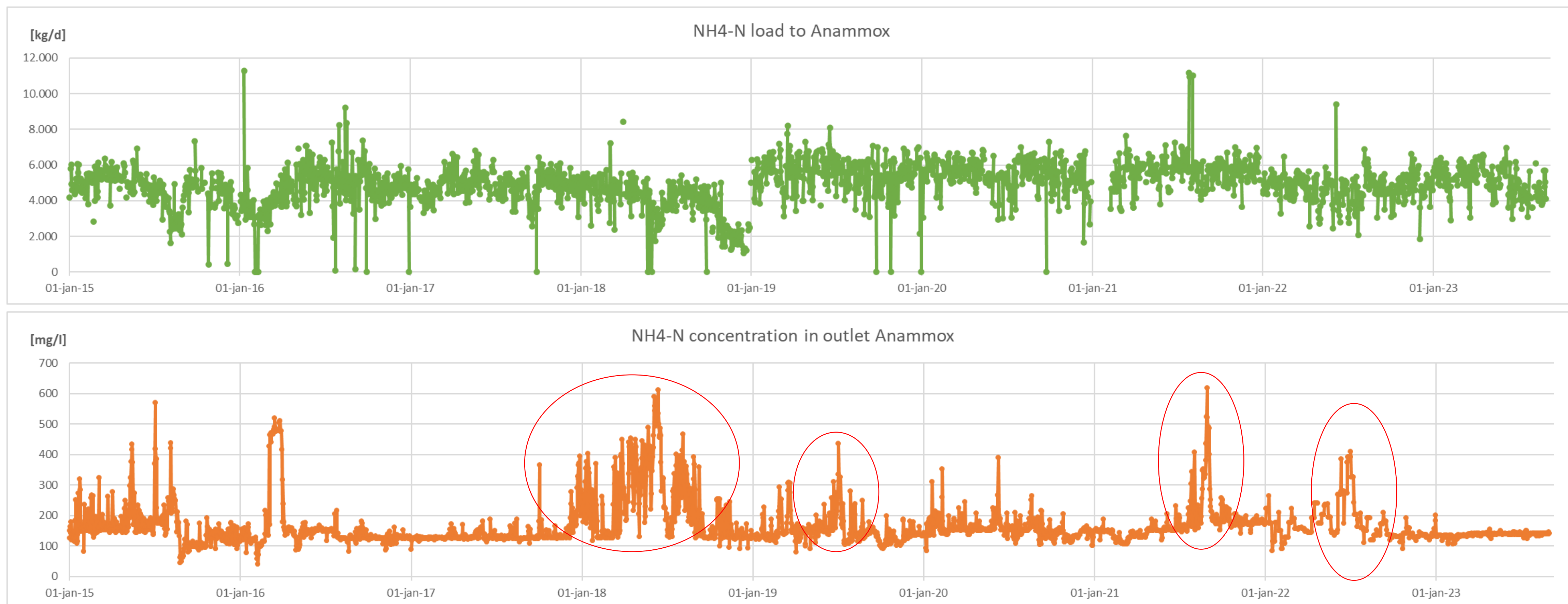
Key numbers

- Since 2013 operational
- $\text{NH}_4\text{-N}$ load $\pm 1.5\text{-}2 \text{ kg N/m}^3\cdot\text{d}$
- $\text{NH}_4\text{-N}$ removal $\pm 90\text{-}95\%$
- Limited sludge production
- Completely automated process
- Stable treatment process

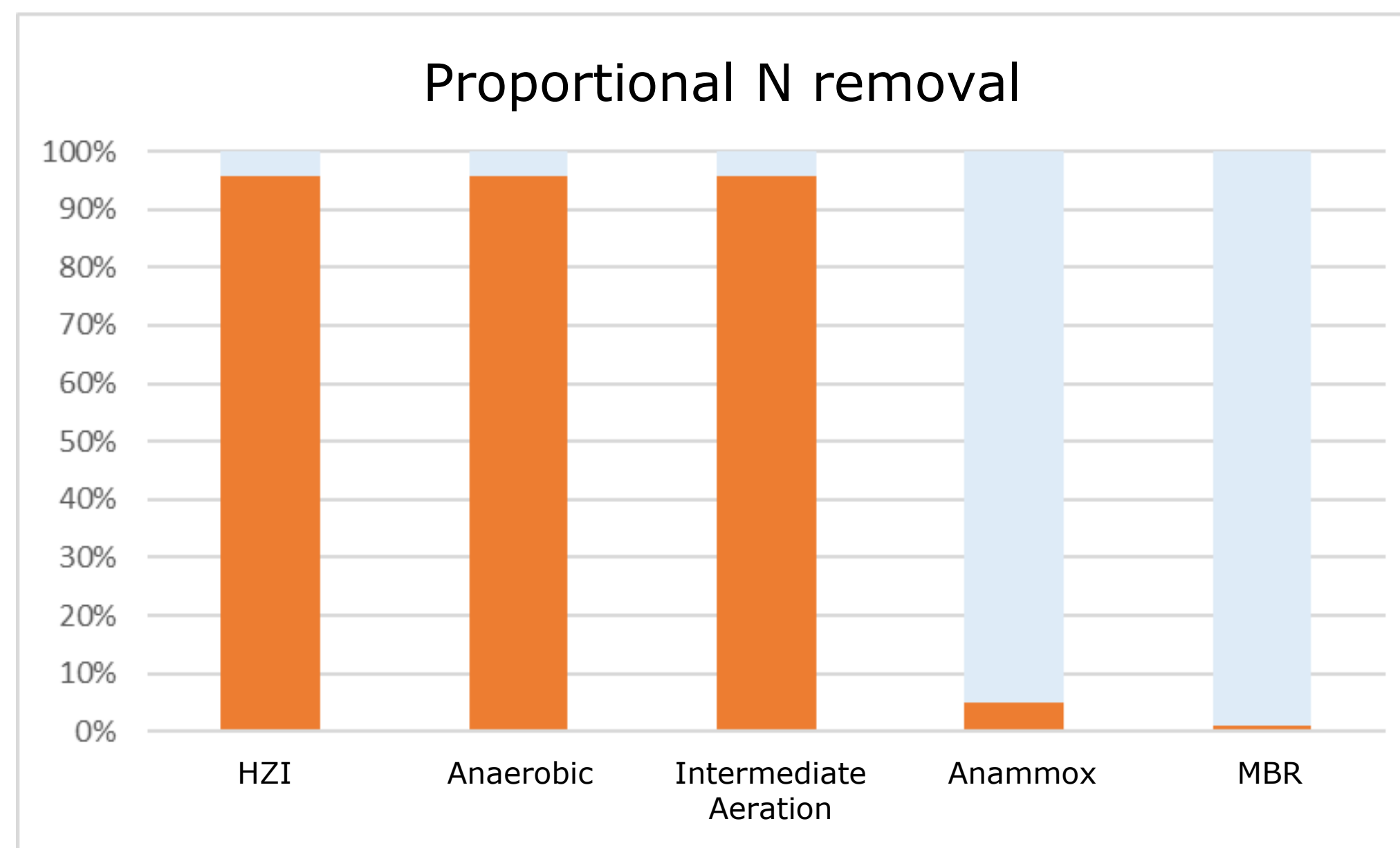
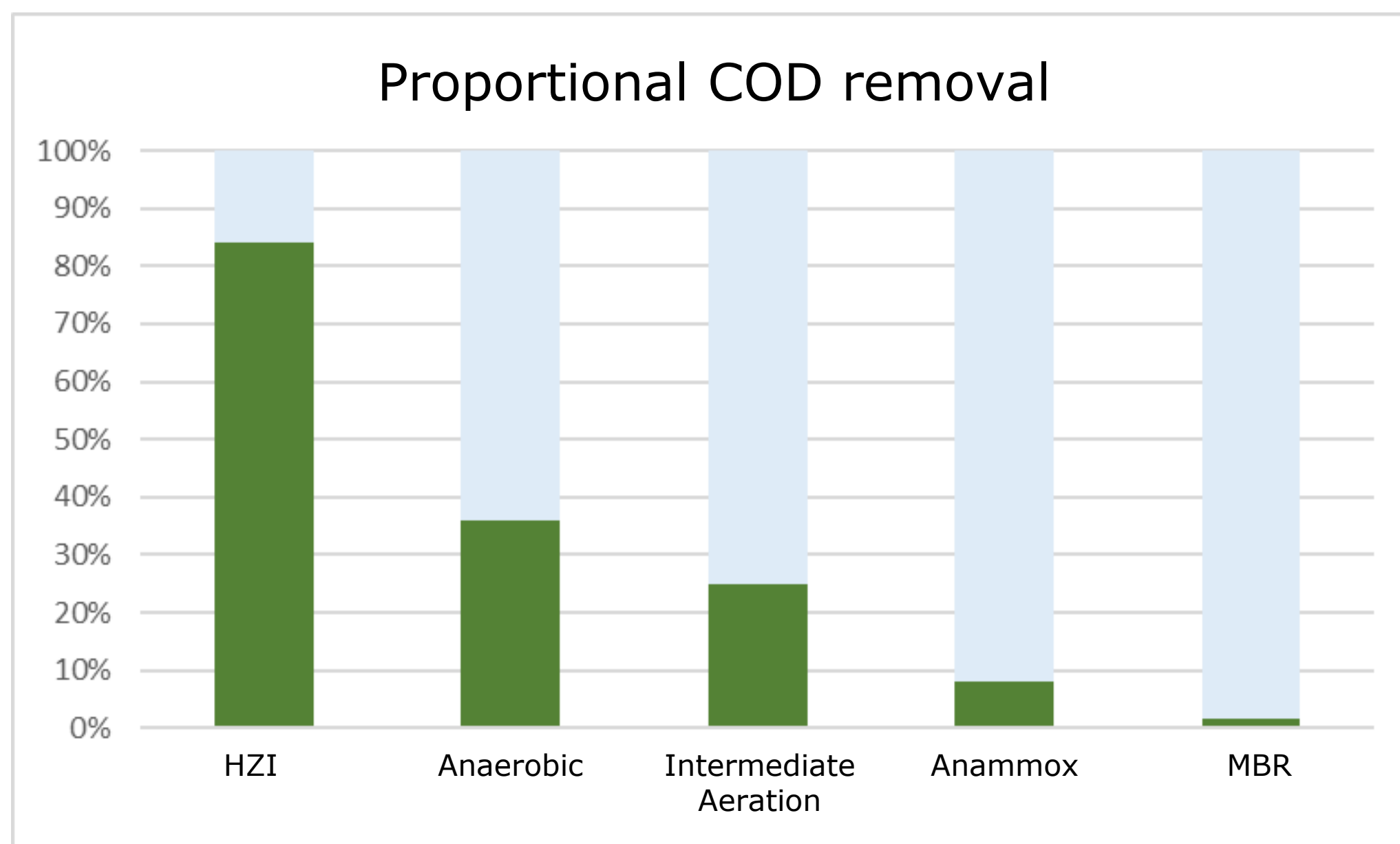
Adjustment to original design

- In 2018 (after 5 years) covered due to legionella.
- Screen installed on effluent to capture Anammox granules (2018)
- New aeration grid (2018)
- More cooling capacity

Treatment step – Anammox treatment



COD and Nitrogen removal per treatment step



Take away messages

The combined Anaerobic-Anammox-Aerobic treatment system for rendering and bio-digestion wastewater for ERS Son

- Has proven to be in the long run a **robust and reliable** system.
- Is a more **complex treatment process** and need closer follow up (well trained people).
- Gives **very high treatment results**.
- Can give a risk on Legionella growth and thereby mitigation actions are needed.

If the combined Anaerobic-Anammox-Aerobic process is compared with a classical aeration process for this type of influent:

- A much **smaller footprint** is needed **(-40-50%)**
- Gives a net **energy production (+50%)**
- Produce **less sludge (-75%)**