POWERSTEP

YOUR FLUSH, OUR ENERGY

FULL SCALE DEMONSTRATION OF ENERGY POSITIVE SEWAGE TREATMENT PLANT CONCEPTS TOWARDS MARKET PENETRATION

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Veolia Water Technologies - AnoxKaldnes

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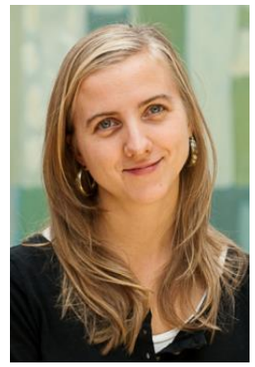
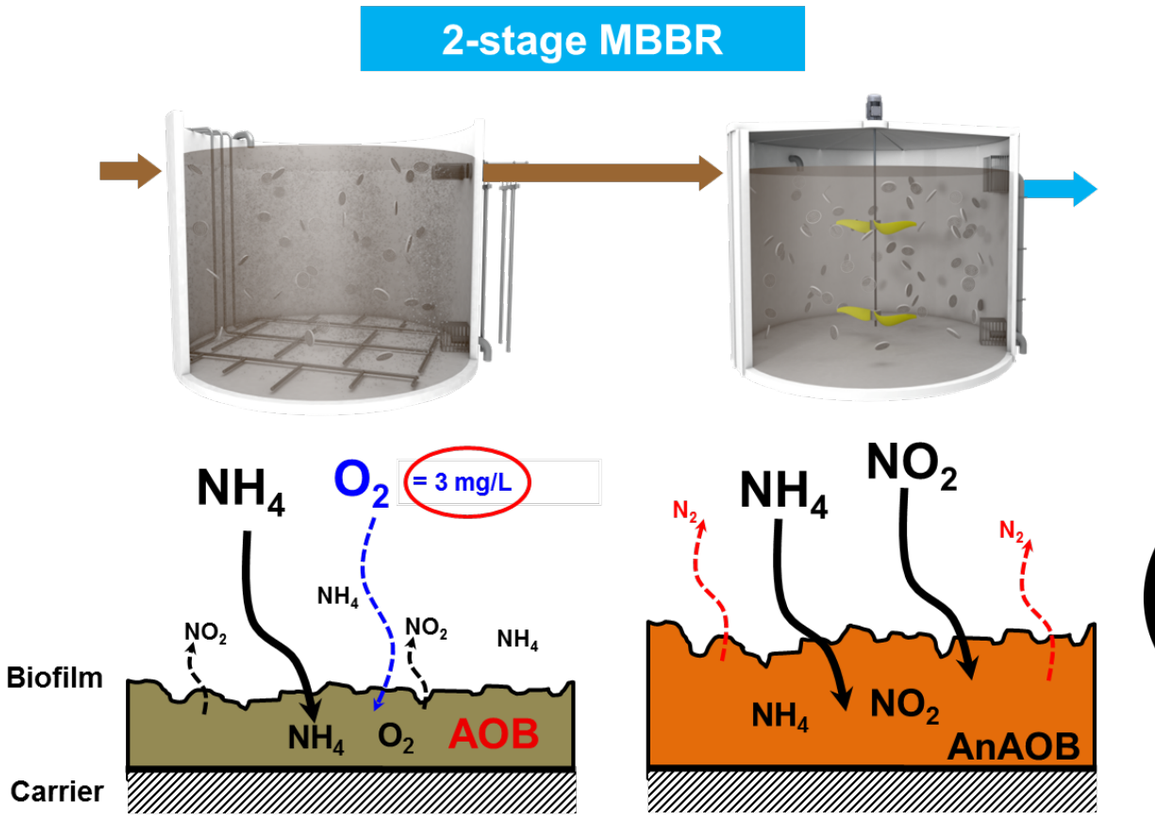
POWERSTEP

Mainstream Anammox and NOB suppression strategies in MBBRs – from lab to full scale?

Overview

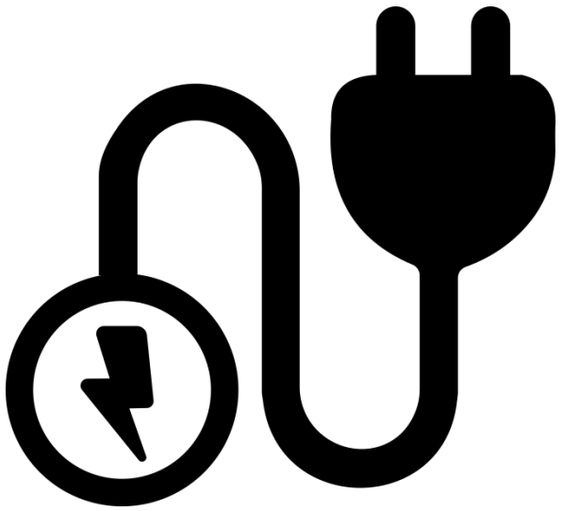
ANOXKALDNES by VEOLIA Water Technologies





Thin, exposed biofilm = NOB suppressed

Pure AnAOB = No NOB competition



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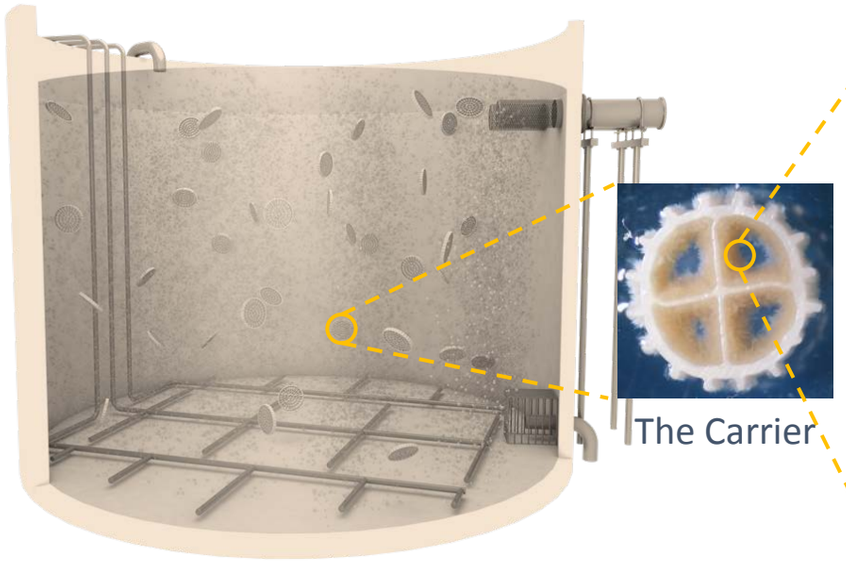
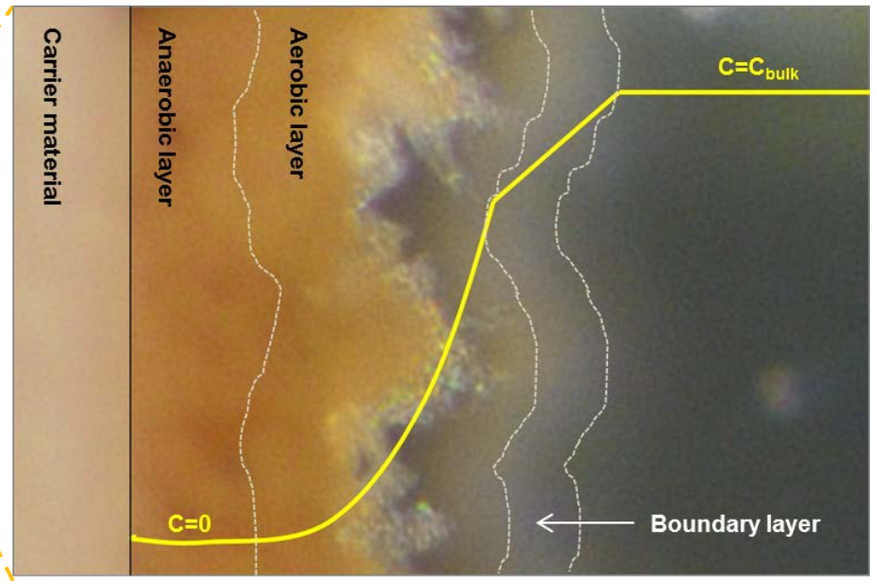
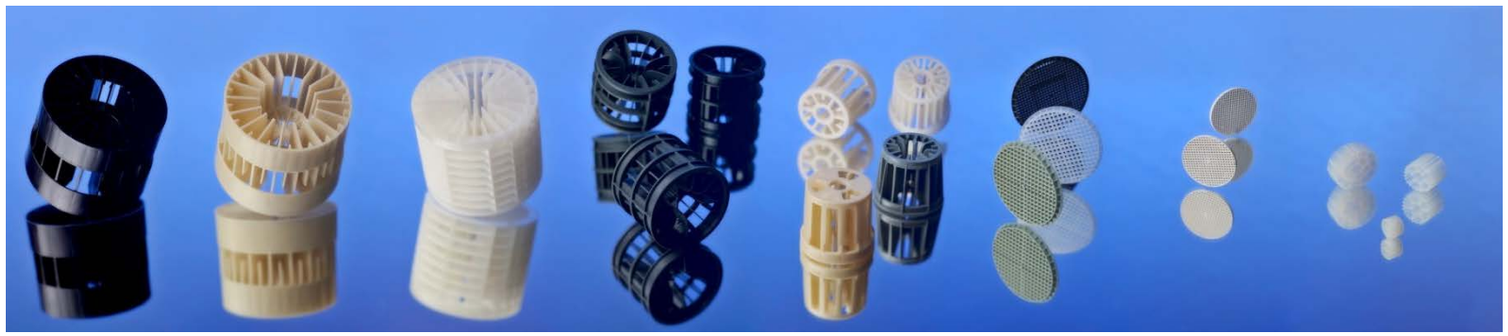
Moving Bed Biofilm Reactor



The Moving Bed Biofilm Reactor



The Biofilm



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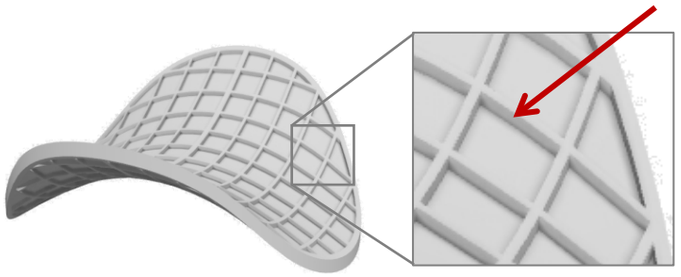
The Anox K™ Z carriers



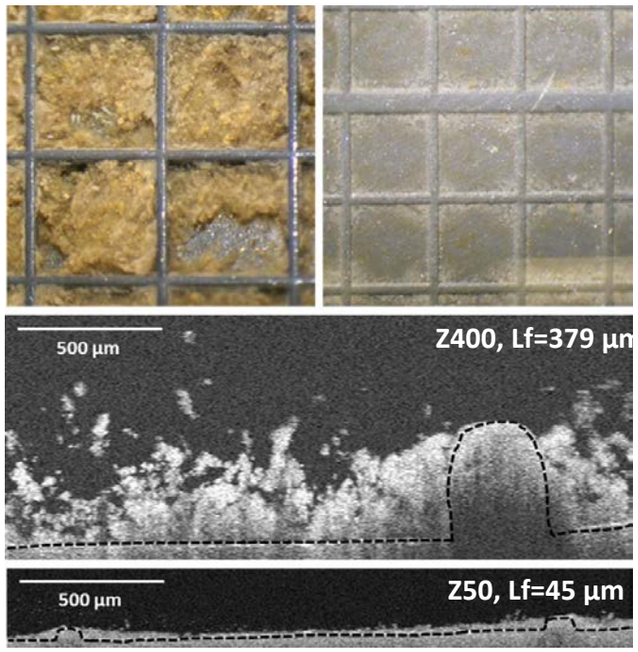
Z-50 - 50 µm

Z-200 - 200 µm

Z-300 - 300 µm

Z-400 - 400 µm

Z-500 - 500 µm



Piculell et al., Water Research, 2016

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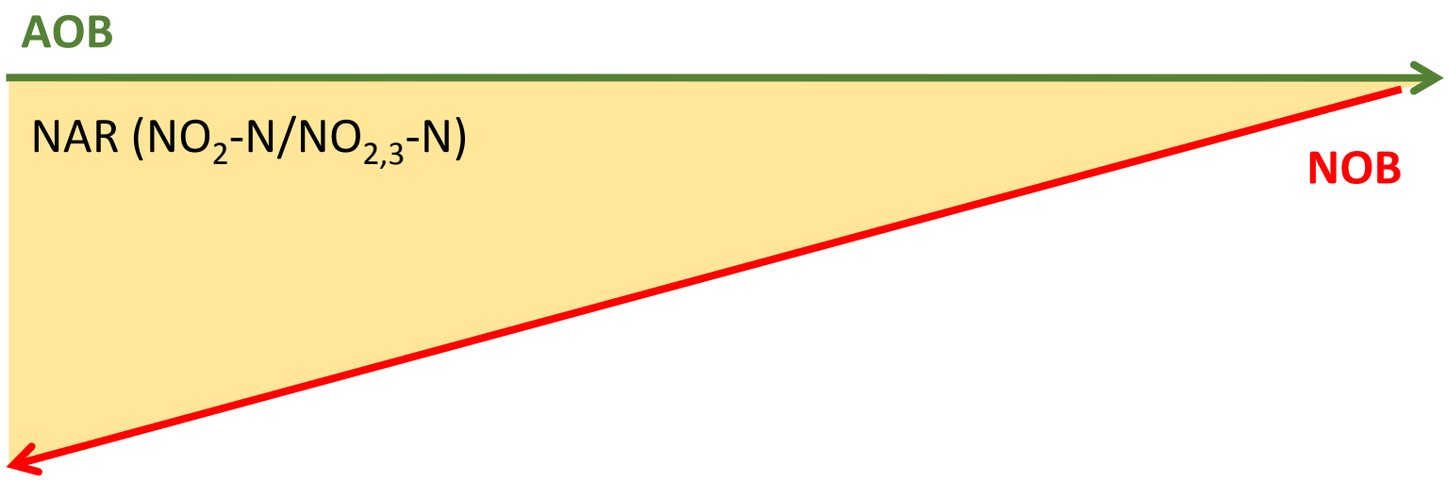
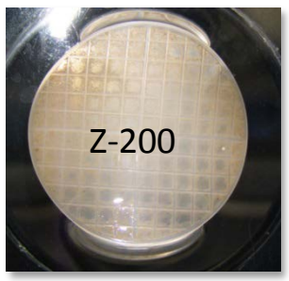
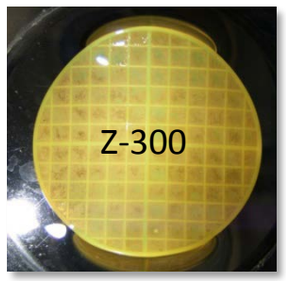
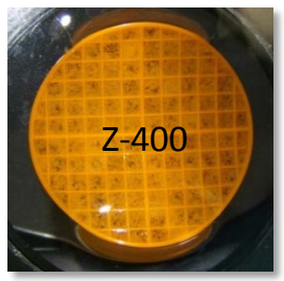
First trial: Lab scale nitrification

- NOB inhibition in thinner biofilms?
- Application for mainstream anammox?









Piculell et al., Env. Tech., 2016

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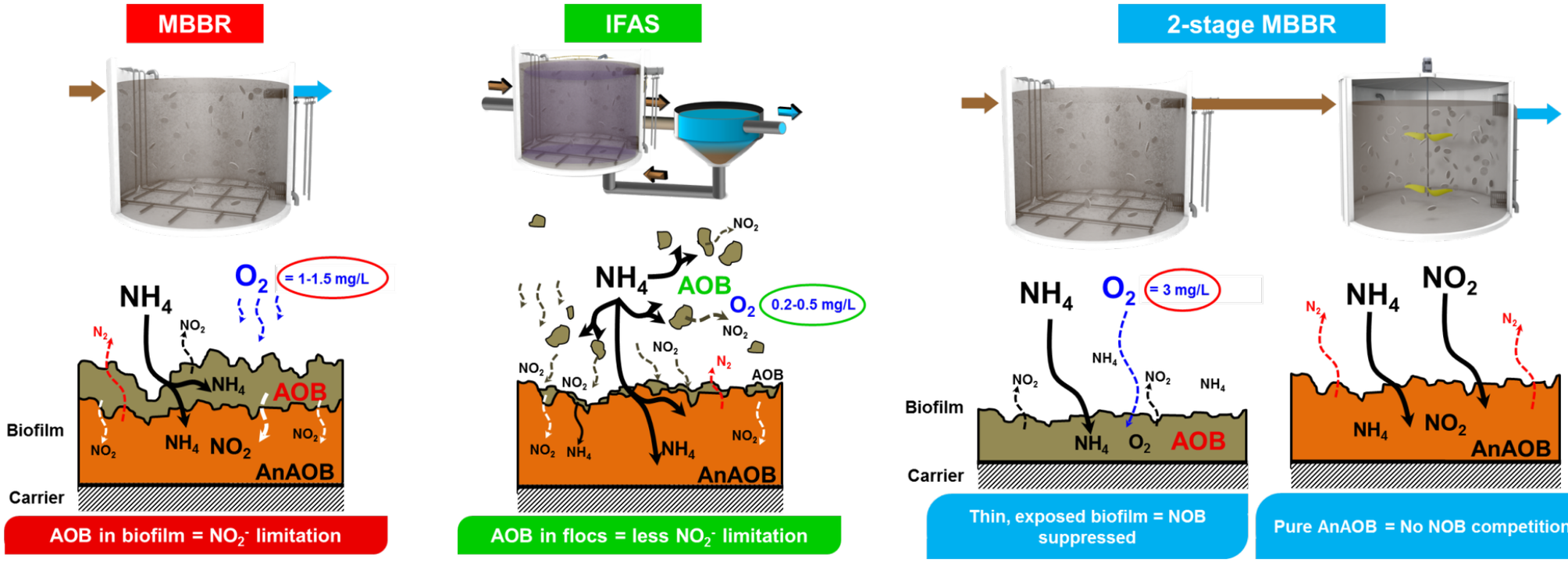
Different options for ANITA Mox™



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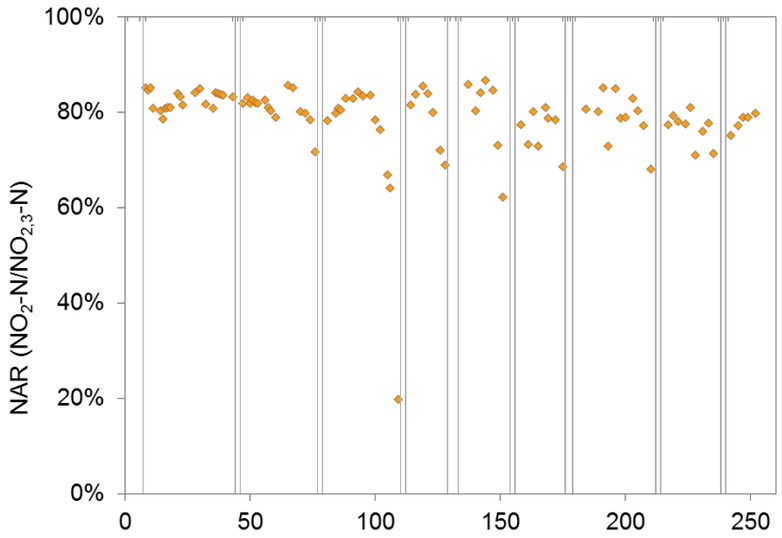
Proof of concept

Lab scale

- Z-200 + K5
- Synthetic feed (50 mgNH_4-N/L, 15°C)
- 2 week cycle w “reject”
- Stable nitritation
- TN removal 0.07 gTN/L,d

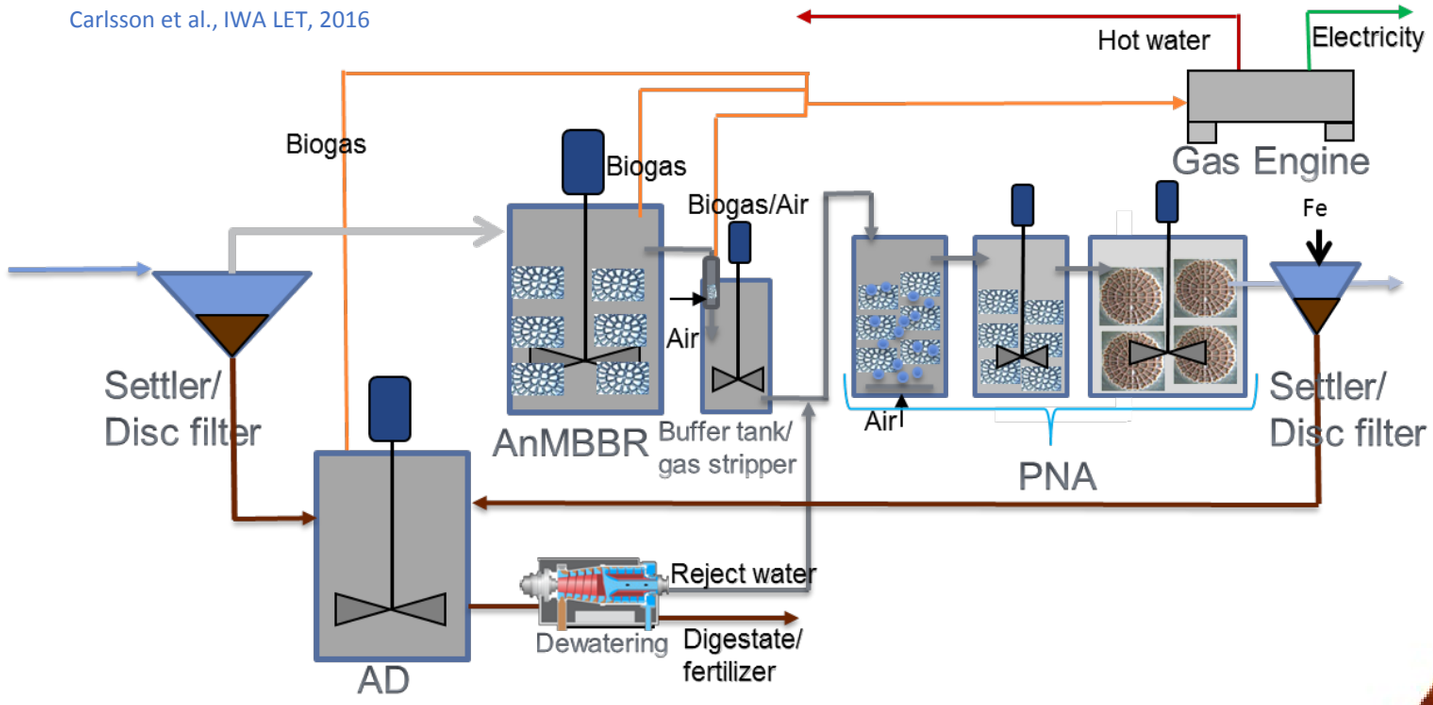
Piculell et al., WST, 2016



Pilot scale

- Z-50 + K5
- Real wastewater (28->18°C)
- 1 week cycle w reject
- Stable nitritation
- TN removal 0.13 gTN/L,d

Carlsson et al., IWA LET, 2016



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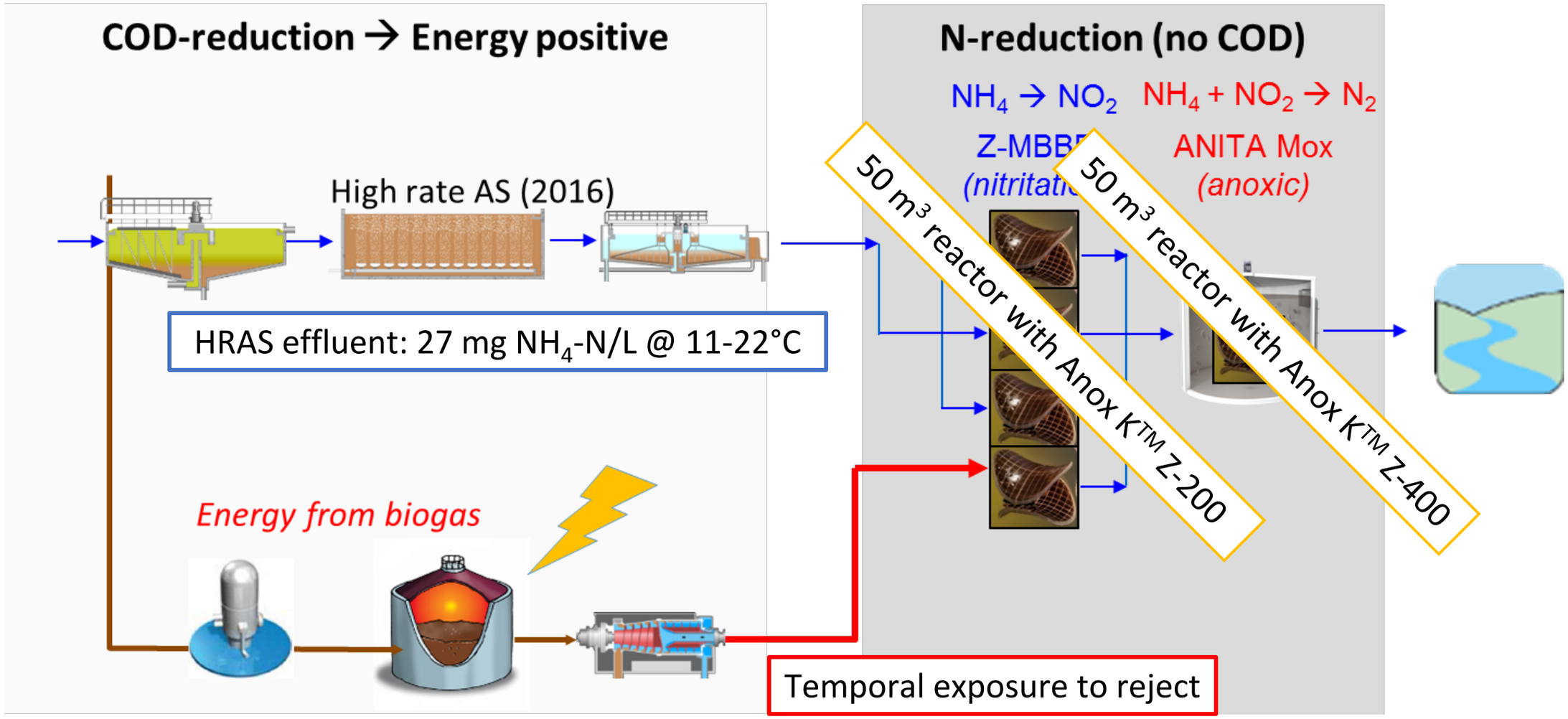
Full scale trials with POWERSTEP



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Control strategies for NOB supression (N-stage)

- Biofilm thickness control (Z-200)
- Switch to reject
  - Varying frequency and duration
  - High pH -> low pH (loop)
    - Flow rate and aeration controlled with alternating pH set points
  - FA/FNA/pH inhibition
- Aimed for a good NO_2-N/NH_4-N ratio for AMX
- Superior Tuning and Reporting (STAR) control program (Krüger, DK)

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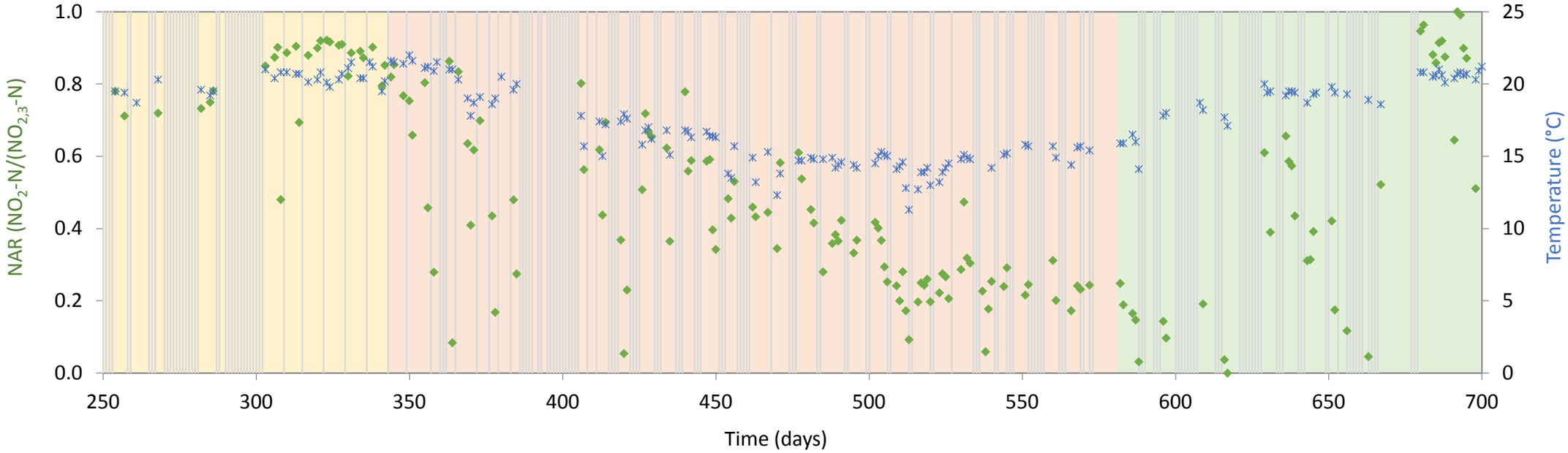
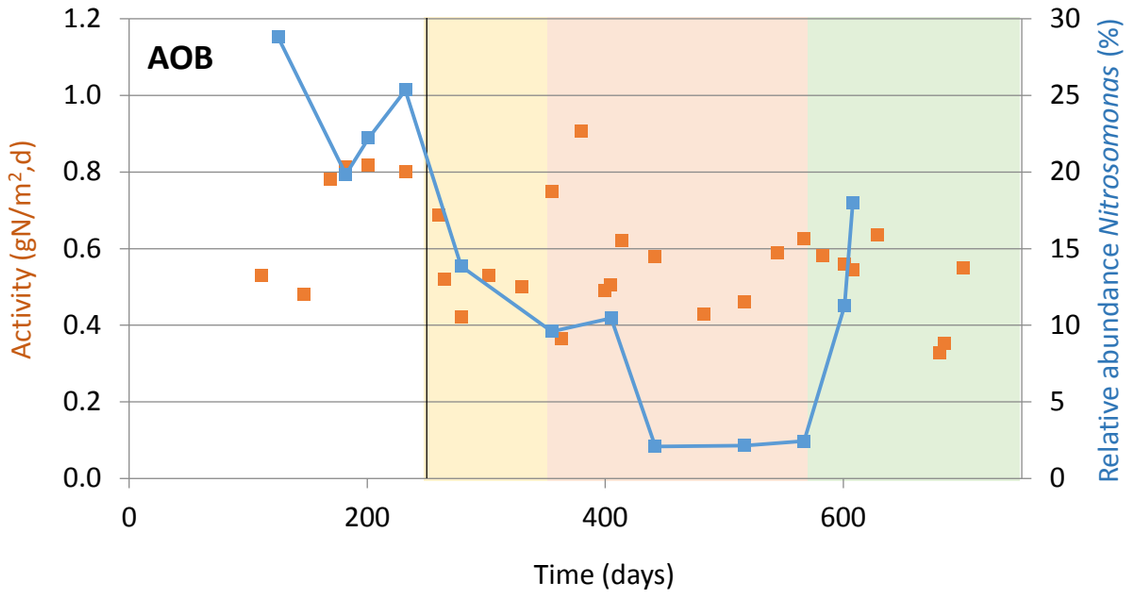
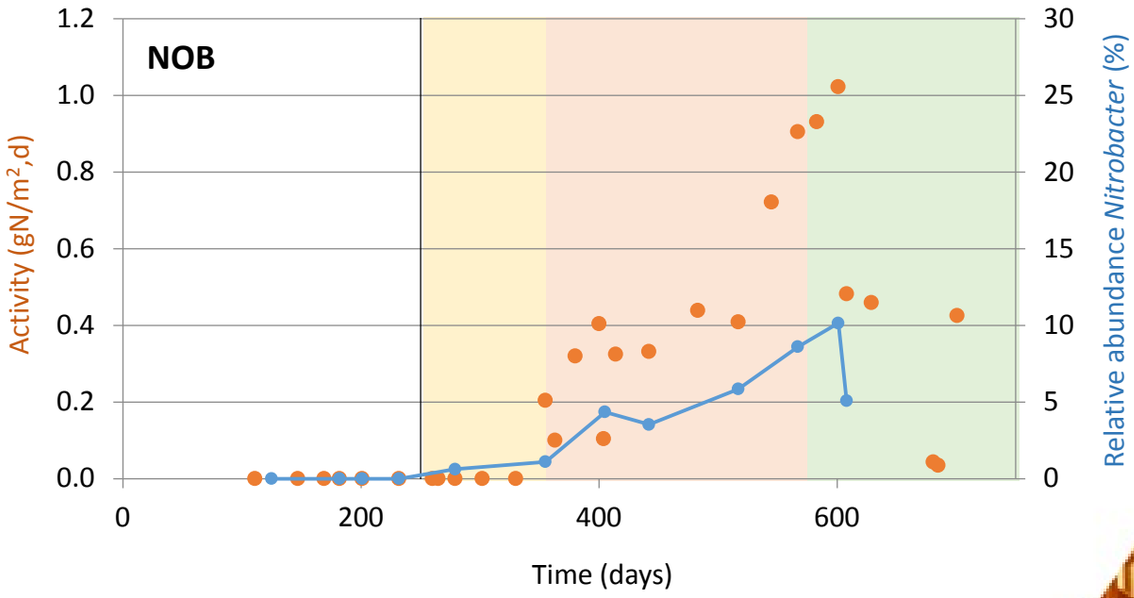
Nitritation performance







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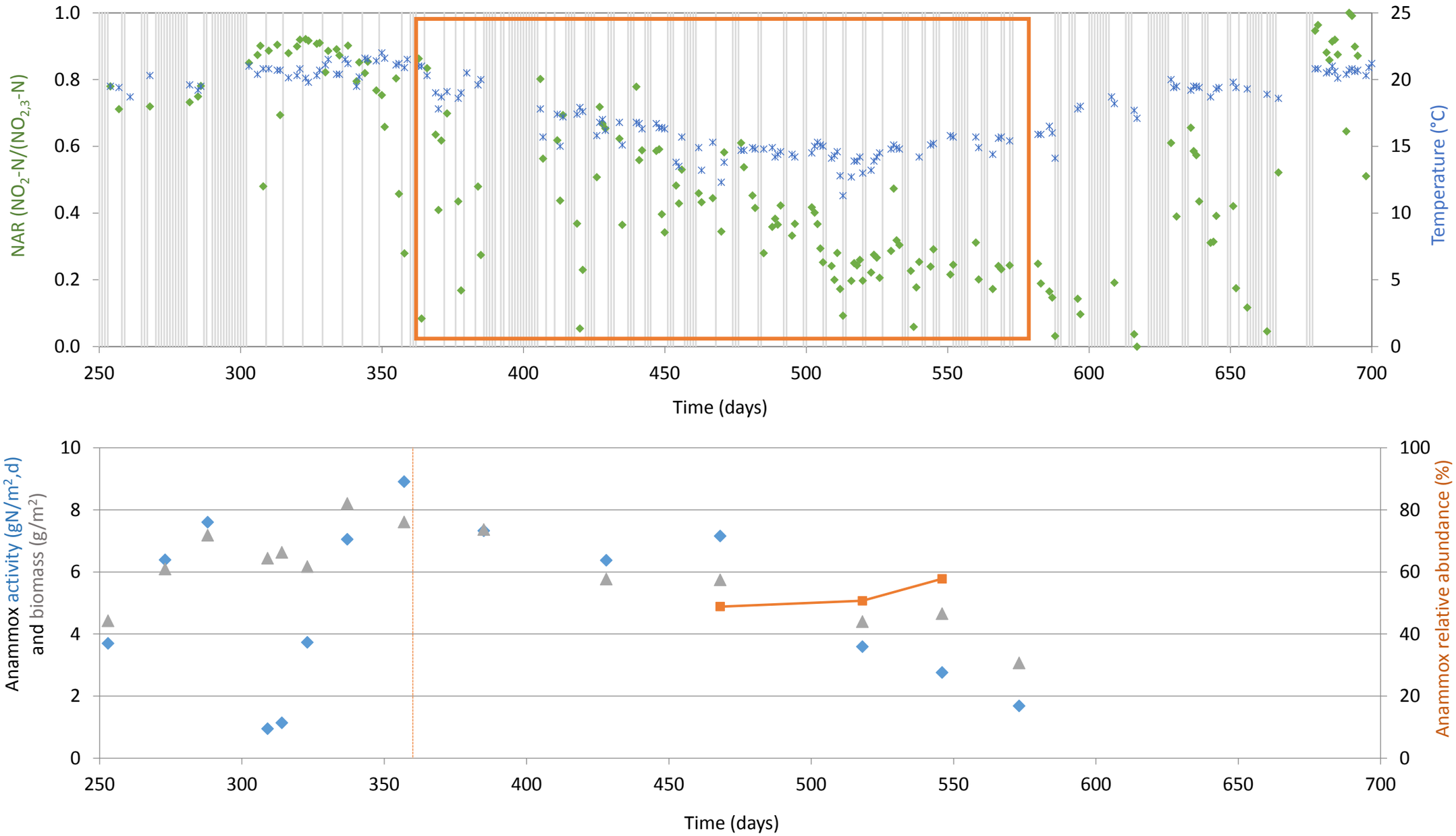
Anammox performance



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Mainstream anammox and NOB suppression strategies in MBBRs

Mainstream anammox

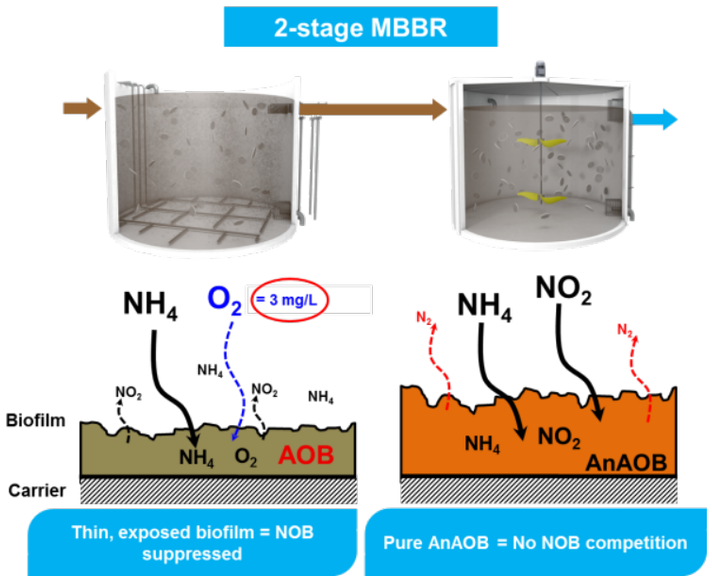
- Two-stage MBBR system
- Lab and pilot trials successful

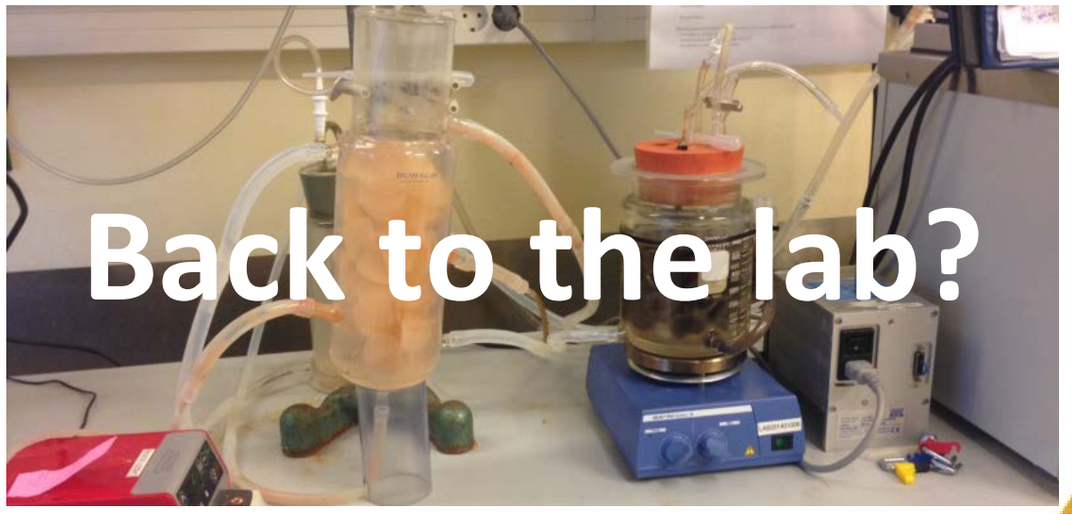
NOB supression strategies

- Biofilm control (Z-200) for nitritation
- Alternating feed supply with reject scheme (pH/FA/FNA)

…from lab to full-scale?

- Possible at right conditions
- Weak water and low temperatures
- Reject scheme requires
  - Rapid changes
  - Extreme conditions (pH)
  - Reliable sensors





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Thank you!

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by VEOLIA Water Technologies

Karlsruhe Institute of Technology

VASYD

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www.powerstep.eu

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