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The logo for Stowa, a Dutch water management organization, features the word 'stowa' in a stylized, lowercase, blue font with a wavy underline.

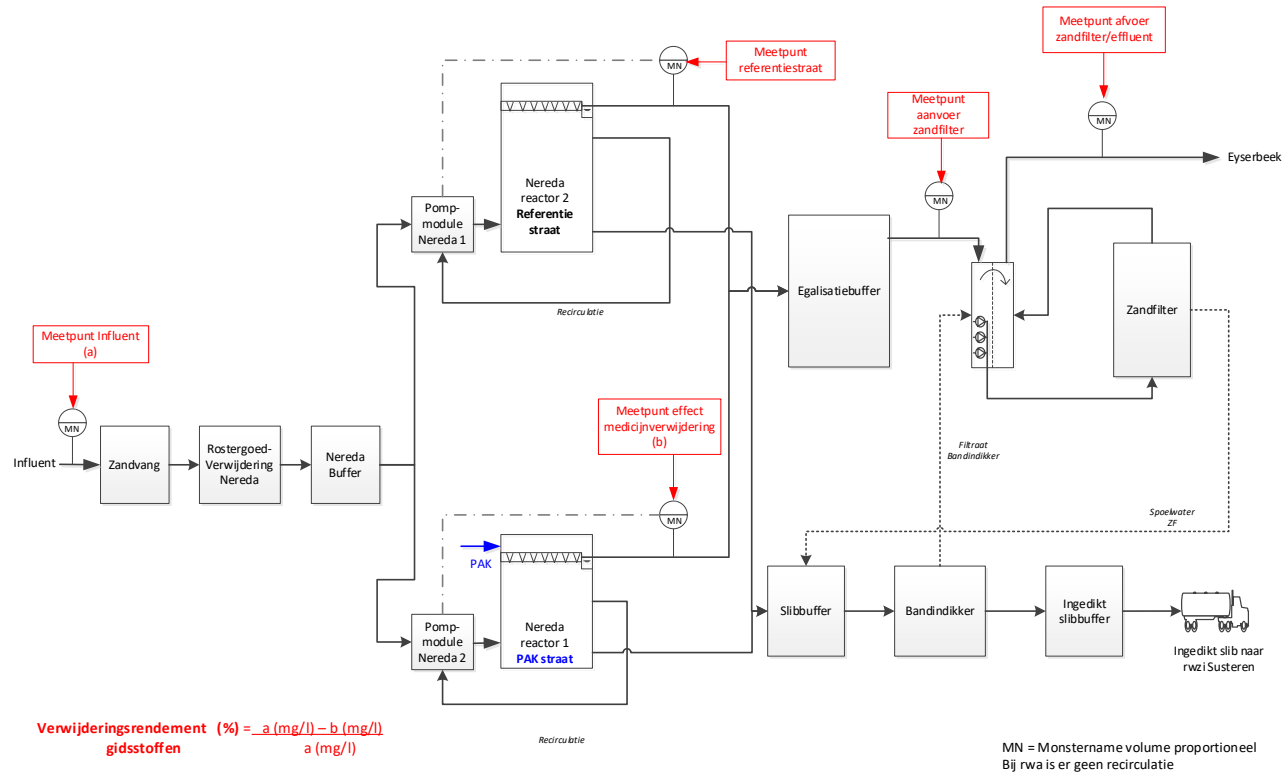
PAC dosing in Nereda[®] Simpelveld

Ad de Man, Sandra Malagon, Wout Pannekoek
Saskia Moll, Pascalle Vermeulen, Herman Evenblij
Aquatech 2021, 3-4 November 2021

Content

- Pilot set up
- First results with dosing 5 and 10 mg PAC/l
 - Pharmaceuticals
 - Macro parameters
- Outlook





3-11-2021



Analysed Parameters

- **Macro's (Eurofins):**
 - COD (total + dissolved)
 - N-total
 - $\text{NH}_4\text{-N}$
 - P-total
 - P-ortho
 - DOC
 - Suspended solids
- **Test kits (Lab SMP):**
 - N-total
 - $\text{NH}_4\text{-N}$
 - P-total
 - P-ortho
- **Micropollutants (Aqualysis)**
 - 19 substances

- **Bioassays (BDS):**
 - Microtox A, Daphniatox A, PAH Calux en ER Calux.
- **And:**
 - Bromide, PFAS, zware metalen (Eurofins)
 - Sludge analysiss: organic, granule fraction (Lab SMP)
 - Kaumera (TU Delft)
 - PAC in effluent PAC reactor and effluent wwtp (Lab SMP)

AK-DOS dosing installation

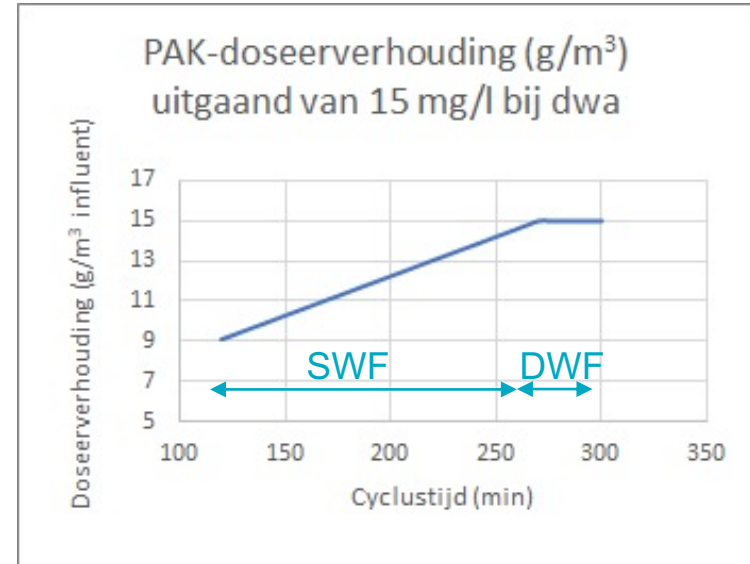


Pilot

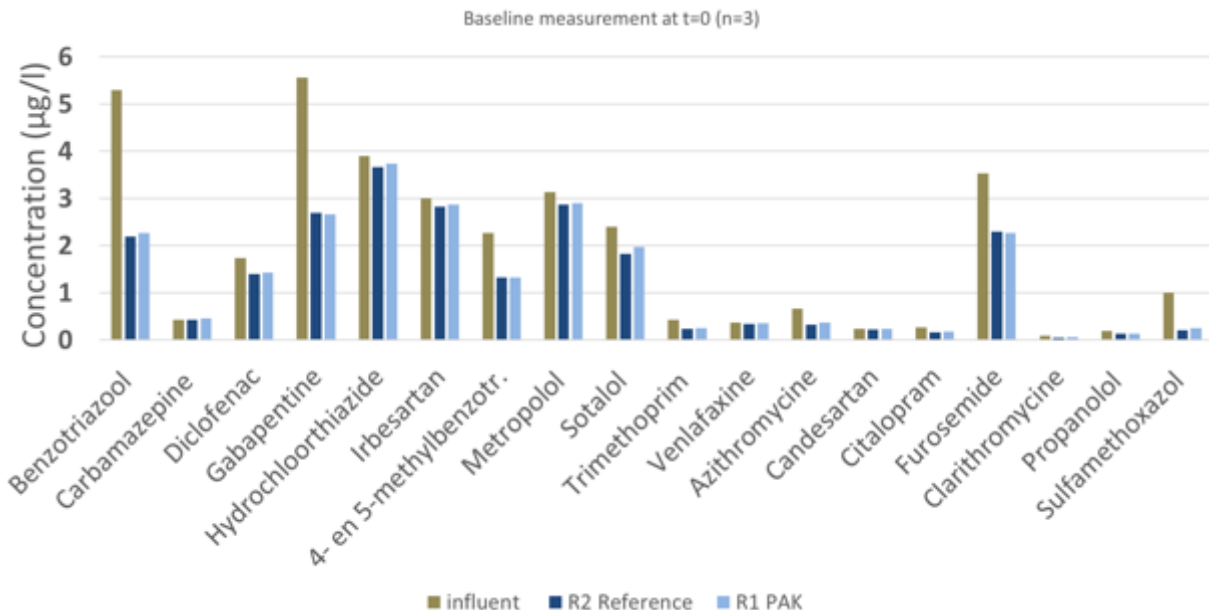
- Discontinuous gravimetric dosing
- Dispersing in drinking water
- Communication container – process control WBL – Nereda Controller

Process control dosing PAC in Nereda

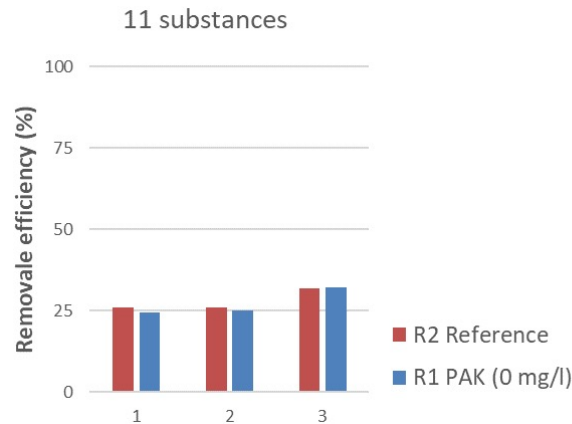
- At the end of aeration phase
- Each batch one PAC-gift, based on:
 - Influent amount per batch
 - Influent flow rate – DWF or SWF
- Cycle time reduces during SWF



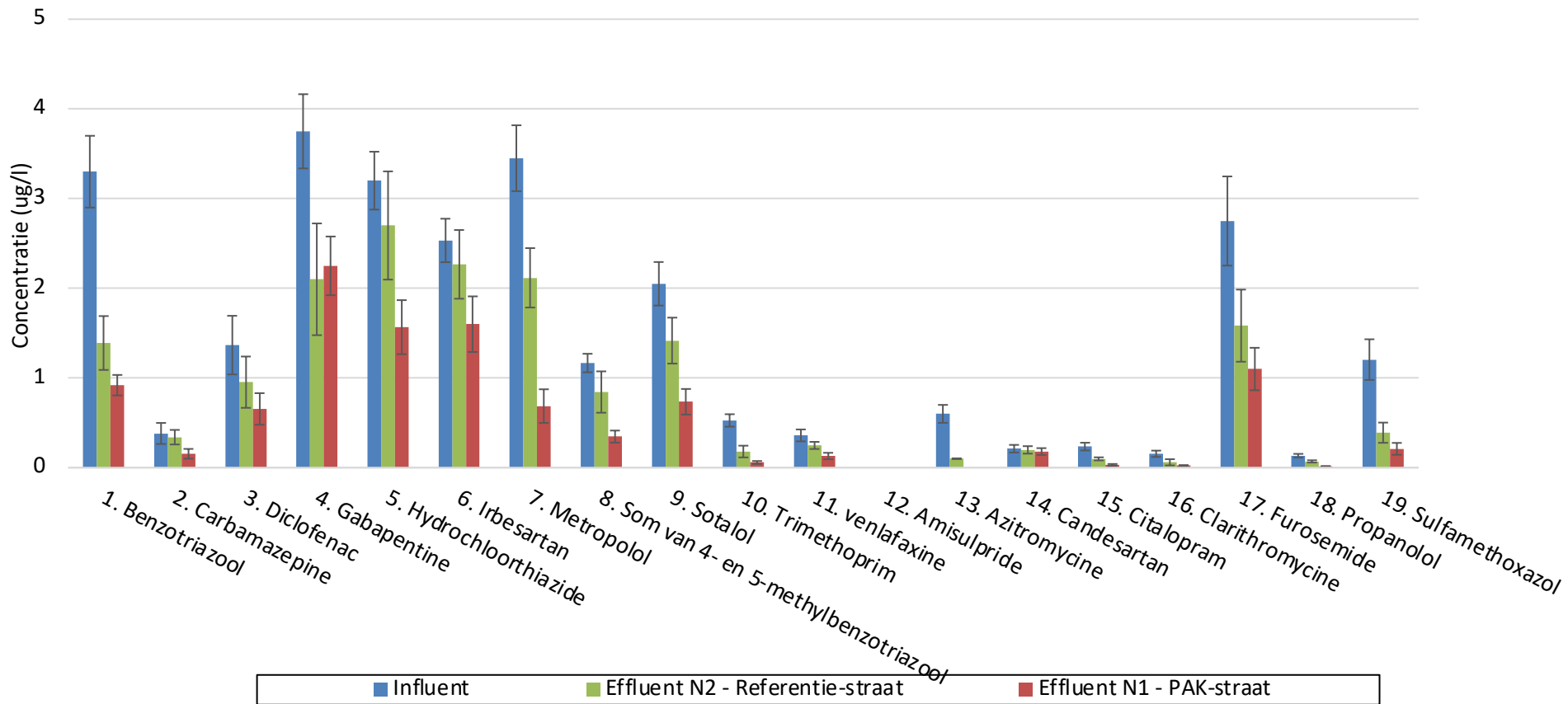
Base line measurement (PAC dosing 0 mg PAC/l)



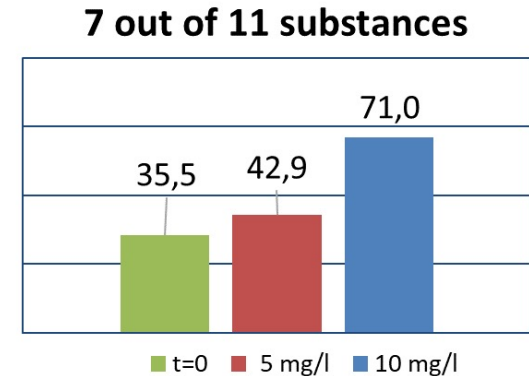
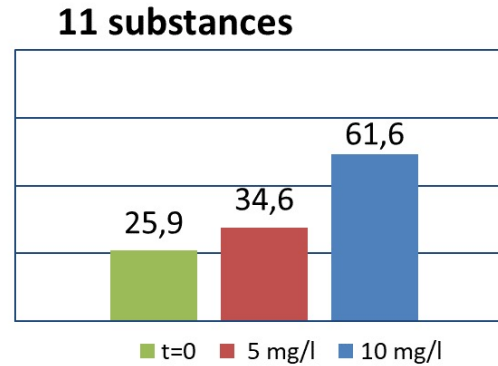
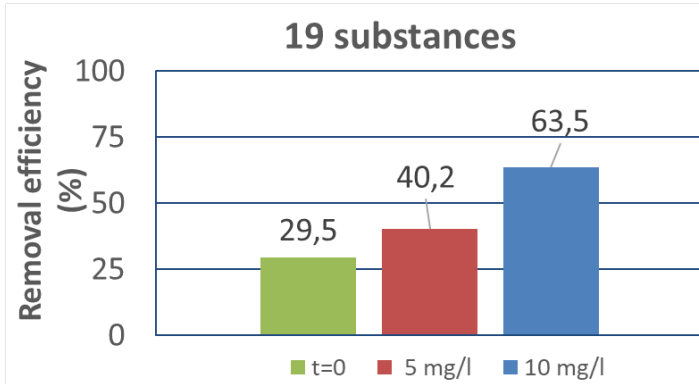
- All substances sufficiently present in influent
- sometimes effluent concentration carbamazepine higher than influent



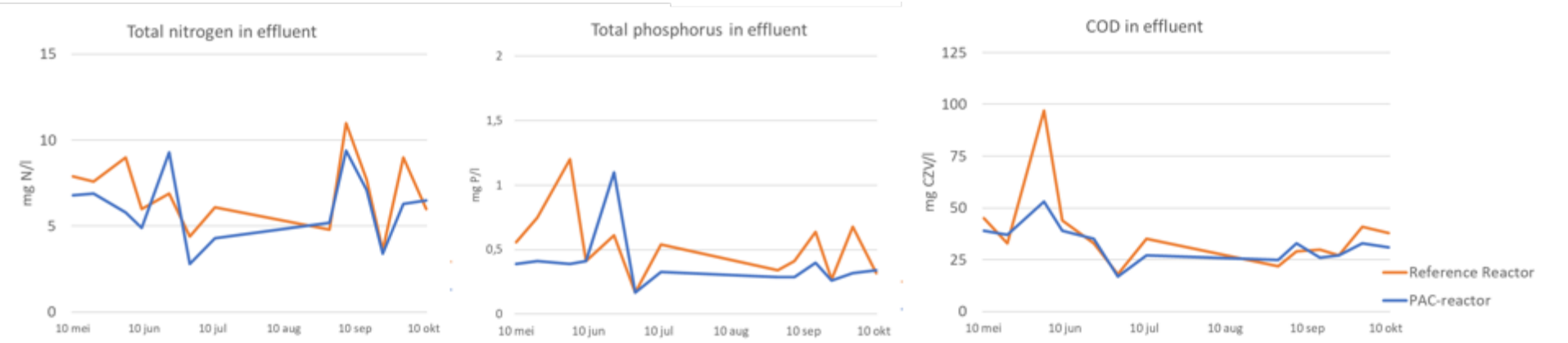
Concentrations 19 substances wwtp Simpelveld (PAC = 10 mg/l)



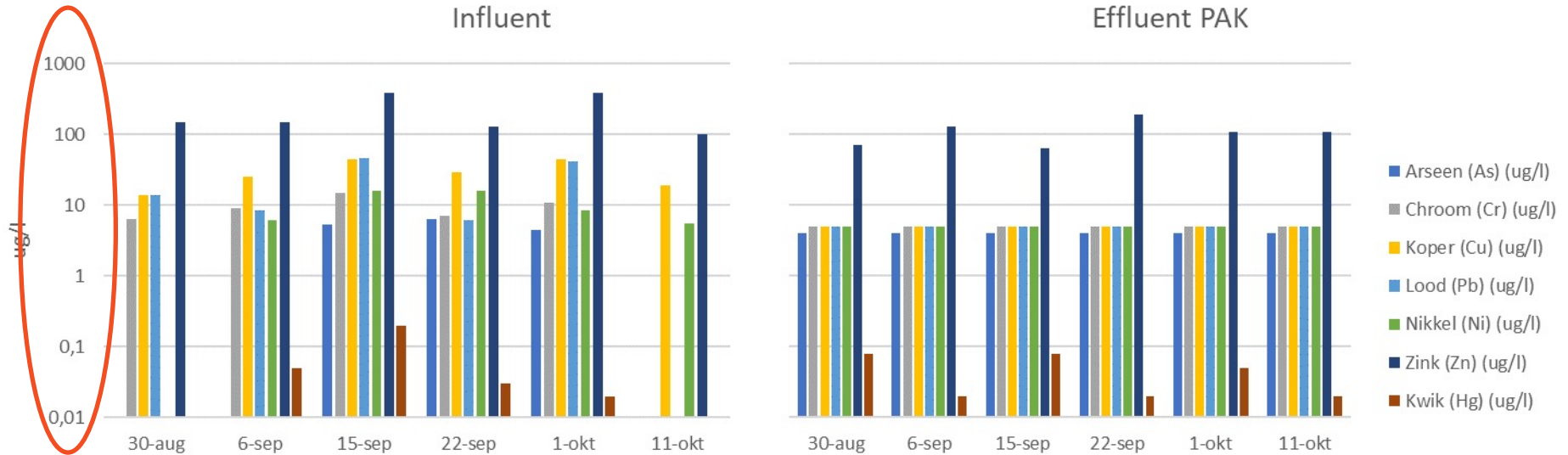
Removal efficiency per dosing rate



Macro parameters



Metals

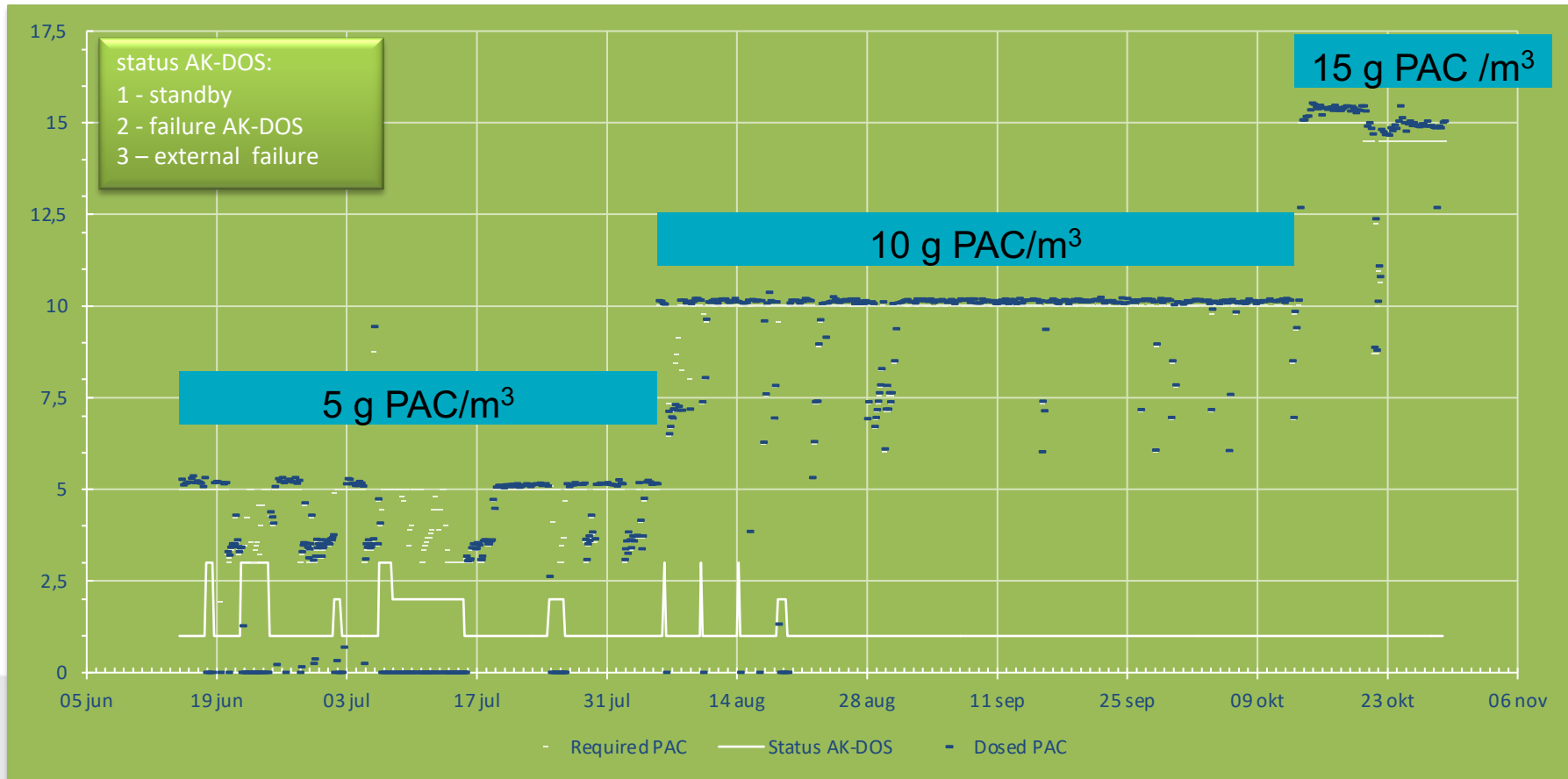


- Bromide: all below detection limit (0.1 mg/l)

PFAS

- 40 components
- 4 times analysed (160 values)
- Influent: 3 times above quantification limit
- PAC reactor: 1 time; Reference reactor: 0
- Sum PFAS influent, both effluents: always 0.03 $\mu\text{g/l}$
- Next analyses another laboratory with lower detection limits

Process stability



Outlook

- Testing 20 mg PAC/l
- Testing carbon from renewable source
- Further quantifying carbon in effluent
- Testing bromide and PFAS at lower detection limits

Conclusions

- Technically PAC-dosing in Nereda® is functioning fine
- Removal efficiency increases with PAC dosing
- Until 10 mg PAC/l no negative effects on Nereda®



Thank you for your attention!



Ad de Man
AdDeMan@wbl.nl



Herman Evenblij
Herman.Evenblij@RHDHV.com



Tackling Micropollutants in Wastewater

Approaches on Implementation and Innovation in Europe and The Netherlands



Rijkswaterstaat
Ministry of Infrastructure
and Water Management

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