

PAC + Pile Cloth Media Filtration

Micropollutants and Phosphorus

PILOT RESULTS

| Open | Arnoud de Wilt | 8 November 2023

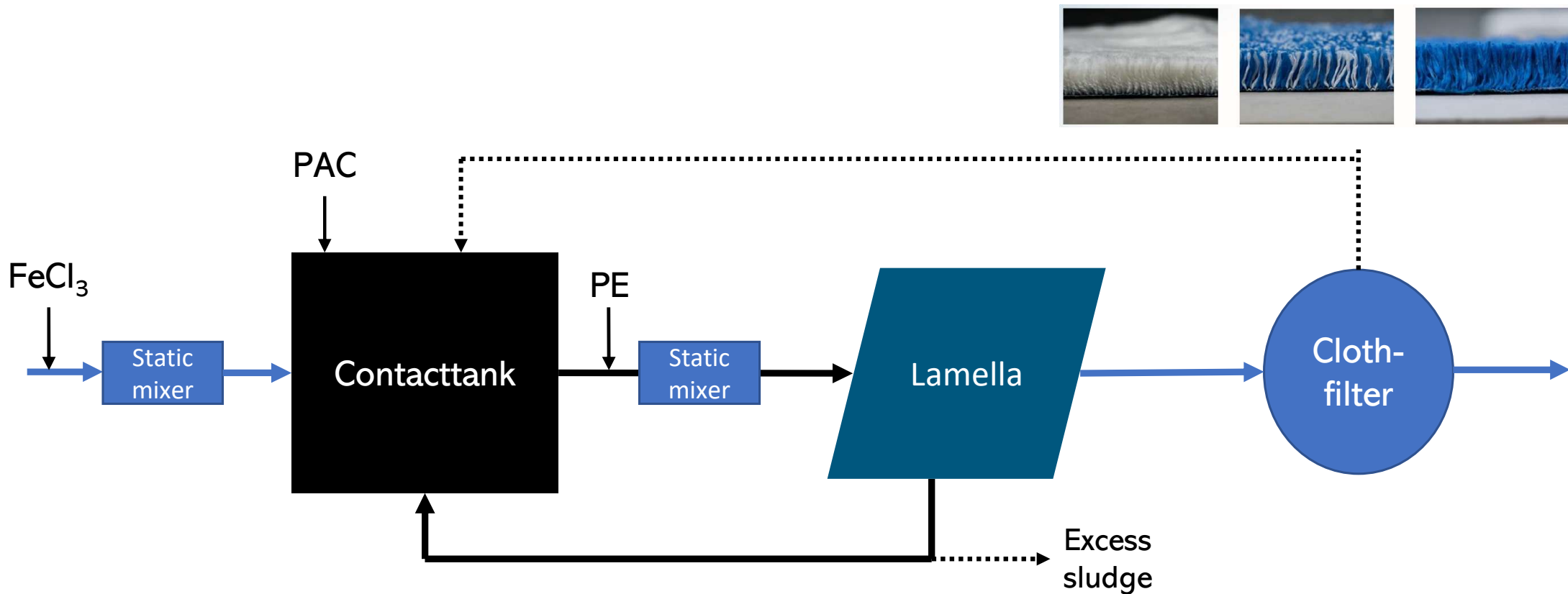


Post-treatment PAC technology



WWTP Lahr, Germany

1st time in the Netherlands



Pilot WWTP Vinkel

- 5 – 15 mg PAK/L
- 5 m³/h



Consortium “PAK+Doek”



WATERSCHAP
Hunze en Aa's



stowa



Waterschap  Rijn en IJssel

WATERBEHEER: VEILIG EN OP MAAT

waternet

ELIQUO | WATER & ENERGY





Inlet

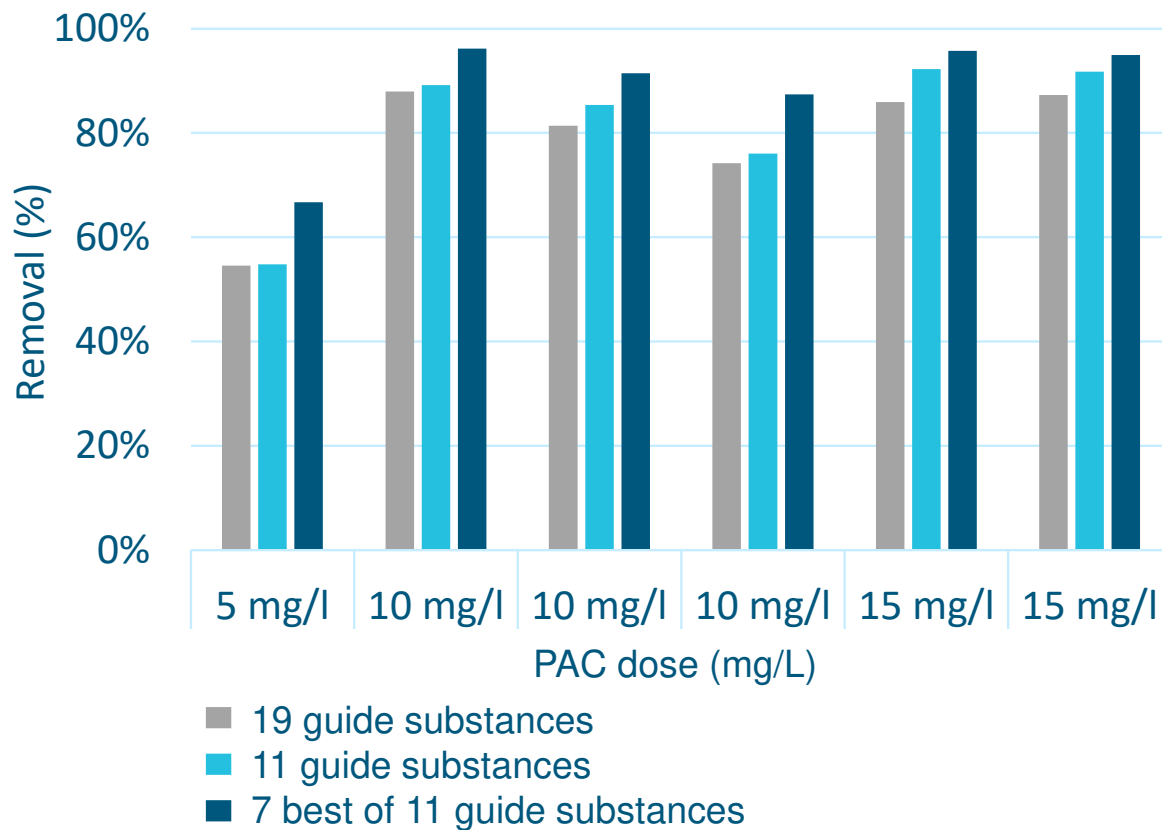
Contact
tank

After
Lamella

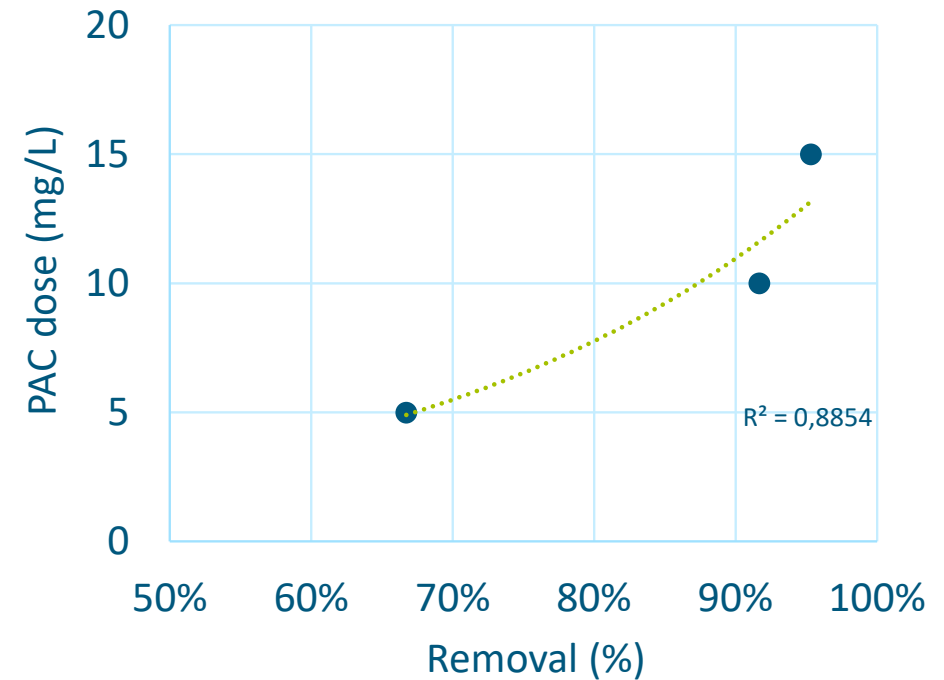
Outlet



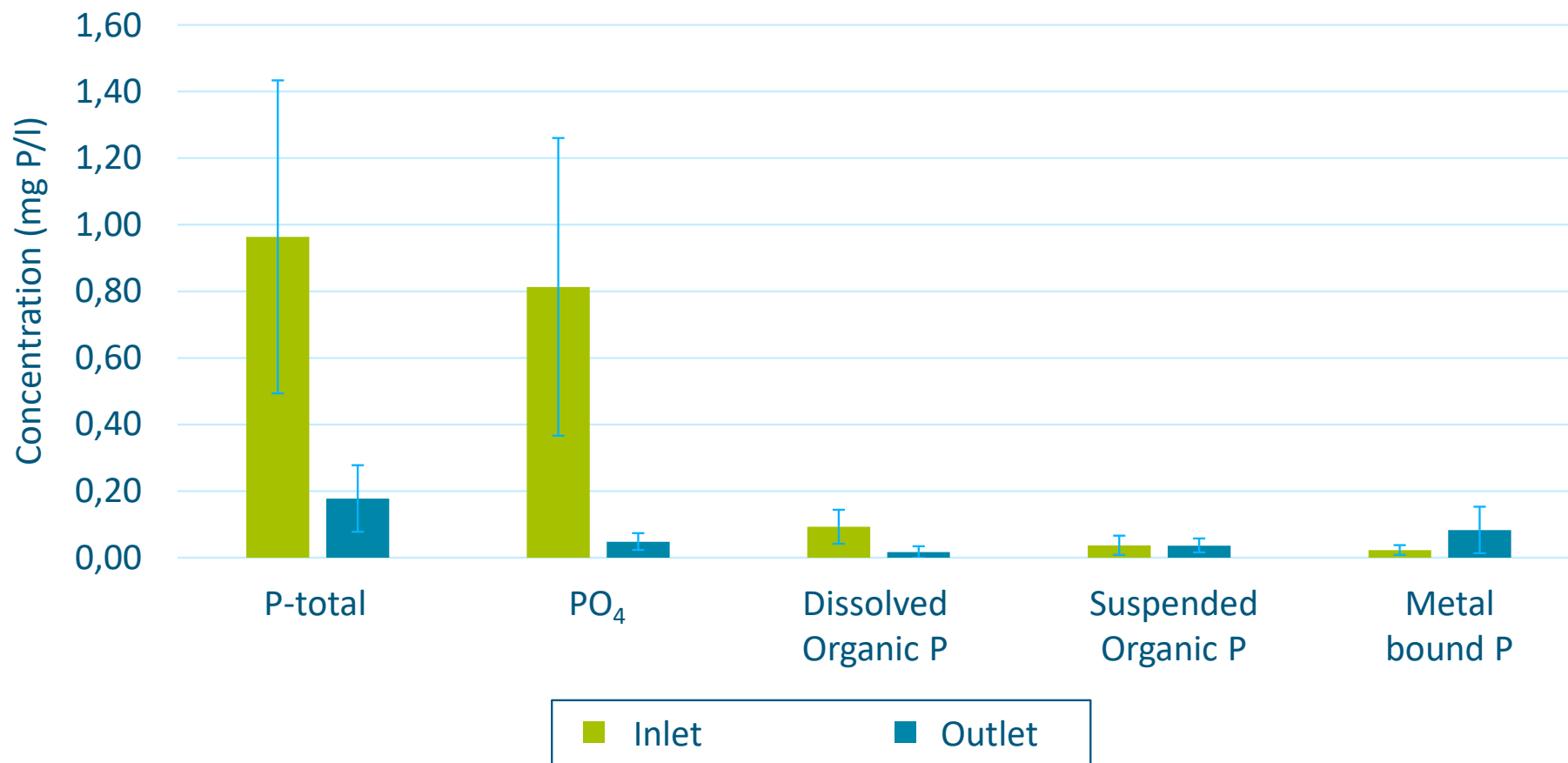
Micropollutant removal



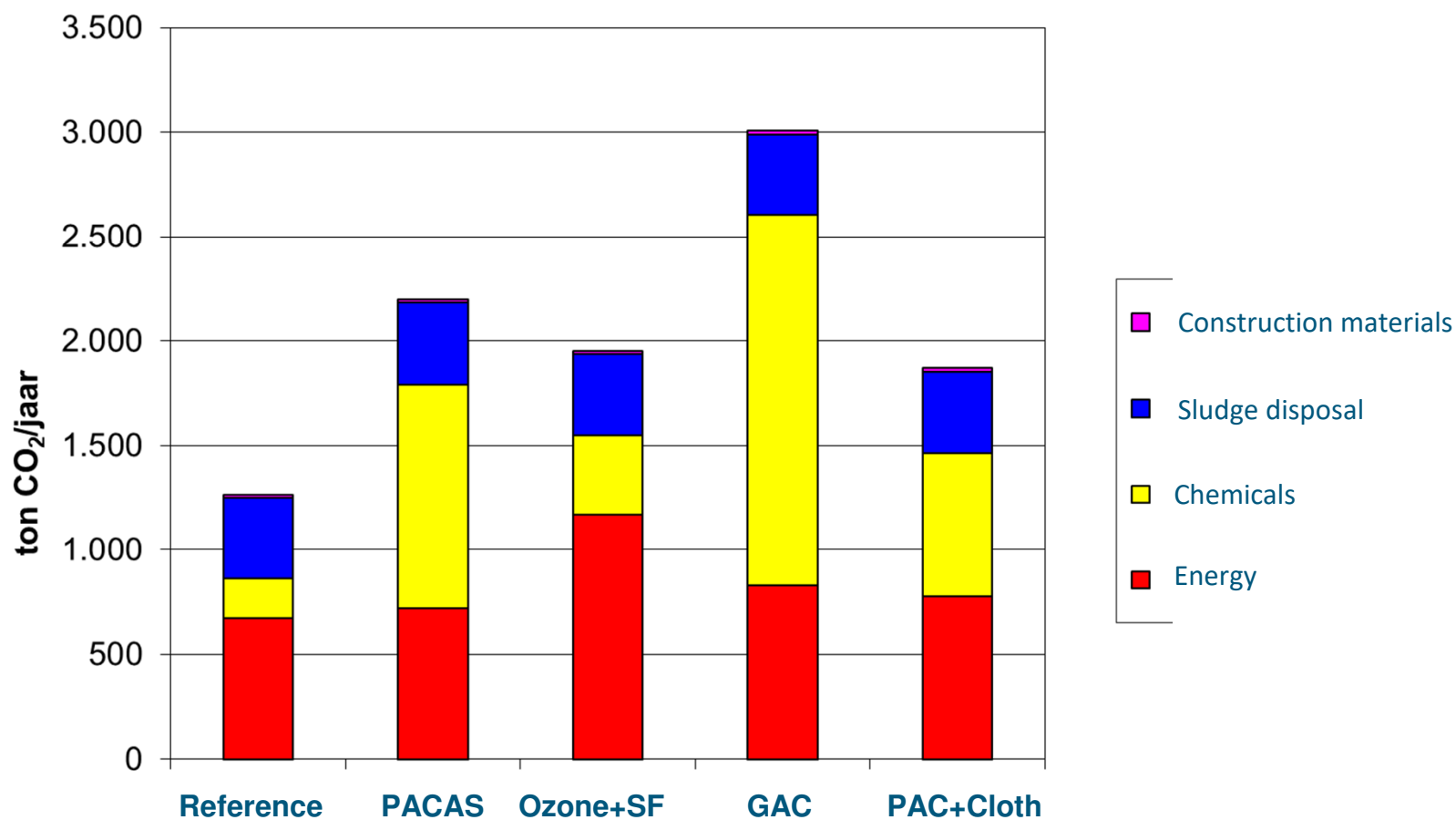
7 best of 11 guide substances



P-removal



CO₂-footprint



Comparison with reference technologies

	UNIT	PACAS	Ozone + Sand Filtration	PAC + Cloth ¹
CO ₂ -footprint ²	g CO ₂ /m ³	122	128	113
Costs ²	€/m ³	0,05	0,17	0,15
Removal Efficiency Dutch guide substances ³	%	70-75%	80-85%	70-80%

¹ PAC dose 8 mg/L, coagulant dose 5 mg Fe/L and PE dose 0,4 mg/L

² Per treated m³ wastewater: peak dry weather flow must be treated. **Please note: standardized cost and CO₂ levels for 2018**; recalibration of all CO₂- and cost levels will take place during the evaluation of the Innovation Program in 2024

³ Overall Removal Efficiency of effluent wwtp to influent wwtp (including bypass post treatment) for 7 of 11 guide substances: benzotriazole, carbamazepine, diclofenac, irbesartan, gabapentine, metropolol, hydrochlorothiazide, mixture of 4- en 5-methylbenzotriazole, sotalol, trimethoprim en venlafaxine in every 24h or 48h flow or time proportional sample. The sampling has to take the hydraulic retention time of the wwtp into account.

Consequences stricter removal efficiencies Proposal EU Urban Wastewater Treatment Directive (80% in EU instead of 70% in NL and different guide substances):

- PACAS will have a CO₂-footprint of 160 g CO₂/m³ and a cost level of € 0,08/m³
- No changes for ozone CO₂-footprint of 128 g CO₂/m³ and a cost level of € 0,17/m³
- PAC+Cloth will have a CO₂-footprint of 130 – 150 g CO₂/m³ and a cost level of € 0,16 – 0,17/m³

Royal HaskoningDHV

Latest insights

- Increase in PAC price
 - € 2.000 per tonne (premise IPMV 2018)
 - € 4.000 – 6.000 per tonne (market price 2022-2023)
- Carbon footprint is high compared to other technologies
 - PAC has fossil origin
 - Slow development of non-fossil (and effective and affordable) PAC
- Proposal EU Urban Wastewater Treatment Directive
 - PAC-dose increase from 8 to 10 or 12 mg/L
 - Stricter requirement on phosphorus and nitrogen



Thank you for your attention!
Thanks to all consortium partners!



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Tackling Micropollutants in Wastewater
Results of the Dutch Innovation and Implementation Program

November 8 and 9 2023
Aquatech Amsterdam

stowa



**Ministry of Infrastructure
and Water Management**

