

Continuous filtration for micropollutant removal by Biologically Granular Activated Carbon (Bio-GAC)

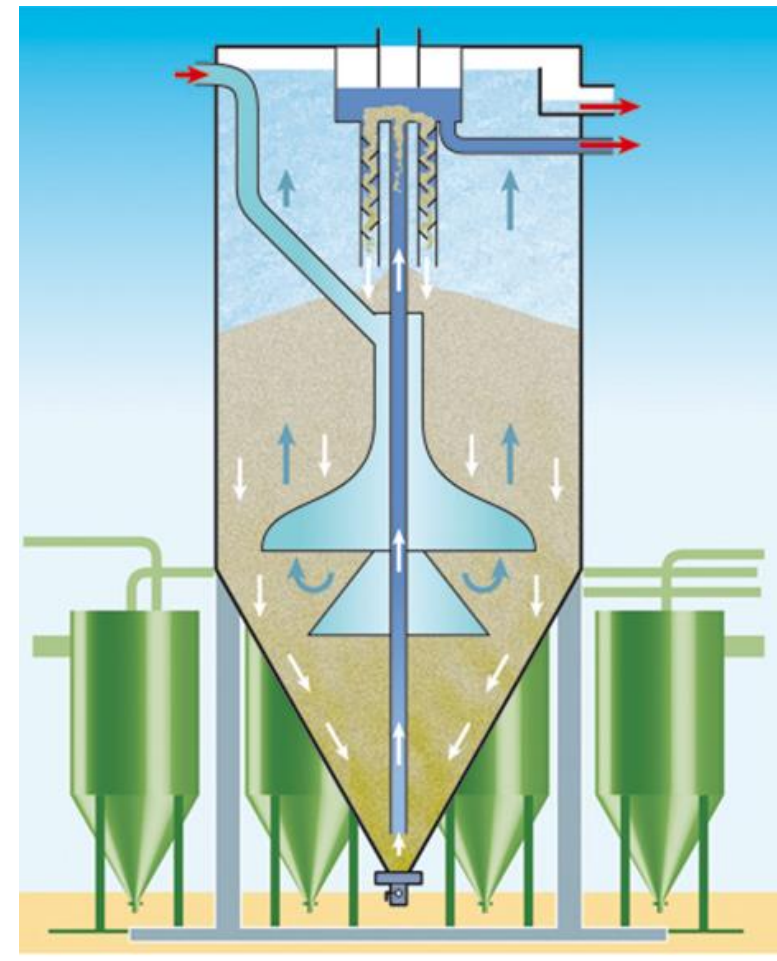
Innovation in Micropollutant Removal from Municipal Wastewater
November 8th and 9th 2023 - Aquatech Amsterdam

Continuous Sand Filtration

- Moving bed filtration
- Continuous sand circulation and washing
- No filtration interruption

+ Combined adsorption, filtration and biodegradation
+ No downtime for backwashing

- Highly concentrated wash water



Bio-GAC



Granular Activated Carbon (GAC)

- Granules
- Adsorption of micropollutants



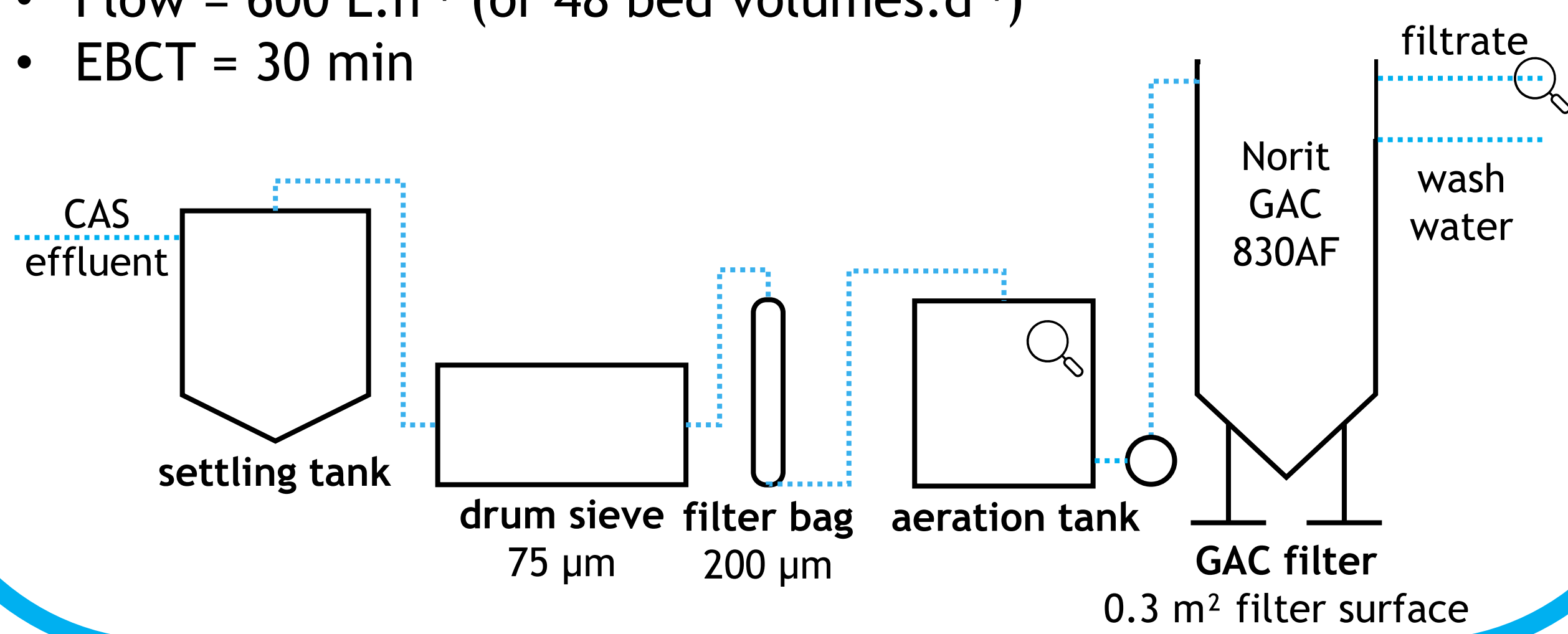
+ Promotion of bacterial growth

+ No formation of harmful substances

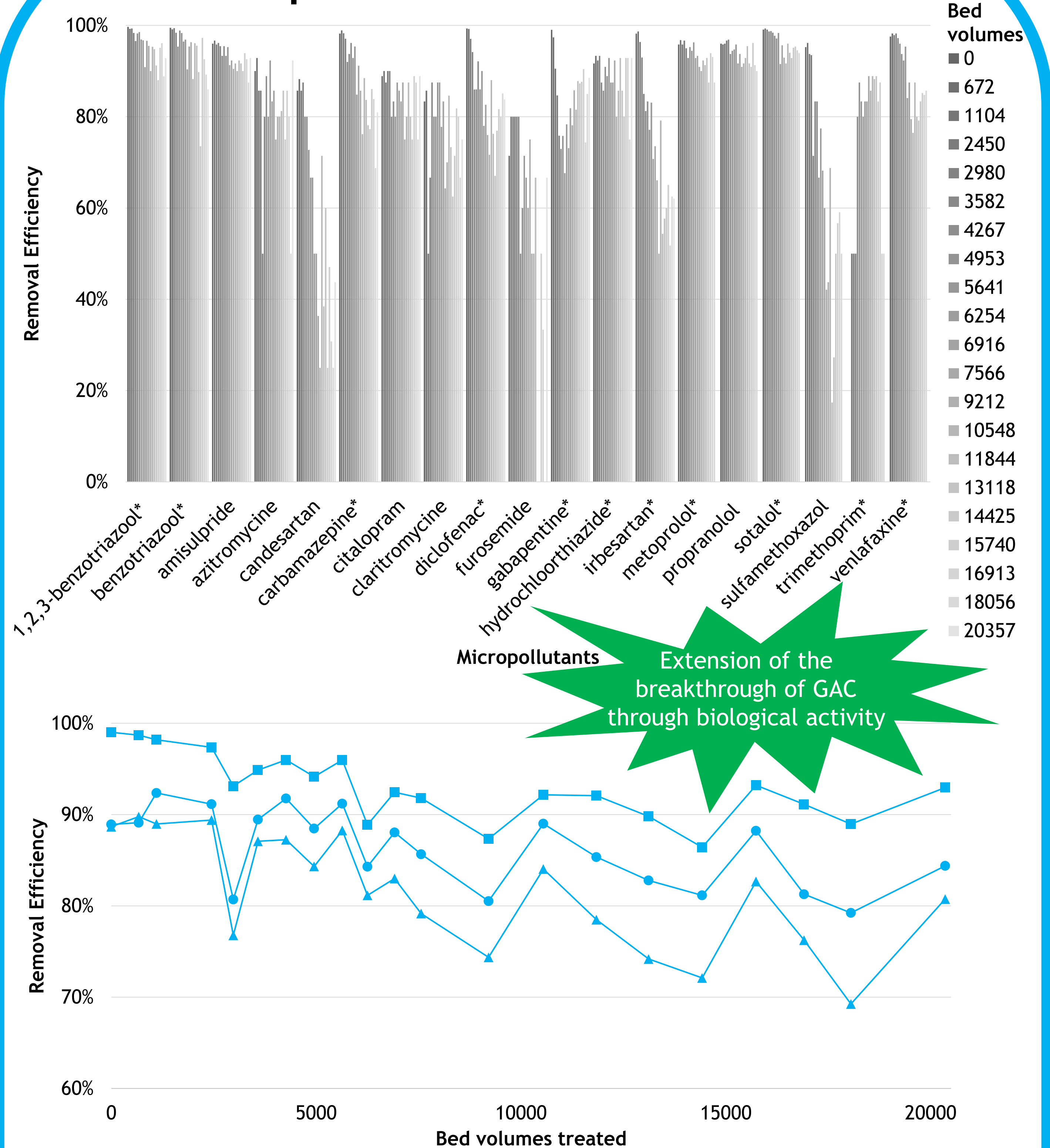
- Time till breakthrough is rather short

Setup

- Location
 - WWTP of Aartselaar (conventional activated sludge system (CAS))
 - 54,000 IE (60 gBOD₅·(IE·d)⁻¹)
 - First full scale quaternary treatment (O₃ + GAC) in Flanders (Belgium) - in operation from November/December 2023
- Pilot study
 - Period: June 2022 - December 2023
 - Mean NH₄-N concentration in CAS effluent of 0.4 ± 0.3 mg·L⁻¹
 - Removal of suspended solids by drum sieve and filter bag
 - Oxygen supply (8-10 mg·L⁻¹) before Bio-GAC filter
 - Flow = 600 L·h⁻¹ (or 48 bed volumes·d⁻¹)
 - EBCT = 30 min

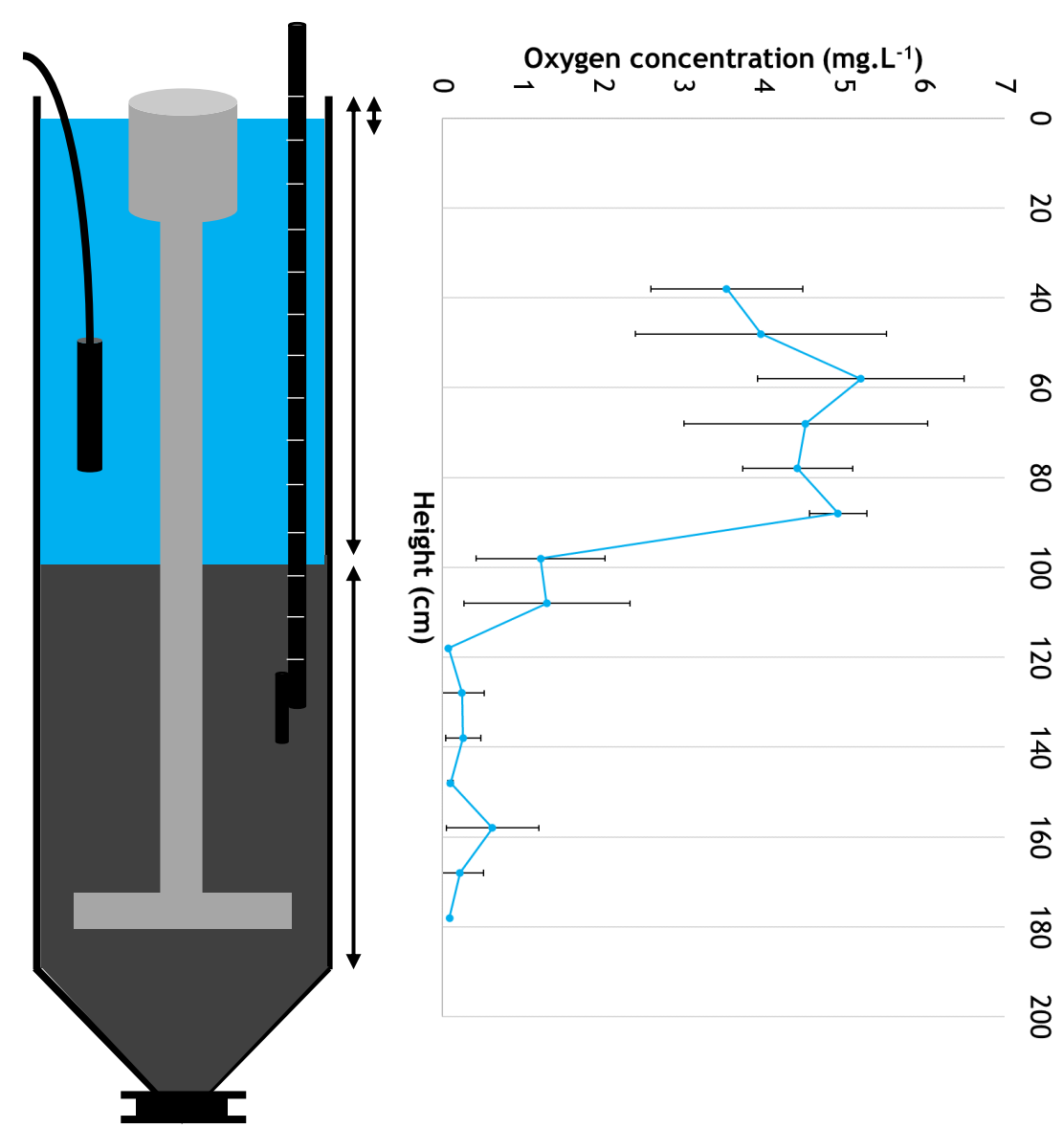


Micropollutant removal over time



Optimizing process design

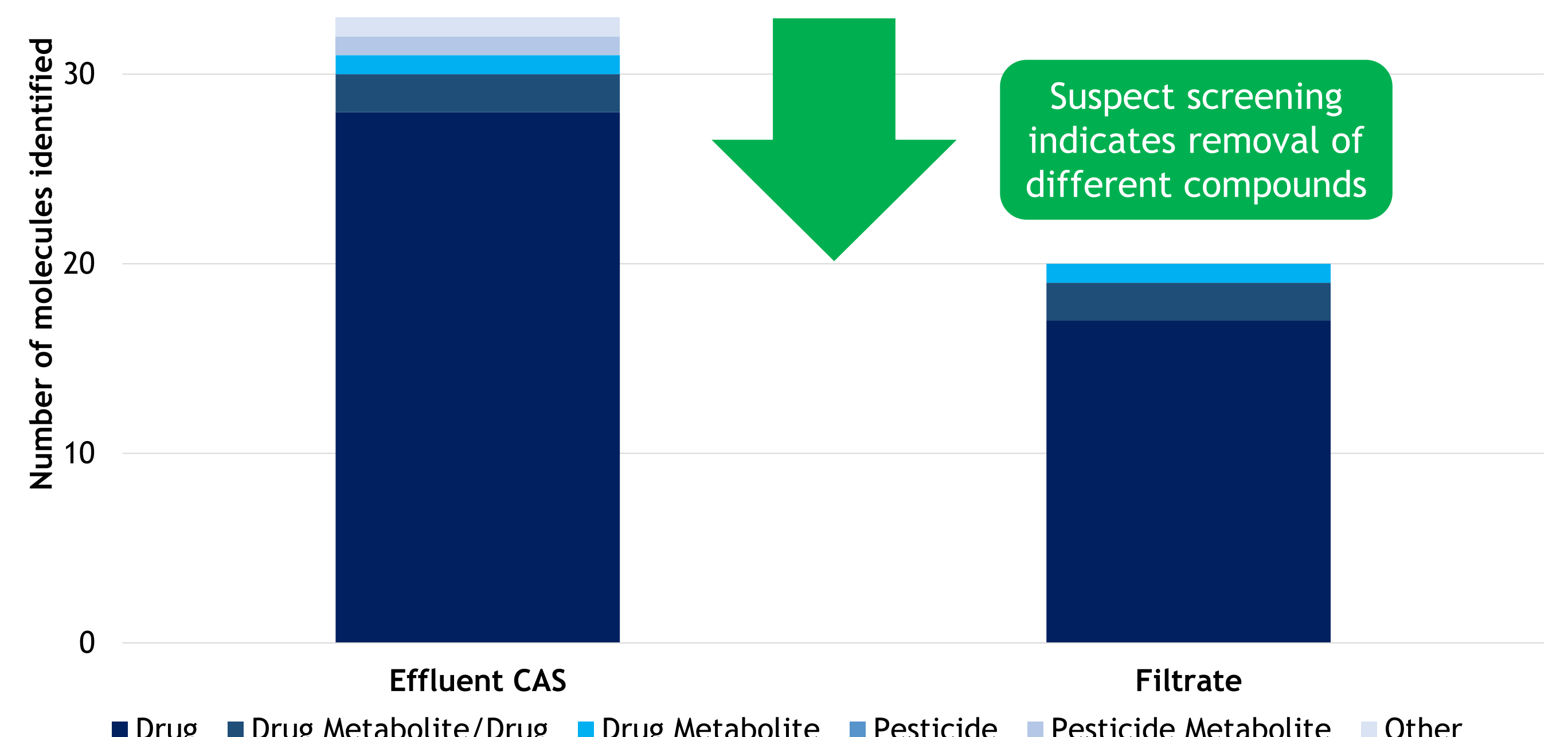
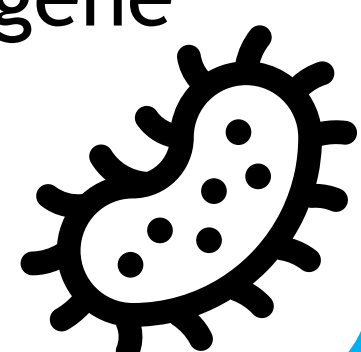
- Indicators of biological activity
 - Increase in bed resistance over time
 - Increase in oxygen demand



- Controlled media circulation (Sand-Cycle)
- Redesign of airlift and washer assembly

Next steps

- In-depth study of the microbial community using 16S rRNA gene amplicon sequencing
- Combination with P-removal?
- Other type of GAC?



- WWTP effluent quality ↑
- CO₂ footprint ↓
- Costs related to replacement of GAC ↓



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In collaboration with:

