

ADVANCED OZONE AND ACTIVATED CARBON OPERATIONAL STRATEGIES



FOR ENHANCED MICROPOLLUTANT REMOVAL FROM SECONDARY WASTEWATER EFFLUENT

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Introduction

Trace organic contaminants (TrOCs):

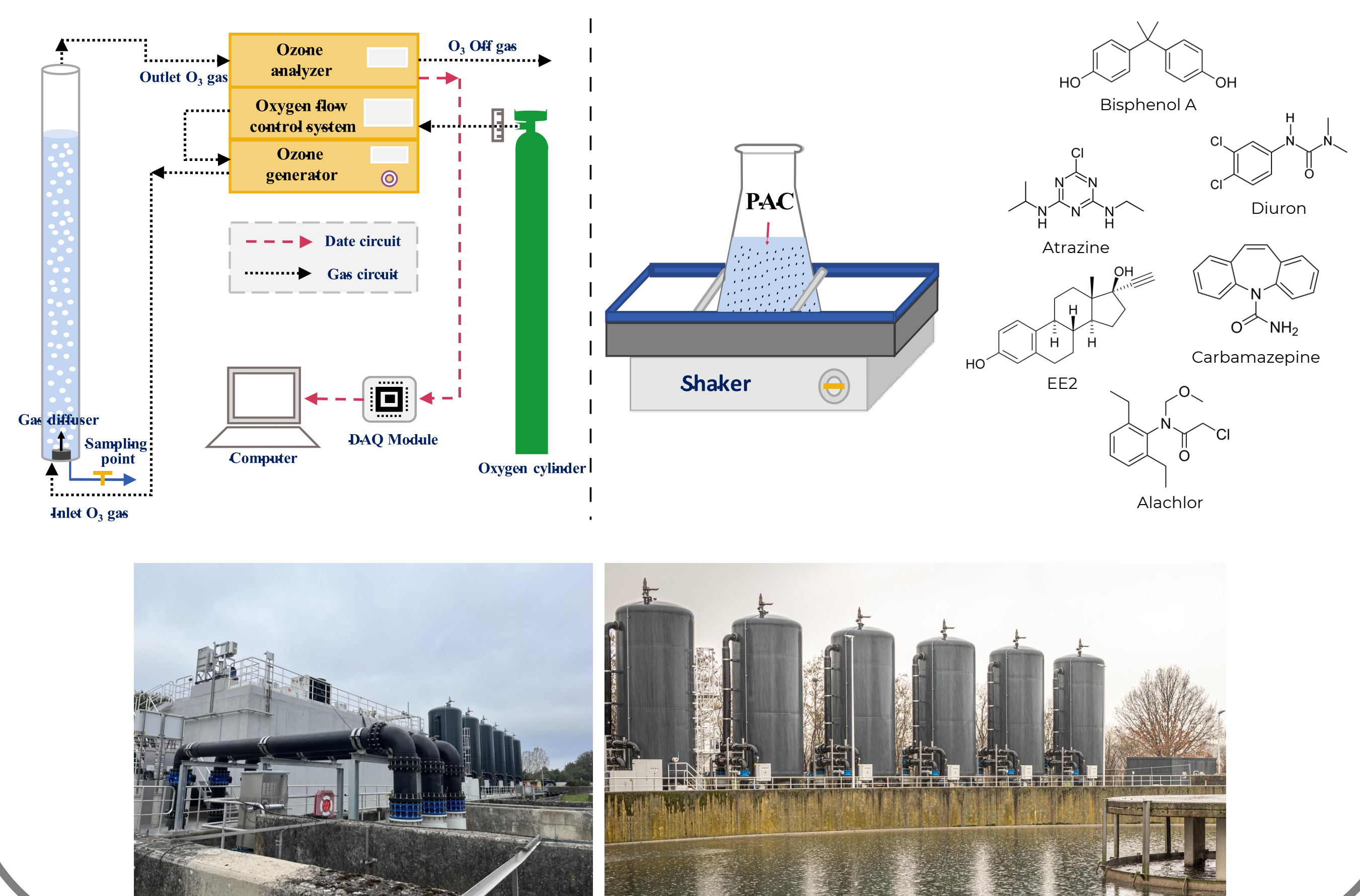
- E.g., pharmaceuticals, pesticides
- Impact on aquatic life and environment
- Poor removal in conventional WWTP
- New EU regulations require 80% removal

→ Combine **ozone** (O_3) + **activated carbon** (AC)
→ Increase TrOC removal
→ Limiting energy use and O_3 by-products (e.g. bromate)

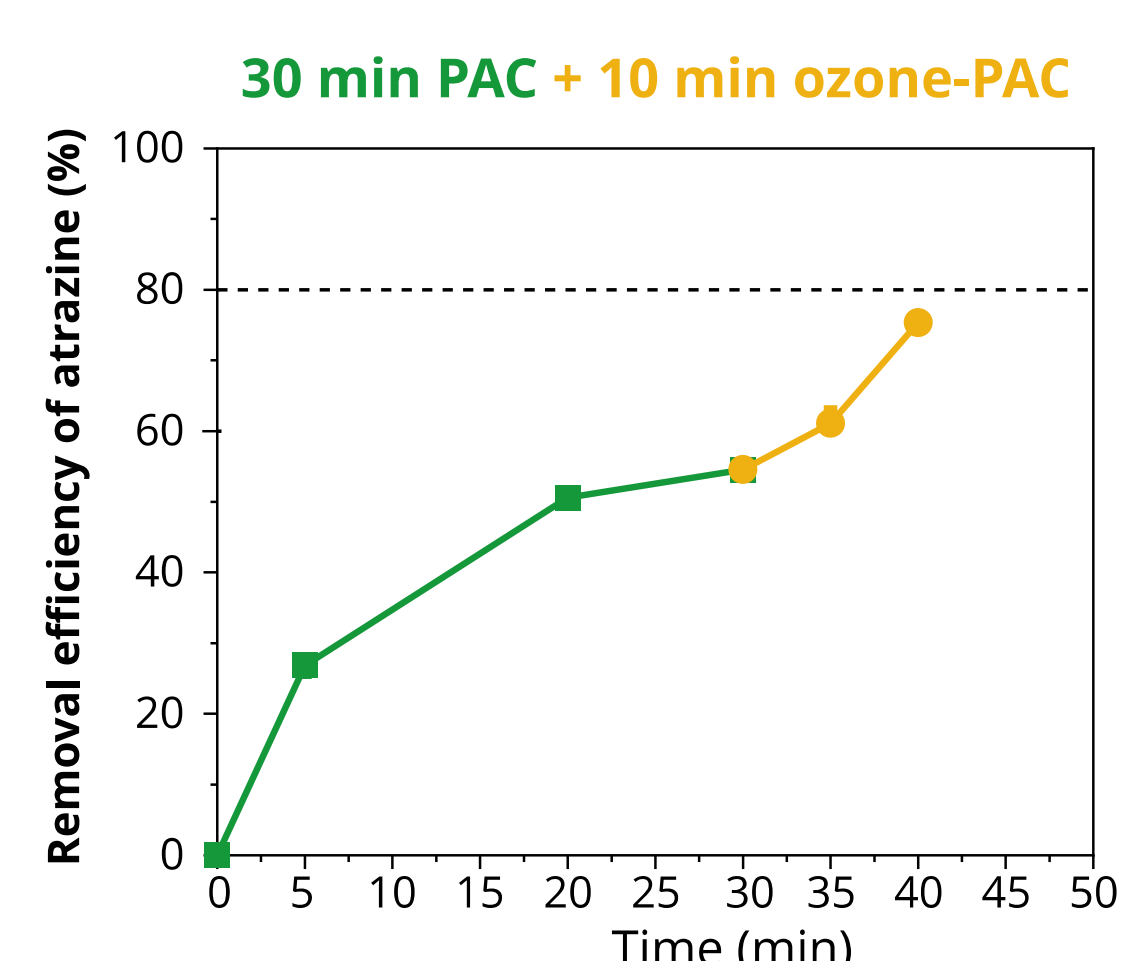
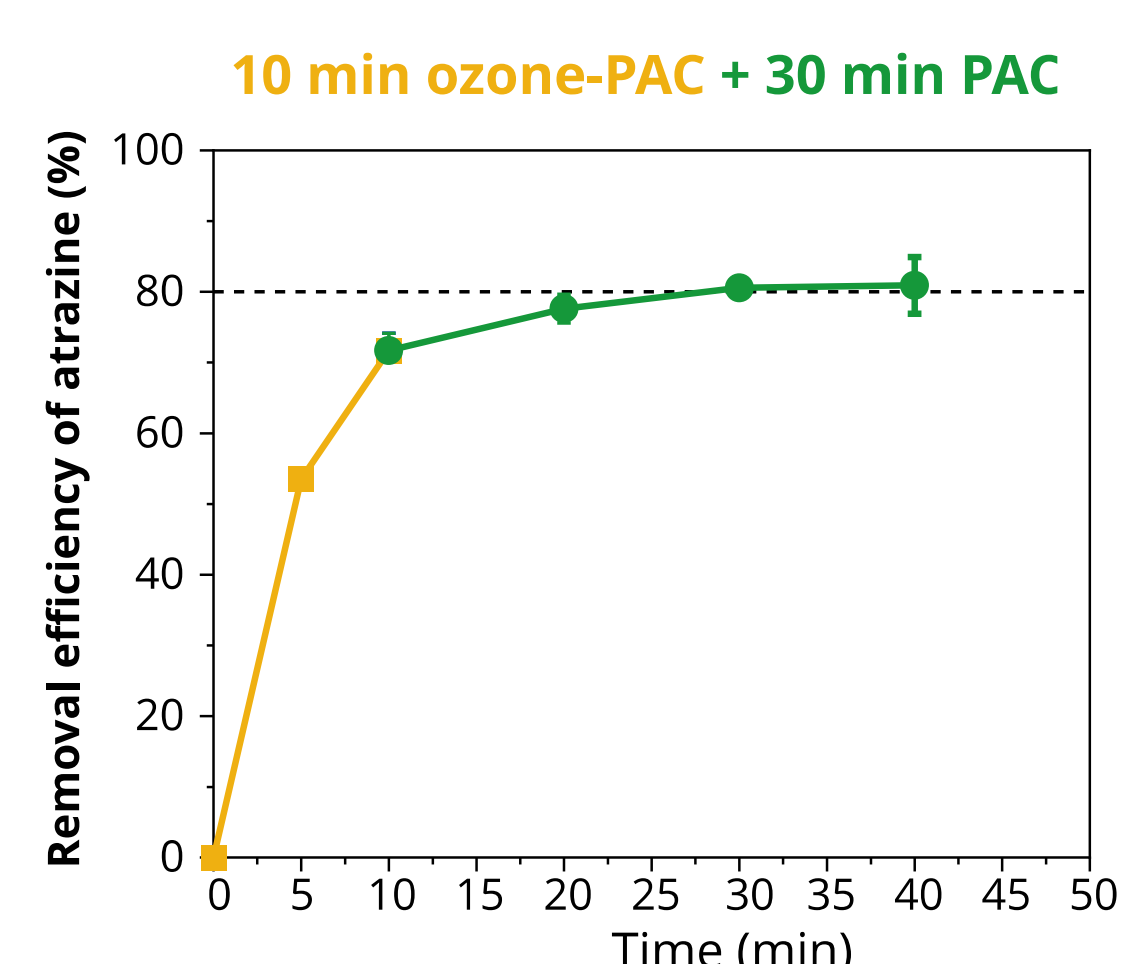
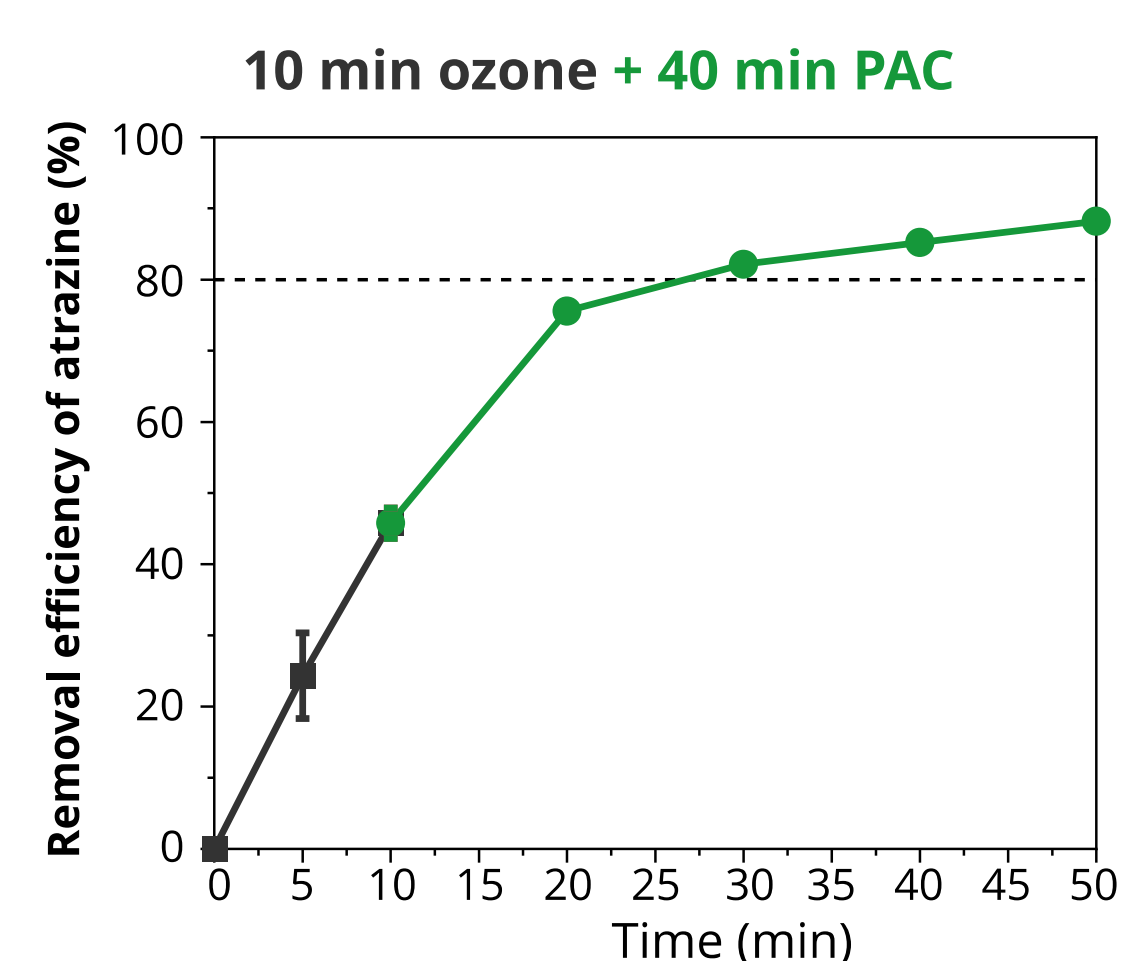
Challenges

- Optimal dosing O_3 + AC?
- Best process order?
- Real-time monitoring in WWTPs?

Materials & Methods



Results

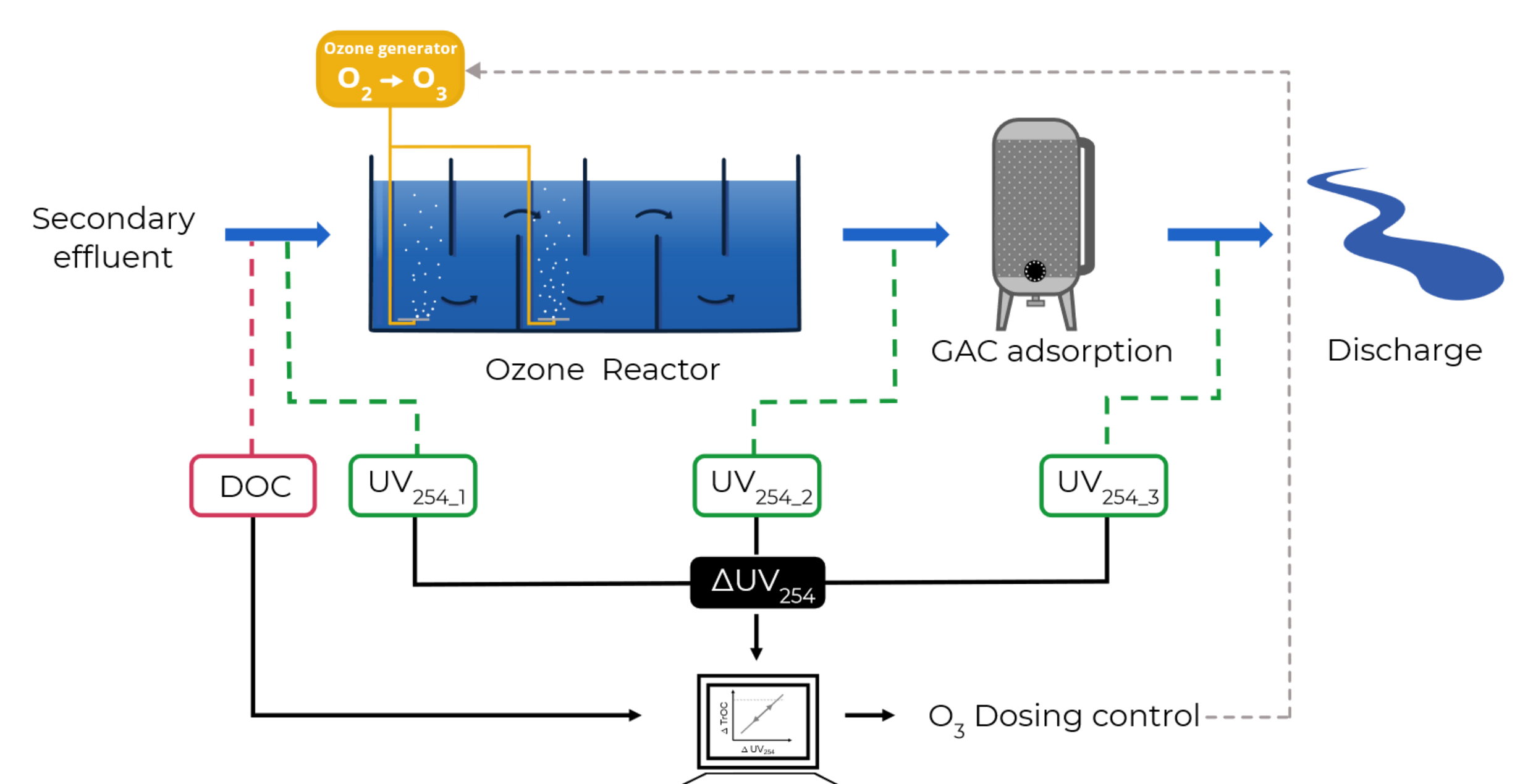
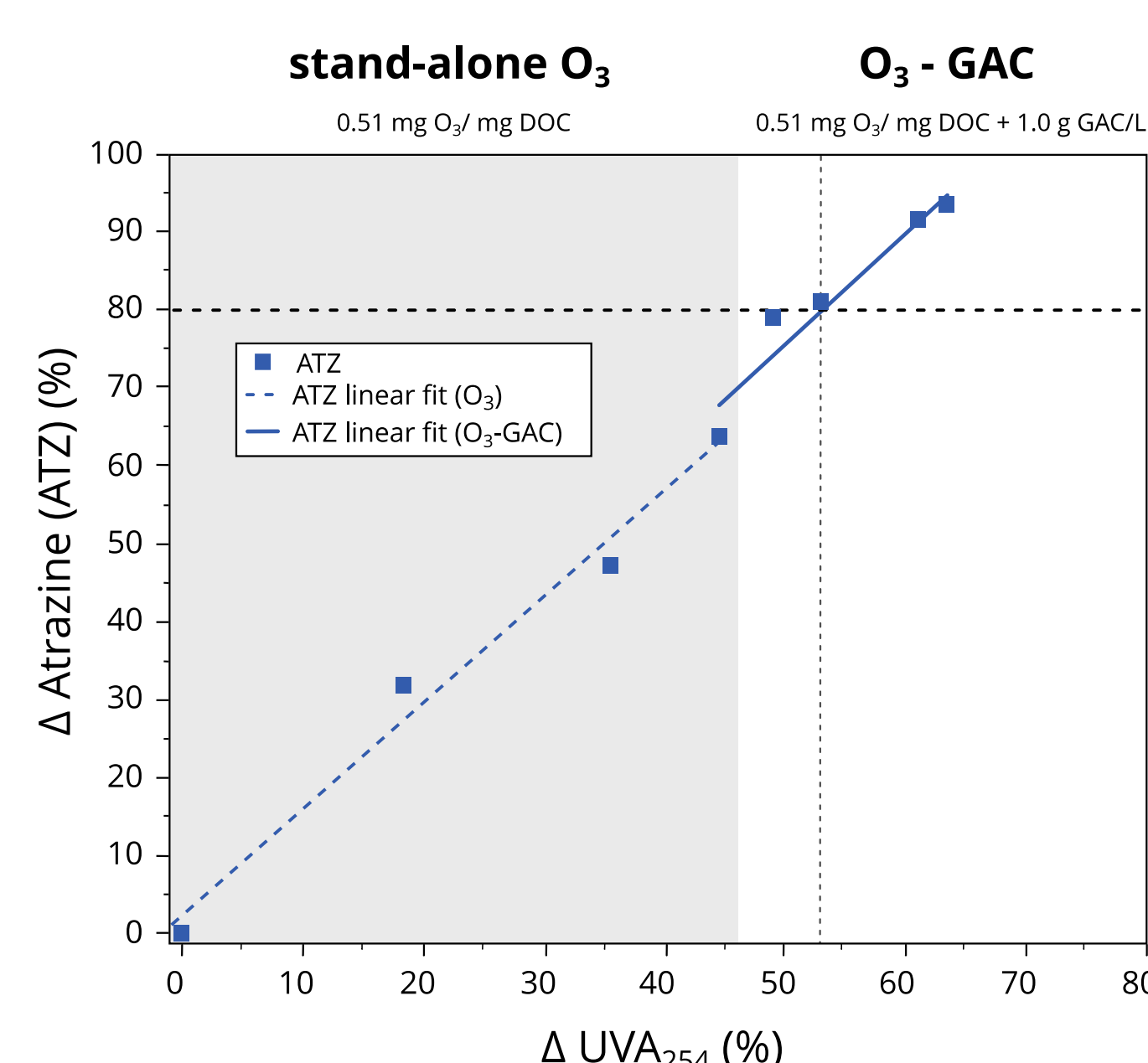


Total ozone dose = 0.54 mg O_3 /mg DOC
Total PAC dose = 1.2 mg PAC/mg DOC

Better removal efficiencies (↑5-10 %) in shorter treatment time (50% reduction) when applying **O_3 before or simultaneous with powdered AC (PAC)** due to:

- Pre-ozonation modifies properties of organic matter
→ **less competition for adsorption sites**
- Pre-PAC adsorption removes only little COD, DOC and quenchers, and shows negligible promoting effects
- Post-PAC adsorption yields **higher TrOC removal** and **less ozonation by-products**

Integrated surrogate-based control



Conclusion

- Moderate O_3 dose (0.5 mg O_3 /mg DOC) → ↑ PAC adsorption and ↓ O_3 by-products
- O_3 before or simultaneous with PAC ↑↑ TrOC removal
- UV₂₅₄ enables real-time monitoring of O_3 + AC performance

→ **Promising approach** to

↑ effluent quality, ↑ water reuse and comply with new EU regulations



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