

Micropollutants in Waste water - treatment solutions and return of experience

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Outline

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2 | Solutions

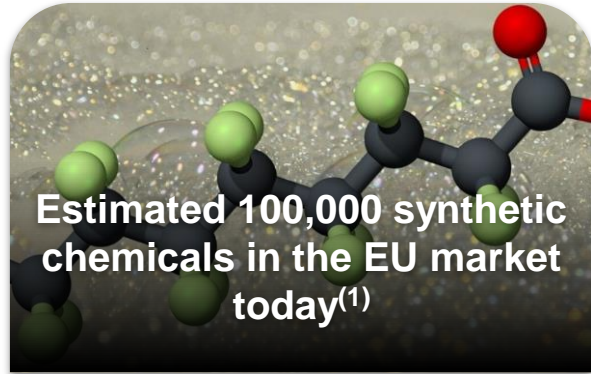
3 | Case-studies

Context



Emerging contaminants

A growing global concern



With robust information and understanding on just 500 of them in water cycle



An anthropogenic origin of pollution: industrial, urban, domestic or agricultural



Suspected and proven health effects⁽³⁾
Potential biodiversity loss⁽⁴⁾

Emerging contaminants

Media attention and Public concern

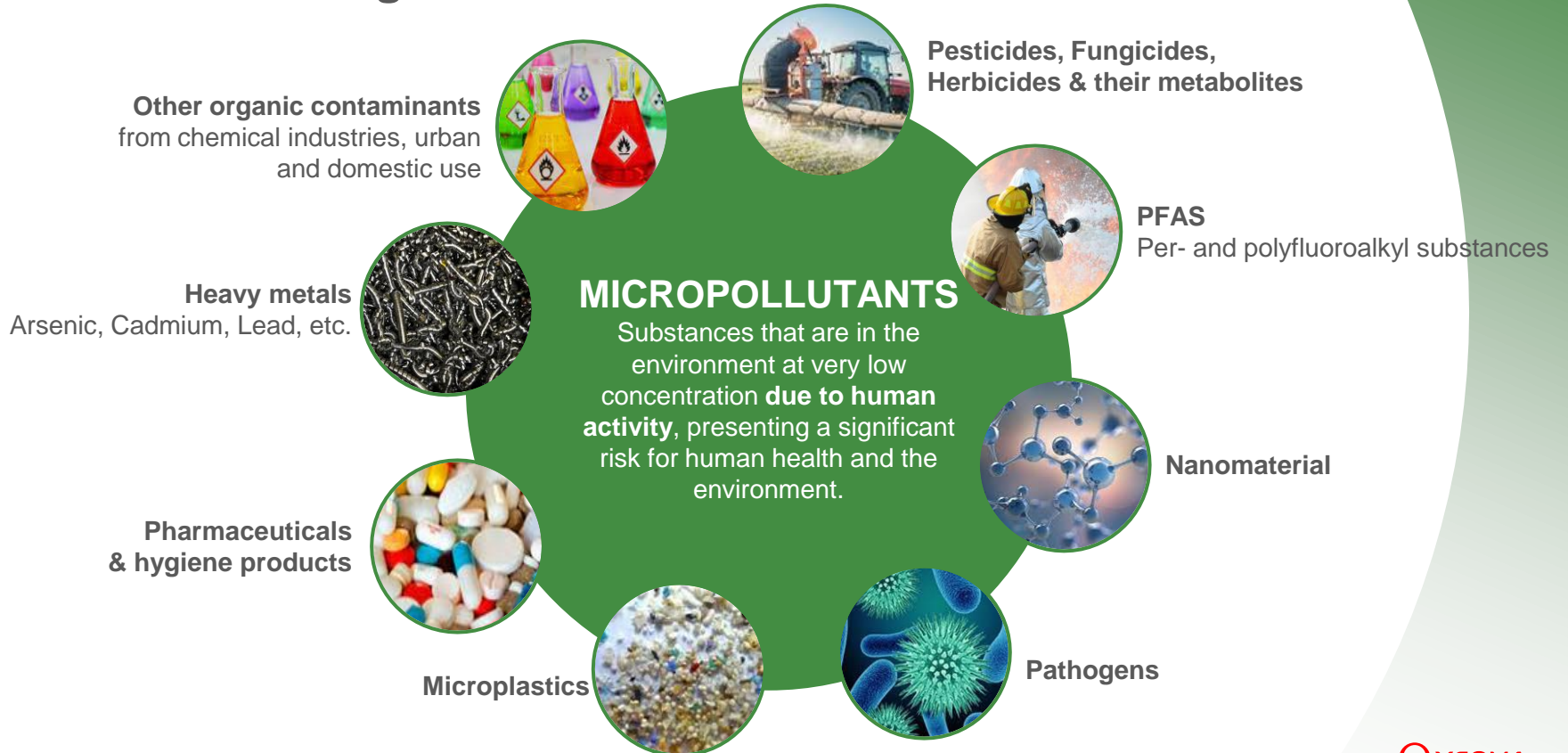


76%

of citizens consider the risk of pollution impacts on resources & health as serious and immediate*

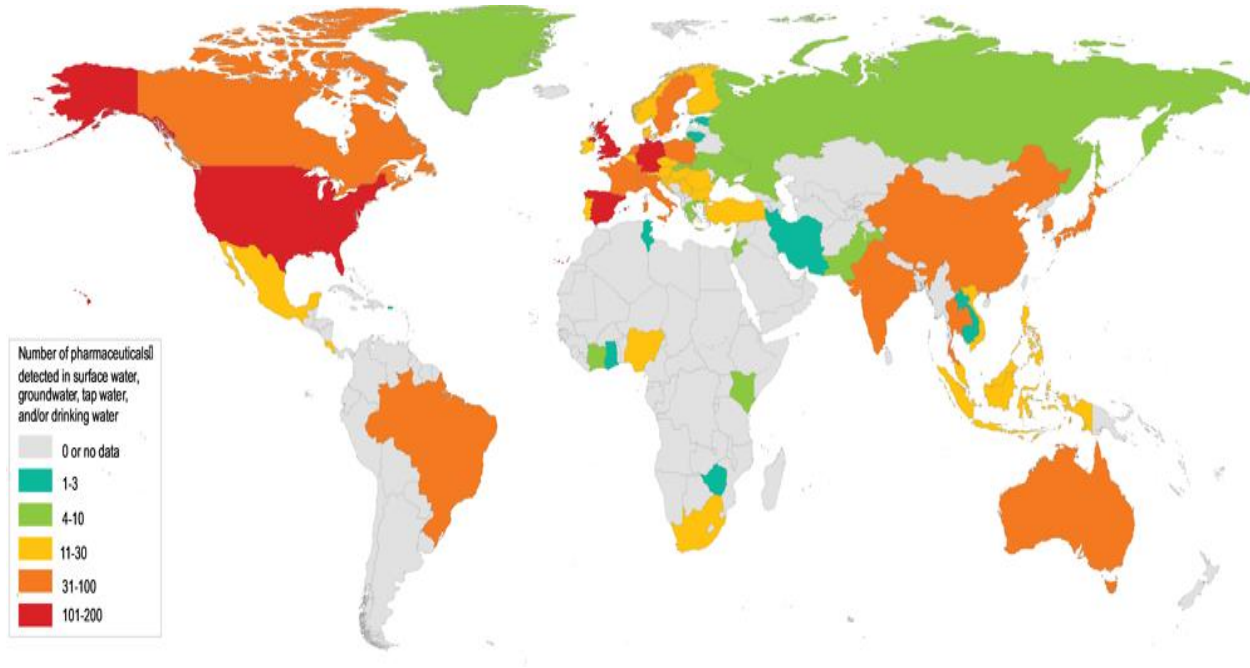
Emerging contaminants

What are we facing?



Emerging contaminants

A closer look to pharmaceuticals in surface water



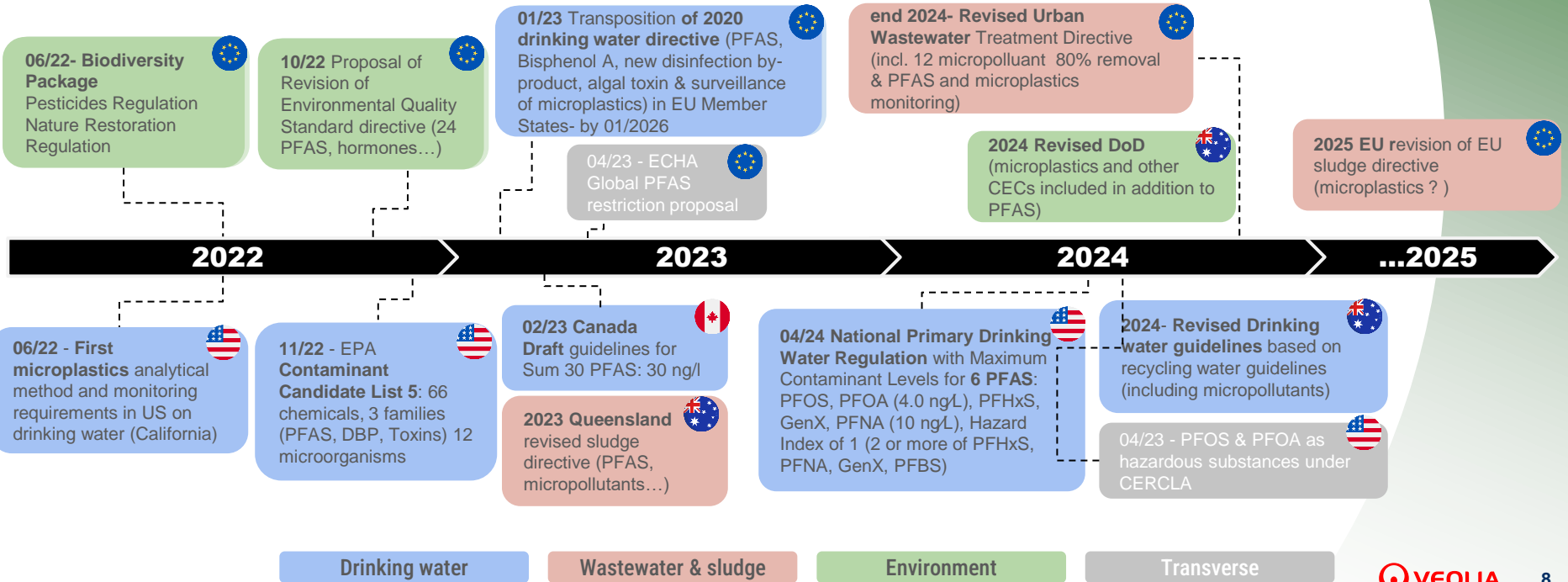
Detection frequency of pharmaceuticals in environment (Aus de Beek et al, [UBA 2016](#))

- More than **3000** active pharmaceutical ingredients worldwide
- Major transfer to environment : WWTP Discharges
- **631** pharmaceutical substances detected in resource and wastewater in more than **71** countries
- Levels : ng/l-µg/l
- The most detected: Diclofenac, Tetracycline, Carbamazepine, Sulfamethoxazole, Ibuprofen and hormones

Emerging contaminants

Evolving knowledge & accelerated regulation

A ramp-up in regulation: more parameters, stricter thresholds, more segmentation



Solutions



Veolia's offer

Global value proposition within 5 pillars



— An end-to-end approach —

To **anticipate** emerging issues and **offer** solutions to contribute to a healthy and safe living environment for the future generations

Veolia's offer

Global value proposition within 5 pillars



Diagnosis and mapping
of pollution emitters:
Actipol, Octopus

**Micropollutant
characterization:**
Analysis, water fingerprint
4000

Control of industrial
effluent discharge in
WWTP

Partnership and support
on changes in agricultural
practices

Public awareness and
involvement actions

Activated carbon

Membranes

Ozonation

Combined processes:
a combination of
technologies

**Target analysis and
water fingerprint**

Bioassays for impact
monitoring

Online monitoring for
process control and
pollution alert

**By-product
management**

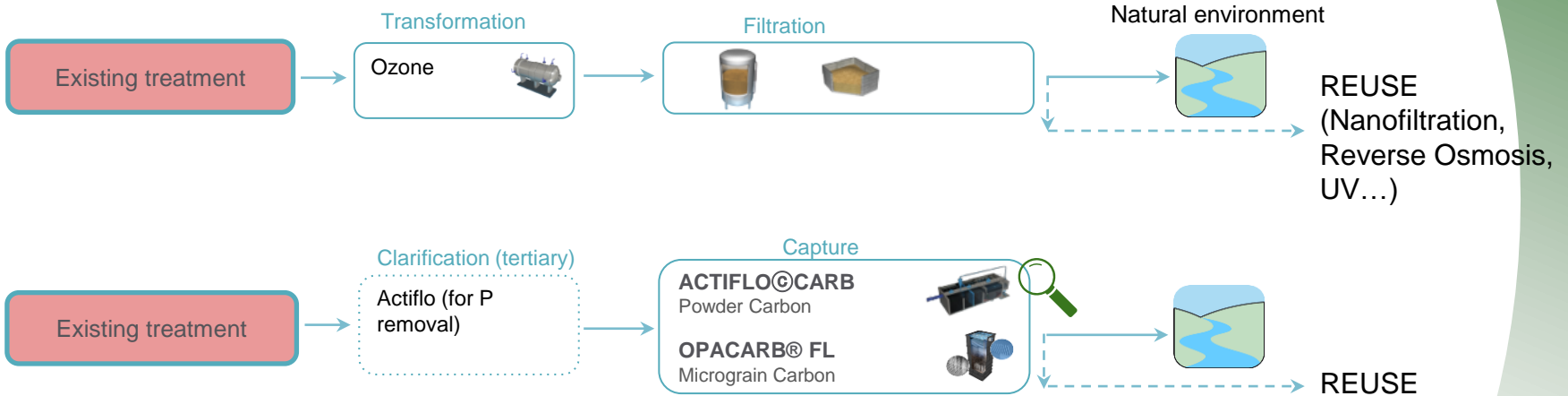
R&D on by-product
regeneration

Veolia's offer

Focus on treatment - stand alone

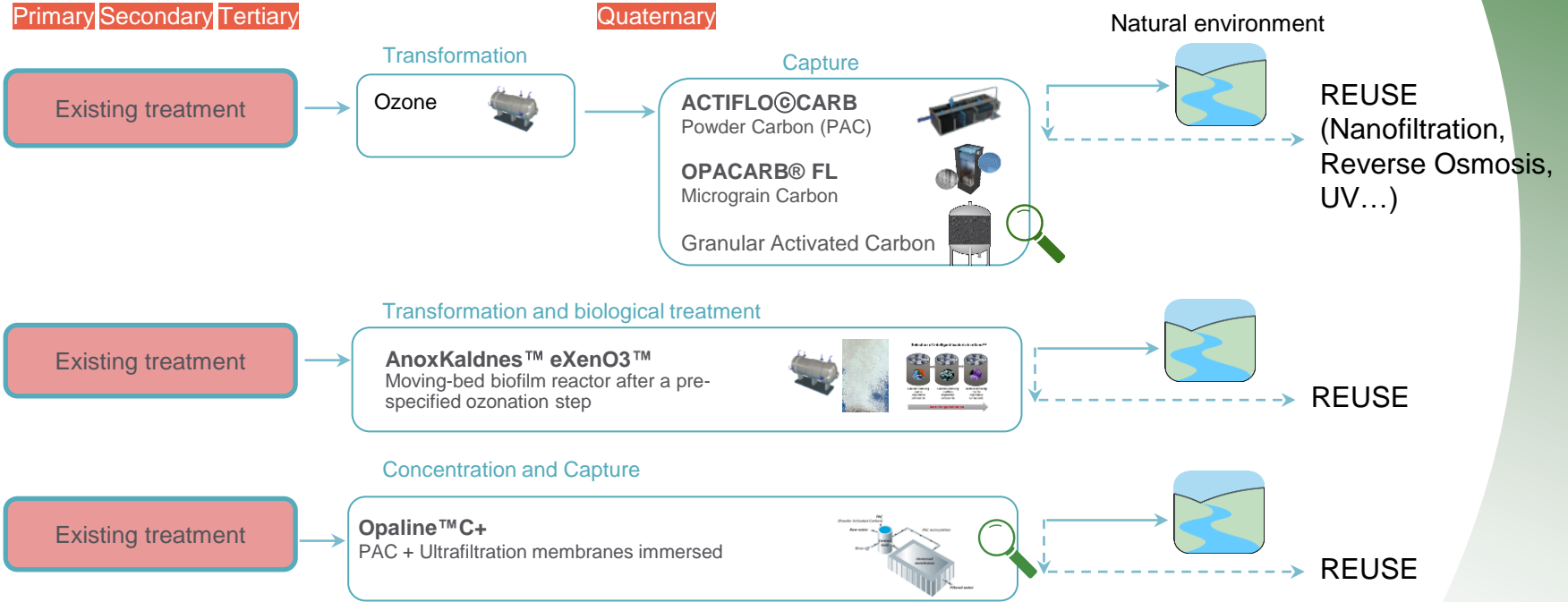
Primary Secondary Tertiary

Quaternary



Veolia's offer

Focus on treatment - Combined technologies



Case studies



ARA Altenrhein 120 000 p.e. WWTP (Switzerland)

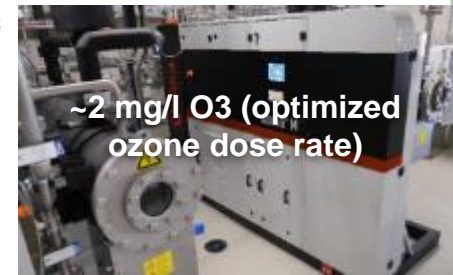
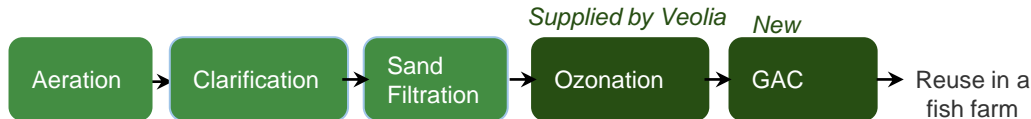
Combination of Ozonation and GAC - Full scale plant

| Challenge

- Ensure sustainable water protection for several decades
- Comply with CH regulation

| Solution

Combination of ozonation and granular activated carbon to gain the benefit of both oxidation of the organic compounds and retention of remaining contaminants and ozone transformation products



>90% removal of 12 substances required by Swiss regulation **since 2019**



Optimization of operational costs with the extension of **GAC lifetime** from **3 to 6 years.**

Herford WWTP (Deutschland)

ACTIFLO®CARB (Powder Activated Carbon) - Full scale plant

Existing wastewater treatment work built 1998 by VWT (Multiflo + Biostyr)

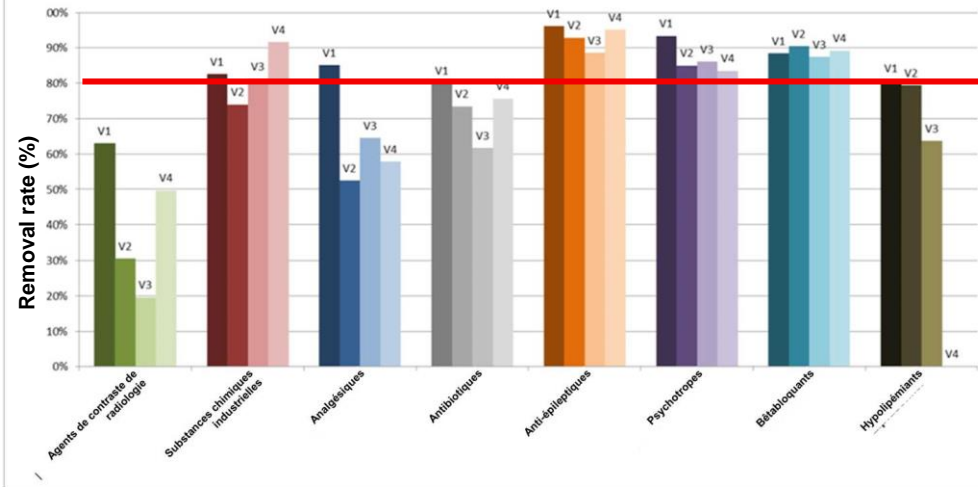
Micropollutants removal using **Actiflo Carb & hydrotech discfilter** (10 µm mesh) - 3 x 300 m³/h



80% removal of industrial cleaning agents & most pharmaceuticals

HERFORD WWTP
Actiflo®Carb + Discfilter

Removal rate by group of substances



Arcachon - SIBA 150 000 p.e. WWTP (France)

Combined treatment - pilot

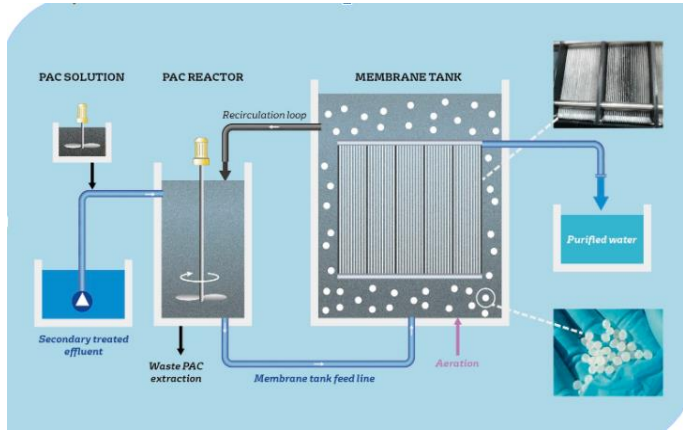
| Challenge

- Protect a sensitive marine environment
- Maintain activities (fishing and oyster farming)

| Solution: An industrial prototype to demonstrate treatment efficiency

- Automatic operation & remote management
- Rigorous monitoring: Physico-chemical & bacteriological parameters; Micropollutants

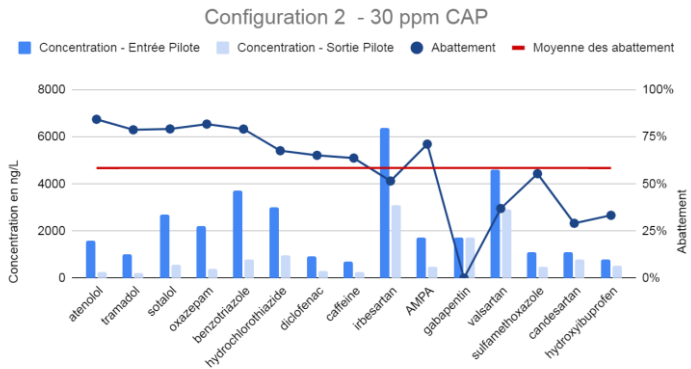
Opaline C+: Powder Activated Carbon Reactor + Immersed Ultrafiltration membrane



60% removal in average



Boost to **75% removal** by direct injection of O3 and PAC dose / 2



Conclusion



CONCLUSION

The treatment of micropollutants is a challenge for sanitation systems:

- More than 100,000 chemical substances listed in Europe and less than hundred substances regulated in living environment
- Regulation is evolving: monitoring and treatment requirements
- Fighting against the infinitely small is not so simple, but solutions exist. To meet this challenge, proven water treatment technologies can treat micropollutants. We have references
- Choice of treatment process on a case-by-case basis (water quality, land use, possible fate of sludge, etc.)
- Challenges remain on the sustainability, on the safe management of by-product ⇒ Innovation program