



# **Title: Pilot test WWTP Aarle-Rixtel**

**Subtitle: Comparison of O<sub>3</sub> and UV/H<sub>2</sub>O<sub>2</sub>**

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**Dutch Innovation on Micropollutants  
Removal from Municipal Wastewater  
November 7<sup>th</sup> 2019 Aquatech Amsterdam**

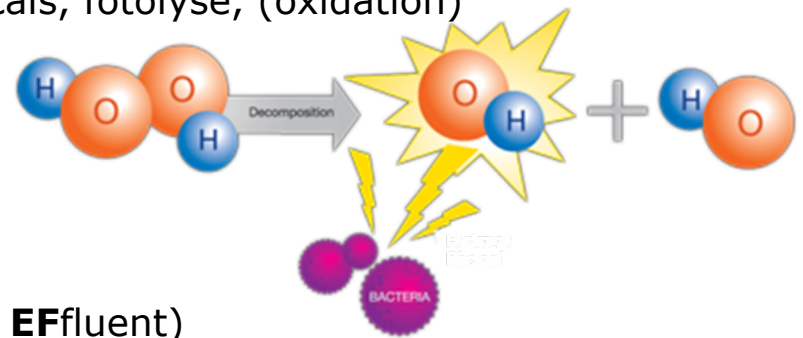
# Oxidative Technologies

- Oxidative technologies

- O<sub>3</sub> + Bioreactor
- UV + H<sub>2</sub>O<sub>2</sub>

Reactions: oxidation, radicals

Reactions: radicals, fotolyse, (oxidation)



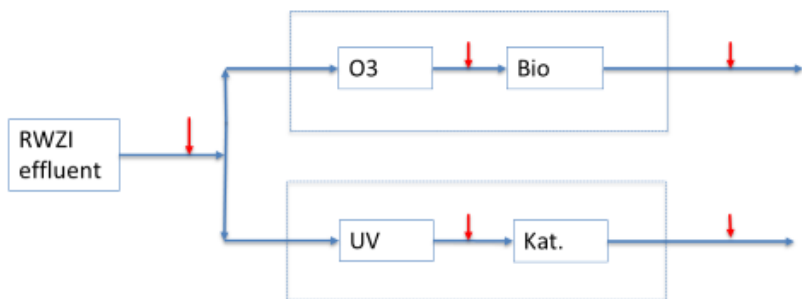
- Comparison parameters

- Removal efficiency
  - 80% (16 medicines, compared to **EF**luent)
  - 70% (7 of the 11 guiding compounds, compared to **IN**fluent)
- Costs, energy, chemicals, metabolites....



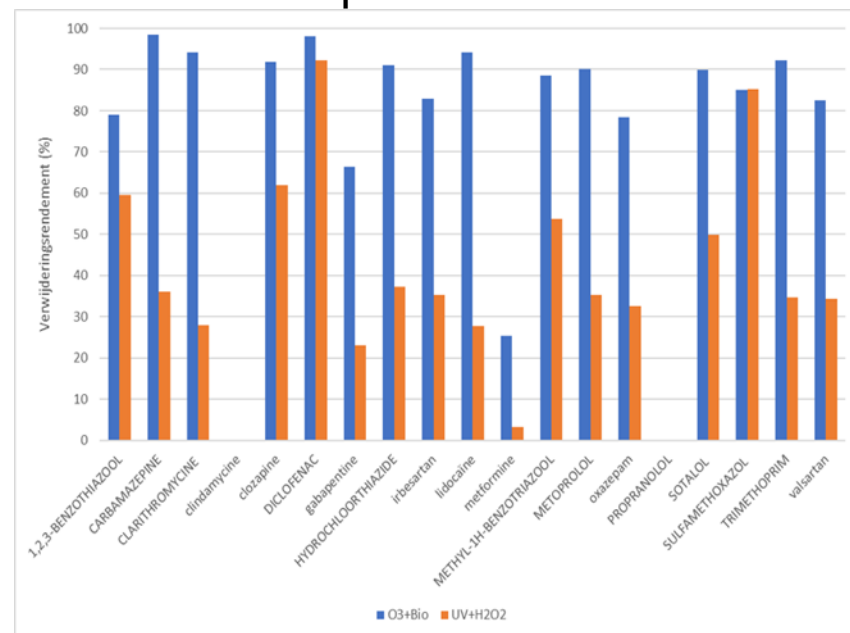
# Pilot Study

UV+H2O2 is “non-proven technology” for WWTP-effluent



Removal Efficiency (%)	Aim	UV+H <sub>2</sub> O <sub>2</sub>	O <sub>3</sub> +Bio
16 medicines, Compared to <u>effluent</u>	80	41	86
7 of the 11 guiding comps, Compared to <u>influent</u>	70	84	94
<b>Points for attention</b>		Energy	Bromate

Individual components:

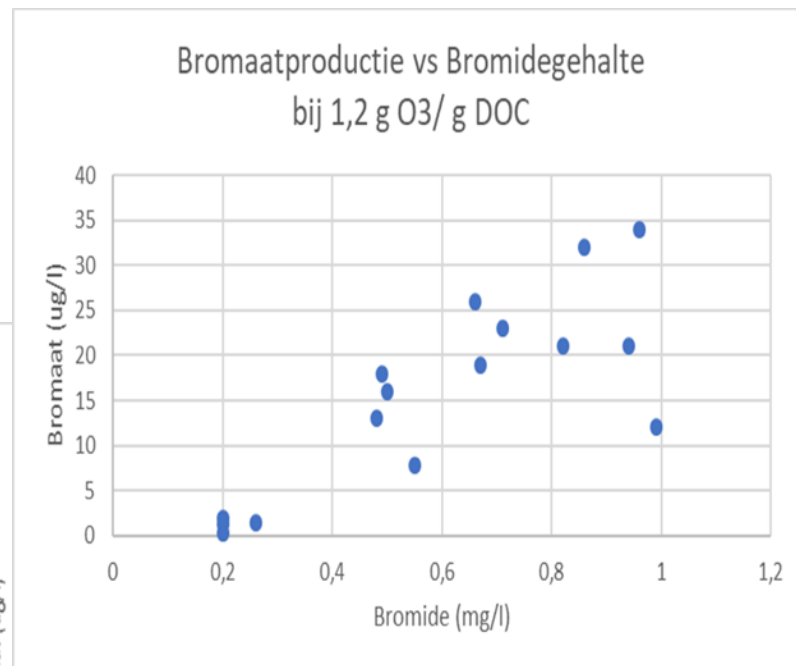
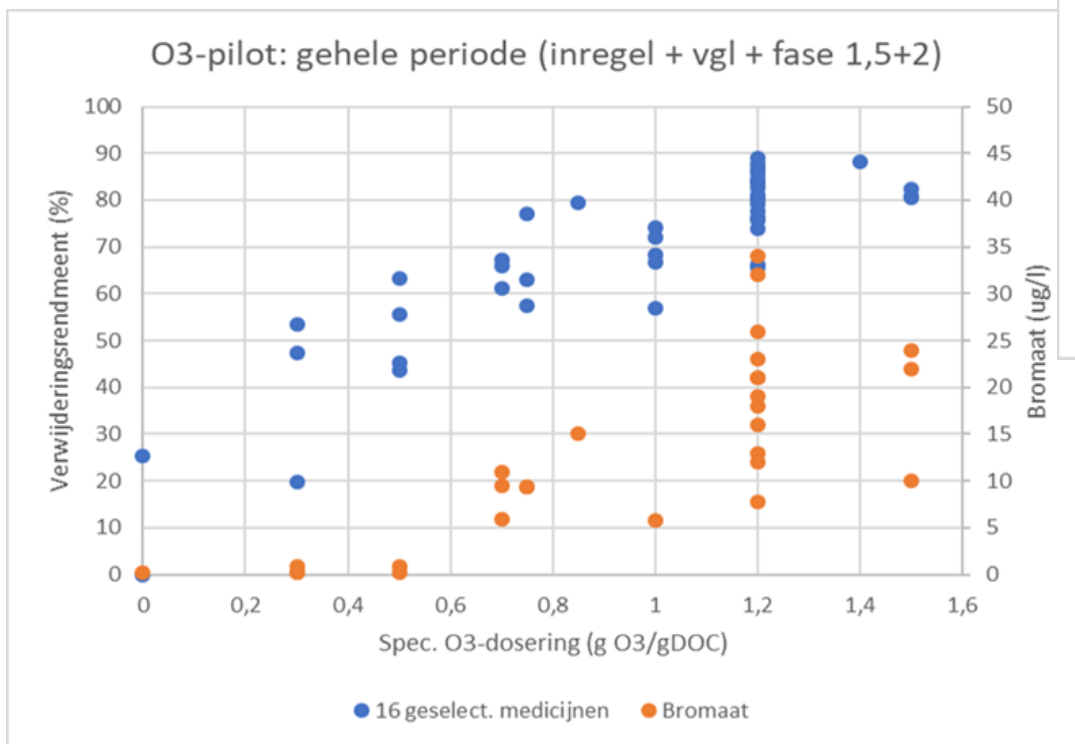


X-ray contrast agents:  
better removed with UV than Ozone

# Pilot Study

Ozone technology: → Bromate  
(avg 19 ug/l, vs 1 ug/l drinking water standard)

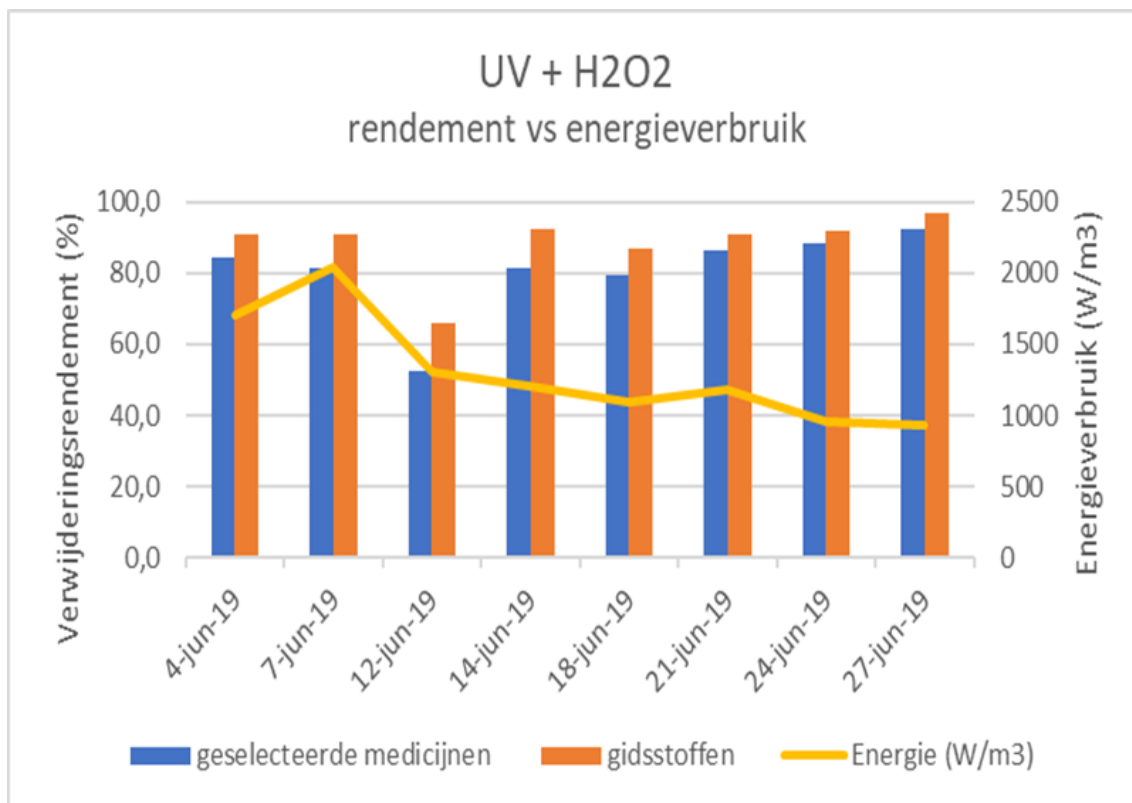
- High Br- in waste water (industrial waste water)
- Relative high O3-dosis



# Pilot Study

UV+H<sub>2</sub>O<sub>2</sub>: Energy consumption

(UV-lamps: 1 kW/m<sup>3</sup> @ 41% removal efficiency comp. to effl)



**Cause: low UV-transmittance**  
of waste water

Pre-treatment: sand filter + coagulant

UV-transmission: 40 → 60%

It helps, but...

..... E-consumption is still high

(UV-lamps: 1 kW/m<sup>3</sup>  
@ 80% removal efficiency comp. to effl)

# Results

Criterion	UV+H2O2	O3+Bio
Removal of micropollutants	++	++
CO2 footprint	--	0
Costs	--	0
Ecotoxicity	+	+
Microplastics	?	?
Antibiotic resistance	?	?

# Further research

## **Conclusion for wwtp Aarle-Rixtel:**

- O<sub>3</sub> more attractive technology than UV+H<sub>2</sub>O<sub>2</sub>
- Point of attention: Bromate

**Recommendation:** first Demo scale, then full scale

Investigate in Demo:

- Reduction/ prevention of BrO<sub>3</sub> (drinking water)
- Combination with nutrient removal
- Ecotoxicity (effect on surface water)
- Efficiency (value for money?)
- ....





**Thank you for your attention!**

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