



# Ozon<sup>ia</sup>\*

Ozone And AOP Application Services

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## Process Application Services

- Industry leading oxidation services
- World-class laboratory
- Partnering with clients for solutions
- From laboratory to full scale
- Project development
- Global presence

## Industry Leading Oxidation Services

Ozone is a solution for any oxidation application including resource recovery processes. Veolia provides full lifecycle services to develop the optimum oxidation solution for our clients.

The first challenge for any solution is feasibility. Feasibility studies by the Ozonia team define process solutions to meet your challenges.

### Our Services

- Batch and semi-batch laboratory testing
- Continuous laboratory testing
- On-site pilot testing
- Analytics
- Expertise and innovation using the Veolia database
- Literature research





## Partnering With Clients For Results

Ozone-based AOP laboratory testing provides results that our clients can count on to meet their goals.

- Our services provide a technical-economical assessment for the optimum oxidation process mechanics including ozone dose, concentration, and process ratios
- We evaluate the site-specific evolution of water parameters (COD, TOC, AOX, micropollutants CECs) to ensure the feasibility of our solutions
- Ozone-based AOP combined with biological testing allows us to recommend a combined ozone-biological treatment process to minimize capital and operational costs
- Pilot testing confirms laboratory testing to optimize full-scale installations and define continuous mode settings to manage:
  - Water matrix variations
  - Process guarantees



## World-Class Laboratory

Our industry-leading oxidation process laboratory is equipped with state-of-the-art equipment, analyzers and data processing technology. Our expert staff brings over 20 years of combined experience to our clients.

### Our Testing

- Ozone-based AOP testing
  - Ozone
  - Ozone + peroxide
  - Ozone with controlled pH
- Containerized pilot solutions
  - Ozone
  - AOP
- Modular and customized pilot solutions
- Biological testing
  - Zahn-wellens test-DIN EN ISO 9888
  - Sequencing batch lab reactor

# Success Story: From Laboratory To Full Scale

## Industrial Wastewater COD And Color Removal

### Challenge

New regulations required stringent COD discharge concentrations.

Process goal was to remove >60% COD.

Client required a bolt-on process to remove several items:

- Color
- COD
- Hard COD compound

### The Veolia Solution

#### Veolia Process Guarantees:

- Ozone production
- 98% ozone transfer efficiency

#### Wastewater Treatment:

- 900 m<sup>3</sup> / day flow rate
- Side-stream injection
- 875 ppm maximum ozone dose
- 1:1 ratio (ozone : H<sub>2</sub>O<sub>2</sub>)
- August 2015 commissioning

#### Ozonia AOP System:

- 45 kg/h ozone capacity:  
2 x Ozonia CFV-30
- LOX supply system: filter, LOX tank, vaporizer, gas supply
- Nitrogen supply system: compressor, after cooler, refrigerant dryer, tank, adsorption dryer
- Two contacting systems

### Results

Laboratory testing at the Ozonia ozone innovation center in Zürich used to define AOP process and equipment requirements.

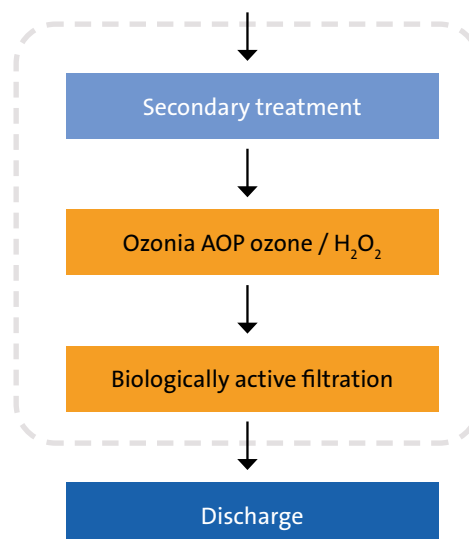
Two-stage AOP selected to achieve an optimized 60% Color / COD reduction.

- 1st stage: O<sub>3</sub>
- 2nd stage: O<sub>3</sub> / H<sub>2</sub>O<sub>2</sub>

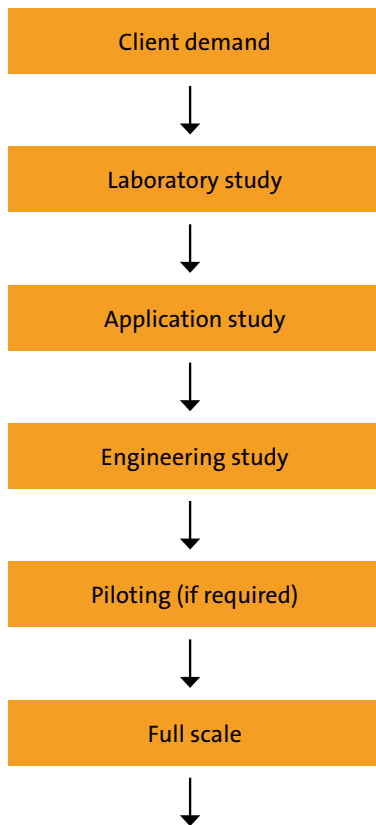
Intelligent process design allows the most cost effective process combination to reduce capital and operational costs Hydroxyl radical reactions were required to break down the remaining refractory (hard to degrade) color compounds and COD.



Existing wastewater treatment plant effluent



## Project Development



>500 Lab Tests

15 On Site Pilots

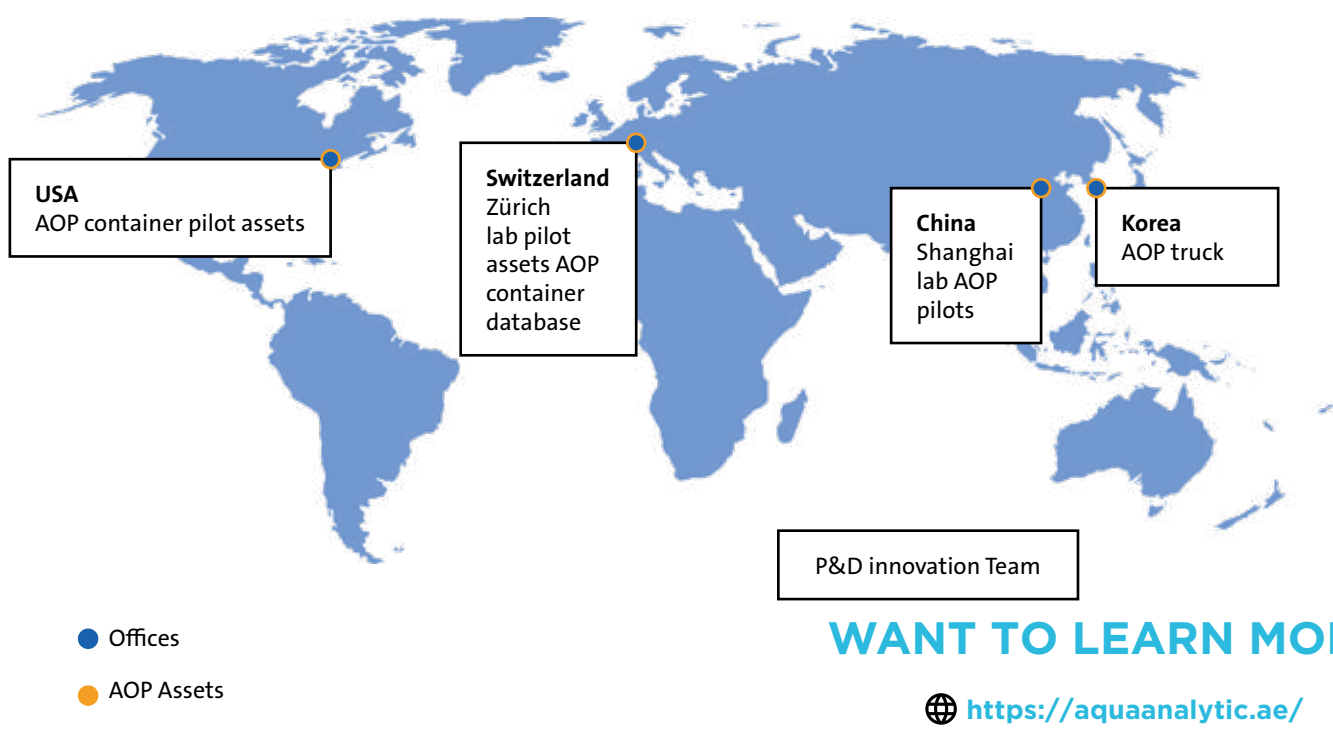
Over 20 Years  
Of Experience

## Global Presence

Ozone and AOP assets are also global with locations in North America and Asia.

### Global Overview AOP

Asset from and supported by Ozonia ozone and Aquaray\* UV



WANT TO LEARN MORE?

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