OPUS2g
Two great challenges

Water-AI-Reclaim-4-25 Technology

Revolutionizing water recovery with artificial intelligence

Efficient, Sustainable, Scalable, Cost-effective, and Adaptive to Multiple Purposes...


Industrial Use


Agriculture


Urban Development

What is Water-AI-Reclaim-4-25?

A system that integrates advanced hyperoxidation technologies, allowing water treatment in small modular spaces in minimal times of no more than 25 mins.

We also develop AI models and new reactors that process any type of water in real-time, adapting to any type of input water.

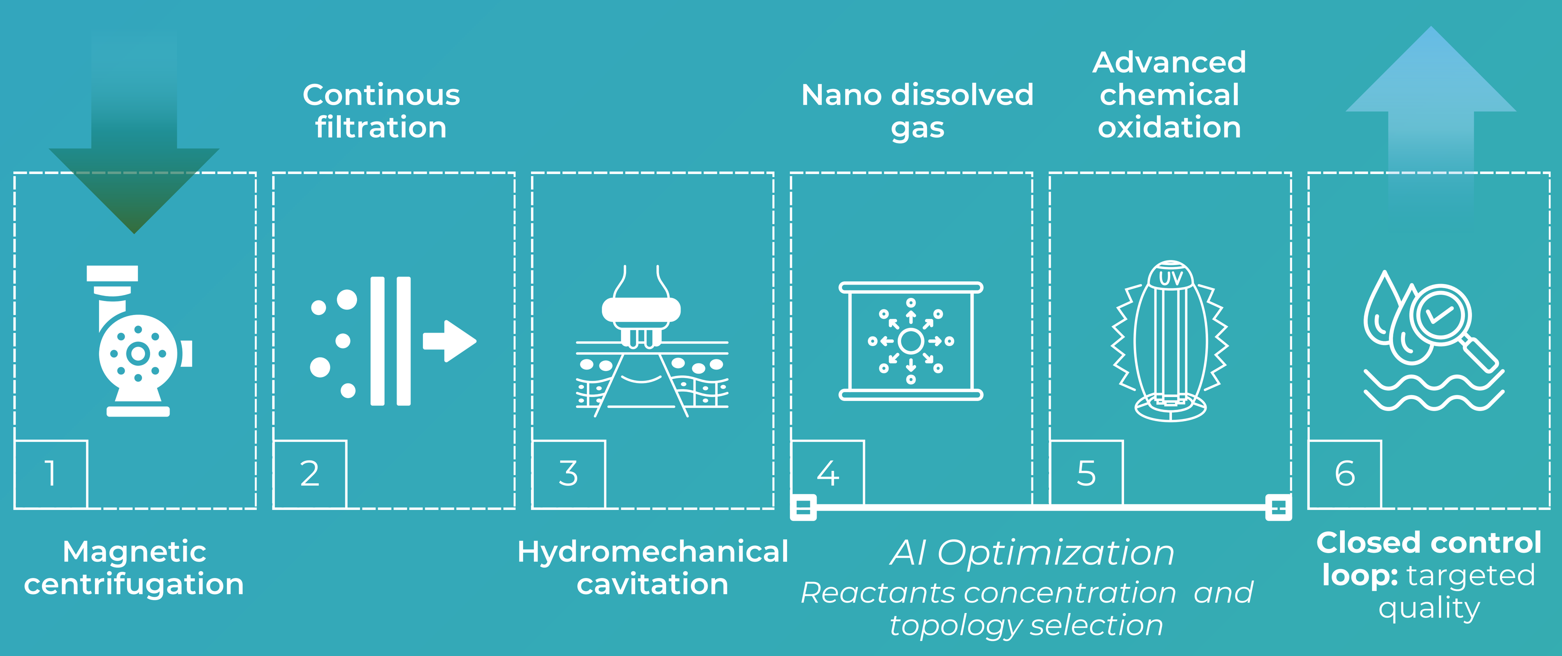
- **Flow rate:** 25 lts/s
- **Space:** 100 m2
- **Zero discharge**
- **No reactants needed**

Key Features

AI Optimization

Comprehensive Sensorization	Provides parametric data for adaptative control algorithms
Cloud Interconnection of modules	Accelerating AI learning processes and building a robust database critical for effective water management
Remote Operation	Monitoring and control of the system from any location

Water Recovery Process



Methodology

Prototype testing

Image 1. Prototype experiment setup. A) Chemical oxidation batch prototype, B) construction of the prototype, C) Ozone nanocavitation setup.

Results

In 25 minutes, methylene blue solution's conductivity decreased by 16%

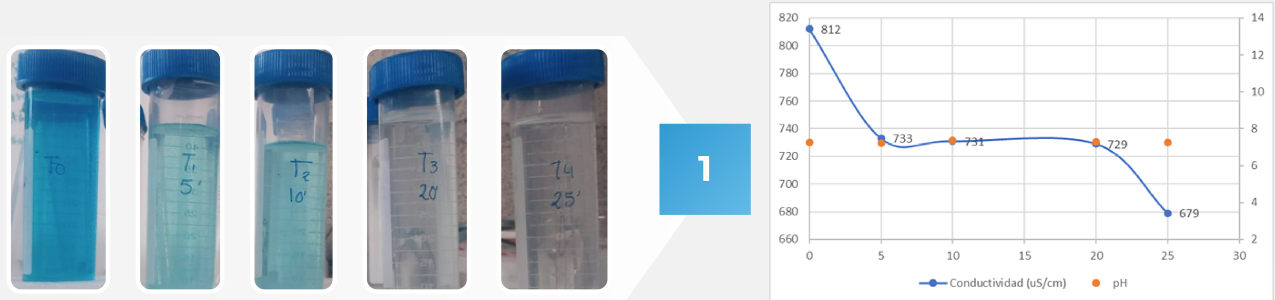


Figure 1. Oxidation of Methylthioninium chloride (Swiss Blue) - 500 ppm solution, measured by conductivity. Time (minutes) vs Conductivity (uS/cm). Control: 655 us/cm

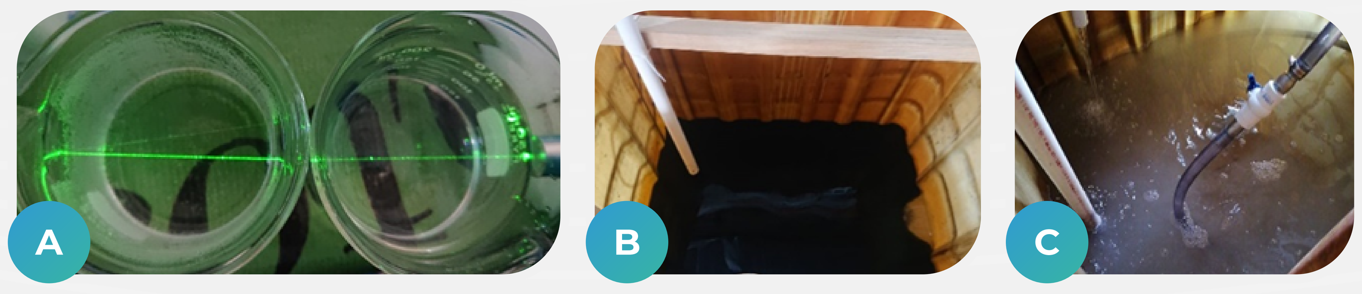


Image 2. Results of batch experiment. A) Laser nanobubbles test, B) Methylthioninium chloride solution 500 ppm, C) Solution after treatment

Optimization

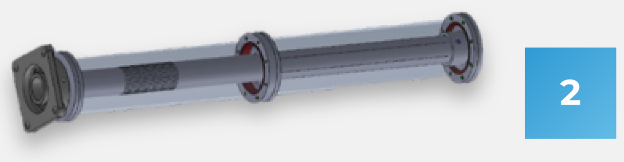


Figure 2. Enhanced design for Nanocavitator (hydro-mechanical cavitation reactor)

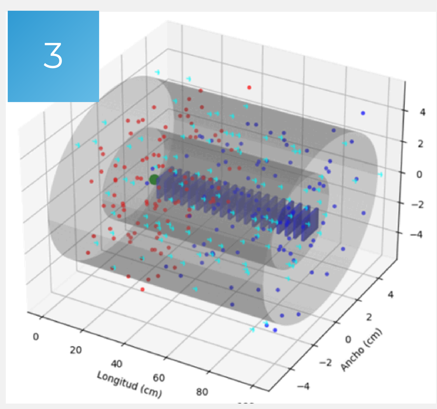


Figure 3. Behaviour of gas disolution inside Nanocavitator

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$$p + \frac{1}{2}\rho v^2 + \rho g h = \text{cte}$$

Bernoulli's principle

$$\rho\left(\frac{\partial v}{\partial t} + v \cdot \nabla v\right) = -\nabla p + \mu \nabla^2 v$$

Navier-Stokes equation

$$C = k_H P O_3 + H_2O \rightarrow 2OH + O_2$$

Henry Law

Figure 4. Equations used for the nanocavitator design

Nanocavitator: hydro-mechanical cavitation reactor simulation

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	AI-WaterReclaim-4-25	
Parameter	INLET value	OUTLET value
Alkalinity	114 mg/L	< 30 mg/L
Barium	0.021 mg/L	< 0.002 mg/L
Boron	3.9 mg/L	< 1 mg/L
Bromide	73 mg/L	55 - 60 mg/L
Calcium	400 mg/L	< 20 mg/L
Chloride	18710 mg/L	17500 - 18000 mg/L
Magnesium	1250 mg/L	< 20 mg/L
Manganese	0.50 mg/L	< 0.01 mg/L
pH	7.9	6.5 - 7.0
Phosphate	0.28 mg/L	< 0.02 mg/L
Potassium	377 mg/L	350 - 360 mg/L
Dissolved silica	3.0 mg/L	< 0.5 mg/L
Sodium	10400 mg/L	9800 - 10000 mg/L
Strontium	13 mg/L	< 8 mg/L
Sulphate	2610 mg/L	2300 - 2350 mg/L
TDS	34000 mg/L	31000 - 32000 mg/L

Table 1. In silico test results for water quality after hydro-mechanical cavitation reactor. Brine Sample from RO, Desalination facility of Guaymas, Sonora, México

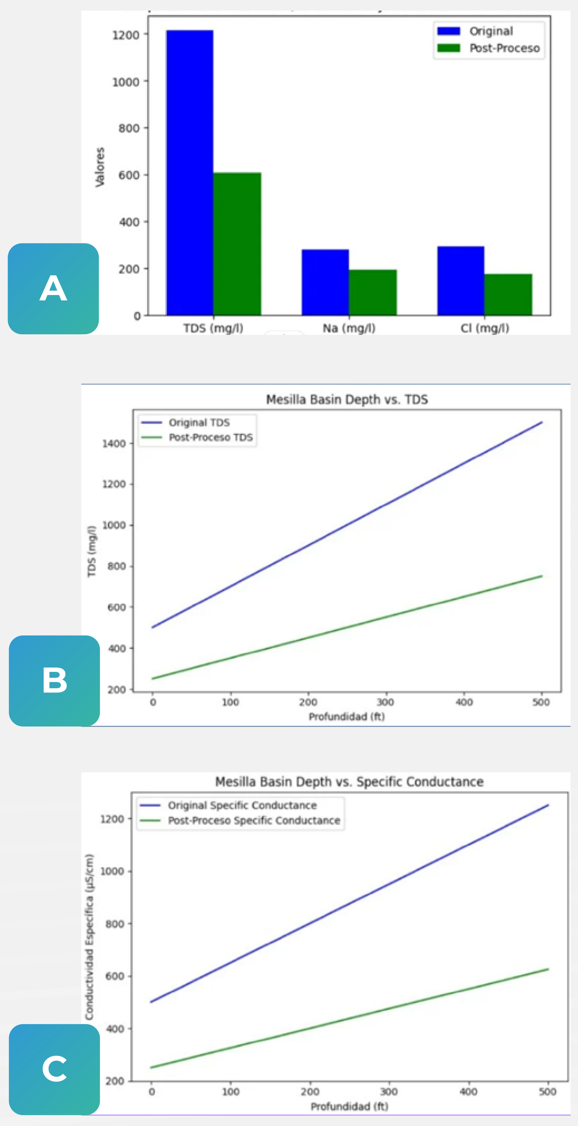

Figure 5. In silico Test results for Mesilla Basin water quality. A) Total Dissolved solids, Na, Cl, B) Depth vs TDS, C) Depth vs Conductivity

What goes next?

Our research lines