Oxyle

Oxyle restores groundwater with comprehensive PFAS treatment system.

Groundwater Remediation Whitepaper

www.oxyle.com

The results

>11x

up-concentration of PFAS with Foam Fractionation.

>99%

of all PFAS destroyed.

1kWh/m³

average energy consumption.

The challenge

The soil and groundwater beneath our client's industrial site are contaminated with PFAS-containing firefighting foam from previous fire drills. To prevent contamination of local waters, a hydraulic barrier has been installed. Currently, PFAS-laden groundwater is pumped and treated using activated carbon adsorption. However, this method is proving unsatisfactory in the long term due to the challenges of managing PFAS-contaminated secondary waste. The limitations of existing technologies created an urgent need for an innovative approach.

The solution

Oxyle engineered a comprehensive process, specifically tailored to our customer's water and operating conditions, which was validated in an on-site trial. The treatment consisted of three steps: up-concentration, destruction, and real-time monitoring housed in a single, standalone container.

Up-concentration:

The system began by separating and concentrating PFAS with Foam Fractionation. This approach exploits the tendency of PFAS to accumulate at air-water interfaces by blowing air into the water and skimming off the concentrated foam. Integrating this up-concentration step into the treatment process offered reduced capital and operating costs. It both reduces the required reactor size, as well as improves energy efficiency as the energy demand scales logarithmically with concentration. While the enriched foamate is subsequently subjected to Oxyle's Catalytic Destruction Technology, the depleted stream is directly discharged without the need for further treatment.

Destruction:

Activated only by the turbulence in the water, Oxyle's catalyst broke down and mineralized all PFAS in the enriched foamate into harmless by-products like fluoride ions, sulfate ions, and carbon dioxide.

Real-time monitoring and optimization:

Throughout the treatment, Oxyle leveraged proprietary Real-Time Monitoring technology to validate treatment success in real-time and continuously refine and optimize the remediation process. This offered further potential to reduce energy expenses, as treatment intensity could be adjusted to fluctuating inlet concentrations.

The system ran continuously for two weeks, to demonstrate the proven cost advantages and effectiveness of Oxyle's comprehensive PFAS treatment system.

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PFAS Compound	Inlet (ng/L)	Concentration after foam fractionation (ng/L)	Outlet after foam fractionation (ng/L)	Outlet after degredation (ng/L)
PFAS Total (6 Subst.)	752	8776	Below detection limit	<14
PFOA	41	576	Below detection limit	2
PFOS	481	4919	Below detection limit	2
PFHxA	33	371	Below detection limit	<1
PFHxS	171	2639	Below detection limit	2
PFHpA	7	97	Below detection limit	5
PFBS	19	174	3	<2

The results

Oxyle's integrated approach proved superior both in terms of energy efficiency and effectiveness.

Substantial up-concentration of PFAS

The foam fractionation process successfully increased the concentration of total PFAS from an initial 752 ng/L to over 8776 ng/L (over 11x up-concentration).

Significant reduction in all PFAS

Using our Catalytic Destruction Technology, short, medium, and long chain PFAS concentrations were all dramatically reduced from >8700 ng/L in the up-concentrated foam to below 14 ng/L, representing a >99% elimination rate.

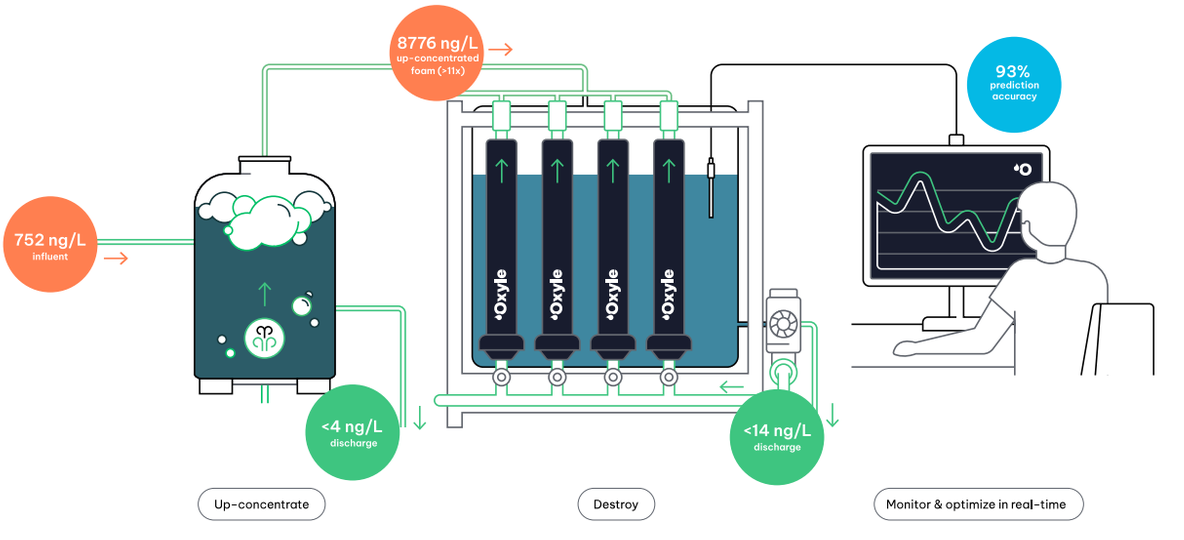
Successful real-time monitoring

The treatment success was correctly predicted by online monitoring with 93% accuracy for discharge limits of 100ng/L, a value that can be significantly improved with additional data.

Category-low energy consumption

The entire system demonstrated high energy efficiency, maintaining energy usage below 1 kWh/m³. This is more than 15 times lower than the nearest destruction technology.

Comprehensive PFAS treatment solution



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