Real-World Industrial PFAS Destruction

Commercial-scale HALT system operating at a water quality building during a 2-week pilot trial.

HALT Performance

The demonstration delivered phenomenal results across the board:

>99%
Total PFAS destruction

>95%
Measured defluorination to inorganic fluoride

3-10% TDS
No pretreatment required for high-salinity waste streams

~$0.10 per gal
OpEx at tested conditions

The Challenge

Fluorochemical manufacturers are navigating growing complexity in managing per- and polyfluoroalkyl substances (PFAS) in wastewater discharge. PFAS are incredibly persistent in the environment, and the precise operations and complex waste streams companies manage make the challenge even harder. Short- and ultra short-chain PFAS are especially resistant to most destruction methods, and expose companies to huge civil liability and increasingly strict regulations.

Costs for traditional disposal methods, such as incineration, landfilling, or deep-well injection, are rising. This poses unpredictable financial obligations on companies in the face of tightening regulations and increased liability. Meanwhile, most alternative PFAS destruction technologies consistently struggle to perform when faced with complex industrial wastewater matrices and industrial-scale operations.

A lead industrial manufacturer collaborated with Aquagga to answer a critical question: ***Can a complex mixture of ultra short- to long-chain PFAS be reliably destroyed on-site, not just in the lab but in real-world operational processes with highly complex waste streams?***

The Solution

In April 2024, Aquagga deployed a commercial-scale hydrothermal alkaline treatment (HALT) system to the industrial partner's manufacturing facility for a comprehensive pilot project. This wasn't just a lab demonstration—it was a full-scale, continuous endeavor treating complex industrial wastewater.

The industrial partner's Environment, Health, and Safety (EHS), Operations, and Wastewater technical team collaborated closely with Aquagga's engineers throughout the entire demonstration to prove HALT's ability to efficiently destroy PFAS.

Results

This project used less energy and fewer chemicals than other methods, significantly reducing operating costs. On-site destruction eliminates the need to haul waste off-site, further reducing costs, lowering long-term liability, and helping improve operational resilience.

Achieved Fluorine Mass Balance

Aquagga achieved near-complete fluorine mass balance across various tested flow rates and temperatures. Even at low temperatures, analysis using a sophisticated suite of analytical techniques confirmed HALT's ability to completely mineralize PFAS in complex wastestreams via total organic fluorine (TOF) and inorganic fluoride (IF) measurements.

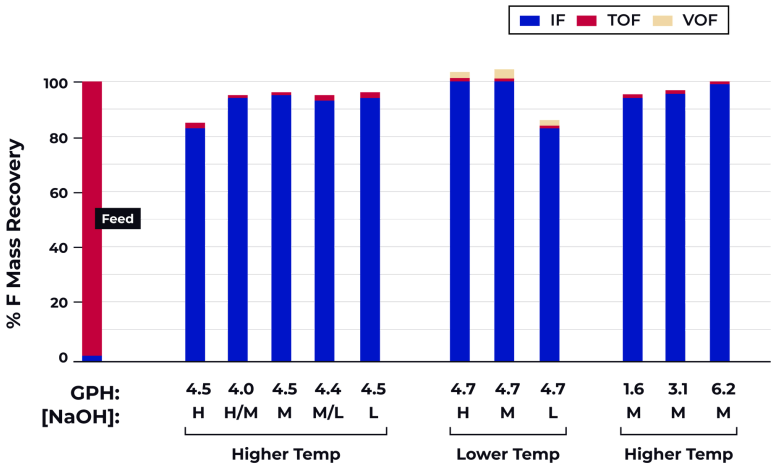
Engineered for the Real World

PFAS destruction is a high-stakes challenge, and most solutions stumble when faced with real-world complexity. Industrial wastewater doesn't arrive clean and simple—it can contain high total dissolved solids (TDS), complex and variable chemistry, organic constituents, and very stubborn short-chain and ultra short-chain PFAS compounds.

HALT was engineered specifically to destroy PFAS in these complex environments. The system uses temperature, pressure, and alkaline conditions to break PFAS molecules apart at the molecular level. The technology maintains subcritical conditions and recovers 80% of the process heat, so energy costs are trivial. The entire system is enclosed in a steel shipping container with remote operation and monitoring, ensuring the safety of operators and nearby equipment.

Unlike alternatives that falter under industrial conditions, HALT maintains robust and consistent performance even when facing high salts, organics, complex chemical matrices, and the inevitable industrial variability.

Remote monitoring and automated controls simplify HALT operation.



Analytical techniques used in the study included targeted LC-MS/MS, total organic fluorine via combustion ion chromatography (TOF-CIC), 19F-NMR, fluoride ion selective electrode (ISE), FTIR, and GC-MS.

Commercial-Ready Solution

Aquagga's demonstration with the industrial client accomplished more than just illustrating HALT's technical proficiency—it validated the system's readiness for commercial deployments.

1. **Practical Solution**
   Proven, reliable, and data-backed path to slash disposal costs.
2. **Remove Liability**
   Meets and exceeds regulations while protecting against long-term liability.
3. **Compact Footprint**
   HALT seamlessly integrates into existing operations with limited pre-treatment needs.

Ready to Deploy

For Aquagga, this demonstration marked a key transition from product development to commercial deployment. For the industry, it showed what's possible with HALT: real and effective PFAS destruction, on-site, even in the most challenging wastewater environments.

Ready to see how HALT can address your specific PFAS challenges? Email our sales team at sales@aquagga.com to learn about our flexible pricing options and explore partnership opportunities.

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