

DE-FLUORO™ is a world-first on-site treatment technology that destroys per- and polyfluoroalkyl substances (PFAS) from contaminated liquids, including Aqueous Film Forming Foam (AFFF) and PFAS-impacted water and liquid waste.



On-site Mobilization – Federal Government Site, Florida

DE-FLUORO Flow Through Treatment System

DE-FLUORO Emissions Control System

DE-FLUORO Batch Treatment Reactors

DE-FLUORO™ Development & Application

DE-FLUORO destroys PFAS via electrochemical oxidation to non-selectively and sequentially break the carbon-fluorine bonds using a proprietary electrode that is durable and low-cost. DE-FLUORO is a viable PFAS destruction technology that builds upon successful bench trials, field pilots, as well as large-scale demonstration and commercial programs in the U.S. and Australia.

DE-FLUORO treats PFAS in liquid media with co-mingled contaminants and varying water chemistry. Our team has successfully used the technology to treat PFAS to applicable discharge limits. This includes successfully treating PFAS in wash waters associated with foam transition programs, ion-exchange regenerant waste, soil washing wastewater, landfill leachate and other PFAS-impacted natural waters and wastewaters, as well as AFFF concentrate.

DE-FLUORO is a containerized, mobile and modular treatment system that reduces PFAS concentrations as either a standalone treatment application or coupled with existing PFAS separation and concentration steps. Depending on site needs and conditions, an optional polishing step can be used prior to discharge (Figure 1). The system is capable of operating 24 hours a day with minimal on-site supervision and minimal power requirements, making DE-FLUORO ideal for remote locations.

In addition, the DE-FLUORO technology is more sustainable and environmentally friendly than off-site destruction options, as our technology results in greater than 95% energy reduction when compared to technologies like incineration.

DE-FLUORO development began in 2017, with bench studies funded by the US Department of Defense under SERDP ER-2717 and ER18-1320.

Field implementation began in 2019 under AFCEC BAA FA8903-17-C-0028 for a pilot at Wright Patterson Air Force Base. This pilot coupled DE-FLUORO technology to destroy the PFAS concentrated in still bottom wastes produced from regeneration of ion exchange resin that was used to remove PFAS from 500,000 gallons of on-site groundwater.

The results of this program and subsequent successful treatment of a wide range of real-world PFAS impacted wastes, lead to the fabrication of two large-scale containerized systems. These standalone demonstration systems were then deployed to government sites in the U.S. and Australia to optimize full-scale operations.

Demonstration Performance & Case Studies

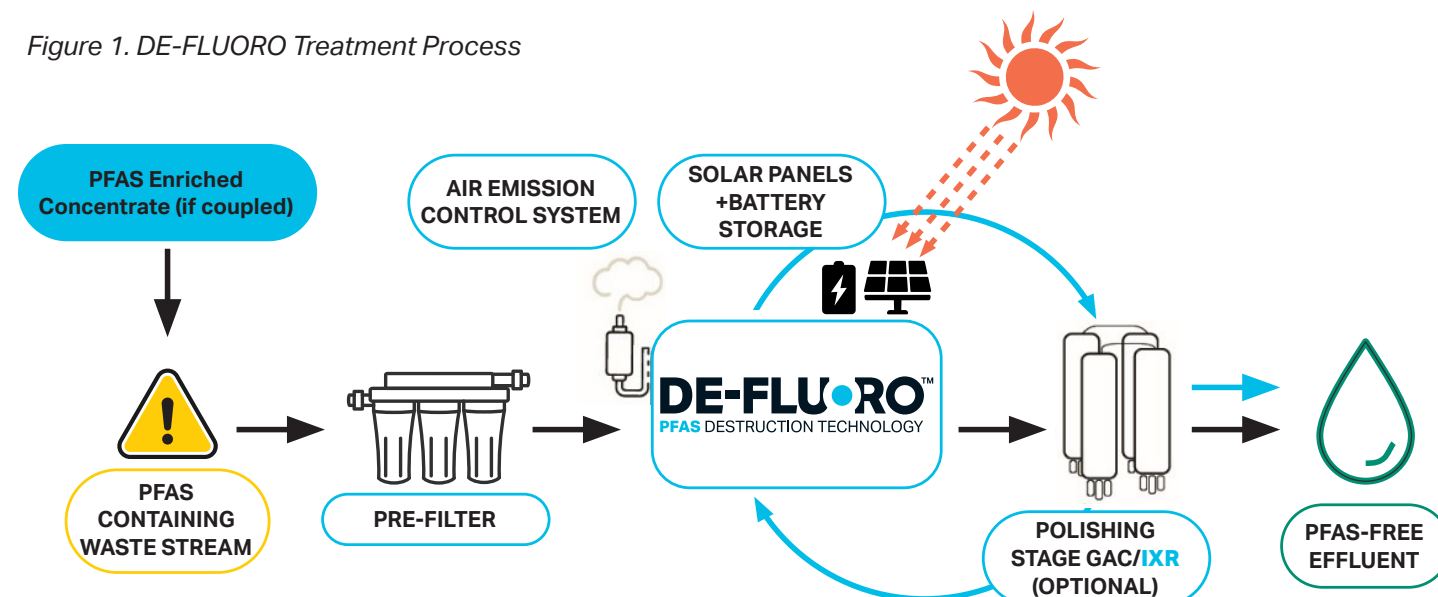
The 550-gallon DE-FLUORO system in Australia operated as a batch system (images 4 & 5) to treat PFAS-impacted wastes including AFFF and PFAS-impacted wash water from an Australian Department of Defence (Defence) foam transition program from May through September 2021. DE-FLUORO treatment reduced PFAS mass by over 90% within 24 hours. The greatest rate of mass reduction occurred in the first eight hours where PFOS and PFOA were reduced by 94.3%-99.9%, allowing treated liquid disposal at the on-site water treatment plant.

In November 2022, our batch system was deployed again by Defence for an on-site commercial project to destroy AFFF system wash waters, and another commercial project is underway with an Oil & Gas Major for similar disposal levels, with initial data showing PFAS reduction in excess of 97%.

Under a Demonstration Agreement with the US Federal Government, a standalone flow-through demonstration system was deployed in March 2022 to a confidential site in Florida to treat firepit water and related PFAS impacted wastes (refer to Images 1, 2 & 3). This demonstration is ongoing.

In addition, we are under contract for three independent field demonstrations in the US. Two of these projects couple DE-FLUORO with Surface-Active Foam Fractionation (SAFF®): one underway for the Minnesota Pollution Control Agency, and a second supporting Allonnia under a USAF Broad Agency Announcement (BAA). The third is also under a BAA and couples DE-FLUORO with Dexsorb, a regenerable novel sorbent.

Figure 1. DE-FLUORO Treatment Process



Why is DE-FLUORO™ Unique?

Existing on-site technologies do not destroy PFAS in liquid waste streams—they separate or concentrate them. In order to achieve destruction, these concentrated PFAS wastes require off-site disposal or incineration, which is energy intensive and carbon emitting. Furthermore, there is concern that incineration can result in PFAS dispersal into the environment potentially threatening human health and the environment. In April 2022 this uncertainty resulted in a ban on any PFAS

incineration by the Department of Defense (DoD) under the National Defense Authorization Act.

Our DE-FLUORO technology uses electrochemical oxidation to sequentially defluorinate PFAS and achieve acceptable final liquid discharge requirements. DE-FLUORO systems are a compact, highly efficient, sustainable and cost-effective destruction solution that destroys PFAS on site providing an innovative and environmentally friendly alternative to incineration.

DE-FLUORO is now commercially available to the industry and is a proven on-site PFAS destruction technology.

DE-FLUORO Preferred Waste Streams:

- Wash waters associated with infrastructure cleaning and foam transition programs
- Industrial wastewaters
- AFFF concentrate
- Concentrated waste derived from separation technologies
- Reverse osmosis brine concentrates
- Landfill leachate



DE-FLUORO On-site Batch Treatment Program – Department of Defence, Australia



DE-FLUORO Delivery Team



DE-FLUORO Mobile Evaluation System

DE-FLUORO offers an attractive alternative to address and support the management of PFAS impacted liquids. Mobile, containerized, closed-loop treatment systems can be easily deployed and operated either on site, or set up as a treatment hub.

Unlike existing treatment technologies DE-FLUORO offers a PFAS destruction solution that can be incorporated into existing treatment trains and coupled with non-destructive technologies to deliver a 'whole of life cycle' solution, or as a stand-alone on-site destruction technology.

Evaluating DE-FLUORO™ as the Right Choice

DE-FLUORO has been demonstrated on a variety of wastes, including AFFF system wash water, fire-training wastes, landfill leachate, soil washing liquids, and regeneration concentrates. To assist in evaluating the applicability of the DE-FLUORO technology for your project, our team has developed a smaller, mobile DE-FLUORO Evaluation Systems (Image 7). These systems are a cost-effective way to provide confidence that the DE-FLUORO technology is right to meet individual PFAS challenges and testing can be conducted either on site, or off site at our facility.

The primary objective of the evaluation programs is to optimize the effectiveness of DE-FLUORO to reduce PFAS in a site derived sample(s) of impacted liquid to a level that will allow our clients to achieve their treatment objectives.

Our team can also undertake supplementary evaluation to consider market competitiveness of DE-FLUORO as an alternate solution to more traditional off-site destruction options.

We are offering our clients an all-inclusive DE-FLUORO Evaluation & Feasibility Program to evaluate the effectiveness of DE-FLUORO on PFAS impacted liquid waste. This includes treatment of 26 gallons of PFAS impacted liquid for a maximum of 100 hours treatment time.

These programs can be undertaken for a fraction of the cost of a full-scale treatment program and will include:

- Coordination of sample collection and transportation, project updates and reporting.

- Treatment of the PFAS impacted liquid sample(s) either on site, or off site at our facility using the DE-FLUORO Evaluation System including monitoring and analysis of samples.
- Evaluation of the DE-FLUORO Evaluation Program including analytical data interpretation, reporting and feasibility assessment of the large-scale DE-FLUORO Treatment System technology for on-site use in relation to the evaluated waste stream.
- Disposal of treated liquid post treatment in accordance with the appropriate waste categorization.

DE-FLUORO™ Commercial Application

Regulations are emerging that require many industries to properly dispose of PFAS impacted liquids as they transition over to next generation solutions. This includes AFFF concentrate and PFAS impacted wash waters that are either stockpiled or will be generated as a result of foam transition programs. These regulations will also require treatment of PFAS-impacted liquids that are routinely discharged from utility providers and industrial complexes including leachate and wastewaters.

DE-FLUORO is an attractive alternative to existing off-site destruction technologies to address and support PFAS-impacted liquid management and can easily be deployed and operated at a site, or at a fixed licensed facility under the following scenarios:

- Deploying DE-FLUORO as a standalone, on-site treatment technology, including ability to commission single or multiple units at strategic sites.
- Deploying DE-FLUORO on site as a closed loop treatment train, incorporating a primary separation and concentration stage and/or a secondary polishing stage.
- Transport of PFAS impacted liquid waste for treatment by DE-FLUORO at a fixed licensed facility, or on-site treatment hub.

We continue to evaluate pricing for treatment, anticipating greater efficiency with system enhancements.

DE-FLUORO™ Destruction Purchase Options

Get in touch to determine a purchase plan that best fits your operational and business needs.

PURCHASE SYSTEM

Purchase a DE-FLUORO system for on-site installation and choose one of several ways to manage ongoing operations:

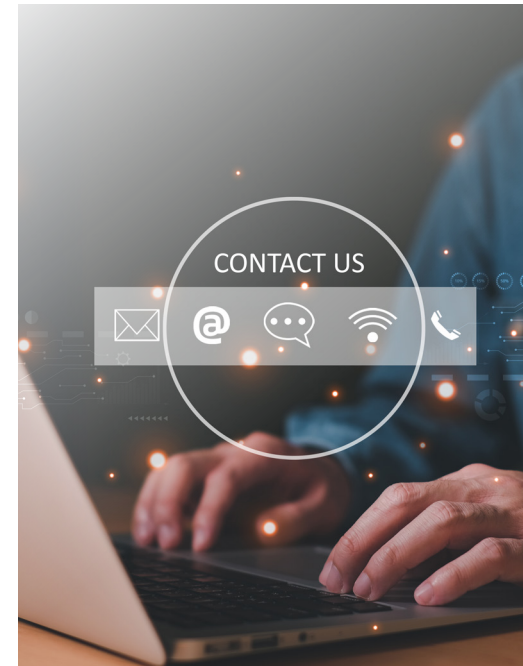
- **Operate it yourself:** For clients with operating capability, clients cover operational costs and only pay for consumables.
- **DE-FLUORO-operated (cost plus):** We operate the system for you, including all labor and materials with a simple mark-up.
- **Pay-as-you-go (volume charge):** We operate the system and bill a flat rate based on volumes processed.

LEASE SYSTEM

Lease a DE-FLUORO system and we will operate the system, billing all labor and materials with a simple mark-up.

VOLUME-BASED BILLING

Pay a flat rate per unit volume processed, with DE-FLUORO providing all necessary operational support.



GET IN TOUCH

We welcome the opportunity to further discuss DE-FLUORO and its capability to reduce PFAS liability.



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