CASE STUDY

Olift™, Foam Fractionation System Removes PFAS from Contaminated Fire Fighting Water

REMEDIATION PROJECT
Hobart International Airport Fire Training Ground

MATERIAL
PFAS Contaminated Fire Fighting Water

VOLUME
106,000 gallons (400,000 liters)

PRINCIPAL
Airport Emergency Services Provider

LOCATION
Hobart, Tasmania, Australia

BREAK FREE FROM PFAS™

Olift™ FOAM FRACTIONATION

SUMMARY

Supporting airports, EVOCRA has delivered a 6,600 gallon/day ozone foam fractionation advanced water treatment plant (manufactured and marketed exclusively in the USA and Canada by E2METRIX) to remove PFAS from fire-fighting fluids. During live fire training, PFAS leached from hard surfaces into firefighting water, despite the client not using PFAS enriched foams since 2010. All contaminated water was collected and treated with Olift™ Foam Fractionation which was installed in mid-2018, operated until late 2019 which it was demobilized. As required, the integrated treatment system ensured the treated water had no detectable PFAS (<0.01 µg/L) during operations. All water was batch tested prior to discharge to local infrastructure

THE CHALLENGE

Historical use of PFAS in aqueous film forming foam (AFFF), industrial surface coatings and other household products, coupled with their persistent nature and high mobility, has led to a widespread global problem. PFAS is a group of over 10,000 synthetic compounds, with current human health concerns dominated by specific compounds including PFOS, PFOA and others. Additionally, there is growing apprehension over the potential toxicity of many shorter chain PFAS precursor compounds. Traditional adsorbent methods do not provide a complete solution for PFAS. Adsorbent media, such as ion exchange resins and activated carbon, primarily target specific compounds such as PFOS, PFOA, and other long-chain PFAS. Limitations of adsorbent media include a lower adsorption efficiency to capture short-chain PFAS, high susceptibility to fouling when exposed to biology, blinding of the resin by many co-contaminants and solids, and the generation of relatively large volumes of spent media that requires landfill disposal at specialized facilities.

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TECHNOLOGY

The continuous flow Olift™ Foam Fractionation system uses a patented process for cost-effective, onsite removal and concentration of PFAS from contaminated waters, including reverse osmosis concentrates, wastewaters, groundwaters, and landfill leachates. Olift™ employs both ozone and air to create smaller bubbles (micro-bubbles) that have a higher surface area and electrostatic charge compared to systems using only air, improving PFAS removal and concentration factors. Ozone and/or air bubbles are introduced into a PFAS-contaminated water stream inside an Olift™ column, specifically designed and optimized for PFAS removal. Each PFAS molecule has a hydrophilic head and a hydrophobic tail, causing alignment and concentration at the gas-water interface on the bubble surface.

These small bubbles, containing PFAS, rise to the water surface and form a concentrated foam at the top of the column, leaving behind relatively PFAS-free treated water (retentate) with up to 99% targeted PFAS removal. The foam is then separated, collapsed and concentrated, allowing for a more economic destruction. The foam enriched with PFAS typically constitutes between 0.1% to 10% of the treated influent, which reduces the size and energy requirements for Obreak™, E2METRIX's Electro-Oxidation (EO) process designed for onsite PFAS destruction. The retentate can be sent to discharge or a media polishing step.

THE SOLUTION

Initially, 6,600 gallons/ day Olift™ Ozone Foam Fractionation was installed with a Reverse Osmosis (RO) system. However, due to performance concerns associated with operating the RO at low temperatures, the plant was reconfigured to utilize IX resin to polish the Olift effluent instead of RO. IX resin bed volumes before breakthrough are expected to increase by a factor of 10 with the Olift™ pretreatment.

The combination of the Olift™ and IX polishing systems has provided non-detection for all measurable PFAS compounds in the treated fire fighting water, providing a high level of reliability in meeting local drinking water criteria. The deployment was able to reliably meet the objective of the client.

CONTAMINANT	INFLUENT QUALITY	Olift™ TREATED	PERCENT VARIANCE	POST NF/RO POLISH	PERCENT VARIANCE
pH	8.33	4.48		4.34	
PFOS	27.5 µg/L	0.05 µg/L	99.81%	<0.01 µg/L	99.96%
PFOA	1.39 µg/L	<0.01 µg/L	99.22%	<0.01 µg/L	99.28%
PFHxS	3.77 µg/L	0.11 µg/L	97.15%	<0.02 µg/L	99.47%
PFHxA	4.25 µg/L	3.22 µg/L	24.05%	<0.02 µg/L	99.53%
PFBS	1.11 µg/L	1.04 µg/L	6.50%	<0.02 µg/L	98.20%
PFBA	1.77 µg/L	1.67 µg/L	5.45%	<0.1 µg/L	94.35
6:2 FTS	4.03 µg/L	<0.05 µg/L	98.76%	<0.05 µg/L	98.76%
8:2 FTS	28.9 µg/L	0.06 µg/L	99.76%	<0.02 µg/L	99.93%
Sum of PFAS	**49.7 µg/L**	**7.90 µg/L**	**84.1%**	**<0.01 µg/L**	**99.98%**

THE PROCESS

The multiple foam fractionation columns of an Olift™ plant removed greater than 99.5% of regulated PFAS and greater than 84% of total measured PFAS from the raw influent.

The Olift™ process provides the following benefits:

- **Eliminates** down time from organic fouling due to its destructive treatment of organic compounds.
- **Eliminates** process obstructions by removing suspended solids from the process fluid.
- **Reduces** the number of unit operations required for complex water contaminations by using the multifunction reaction chambers.
- **Reduces** waste volumes, which reduces on-site costs and external transport and disposal costs.
- **Reduces** media usage by up to 75% in comparison to traditional methods.
- **Removes** contaminants from the environment eliminating risks to human health as well as other ecology.

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