Closed-Loop PFAS Treatment Case Study: Foam Fractionation and Plasma Vortex - 1 PDH

Speakers:

- Zach Pierce, Environmental Engineer at Allonnia

May 14, 2024, 1:30 p.m.

HOUSEKEEPING ITEMS

- Take Note of Exits
- Silence Your Mobile Devices
- Presentations and Audio Recordings will be available in the Attendee Service Center until August 30, 2024
- Download your PDH record in the Attendee Service Center before August 30, 2024

SAME Environmental Community of Interest (ECOI)

- The COI will support and engage SAME Posts, DOD and Federal Agencies by providing members with a wide range of programs, activities, and information to enable them to stay on the forefront of environmental technologies, management and regulatory developments facing the A/E/C community, and national security.
- SAME ECOI Website - SAME ECOI Webpage
- Webinars
- Networking
- Joint Engineering Training Conference (JETC)
- PFAS Industry and Government Engagement (IGE) Project
- Post Support and Interaction
- Monthly ECOI - LINK to monthly call is on SAME ECOI webpage - SAME ECOI Monthly Call
  - Call currently third Wednesday of the month 1500-1600 hrs. May Change in Future
- For more information contact ECOI Chair Ann Ewy annewysame@gmail.com

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SPEAKER

Zach Pierce

Allonnia

Environmental Engineer

Fun Facts

- Huge Red Sox Fan
- Avid Canoer

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ORLANDO, FL

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EXHIBITOR

Mark Matranga

Allonnia

North America Sales Manager - Government

MEET WITH MARK

- Visit Allonnia's booth #425

  OR

- Schedule a meeting

allonnia™

ONVECTOR

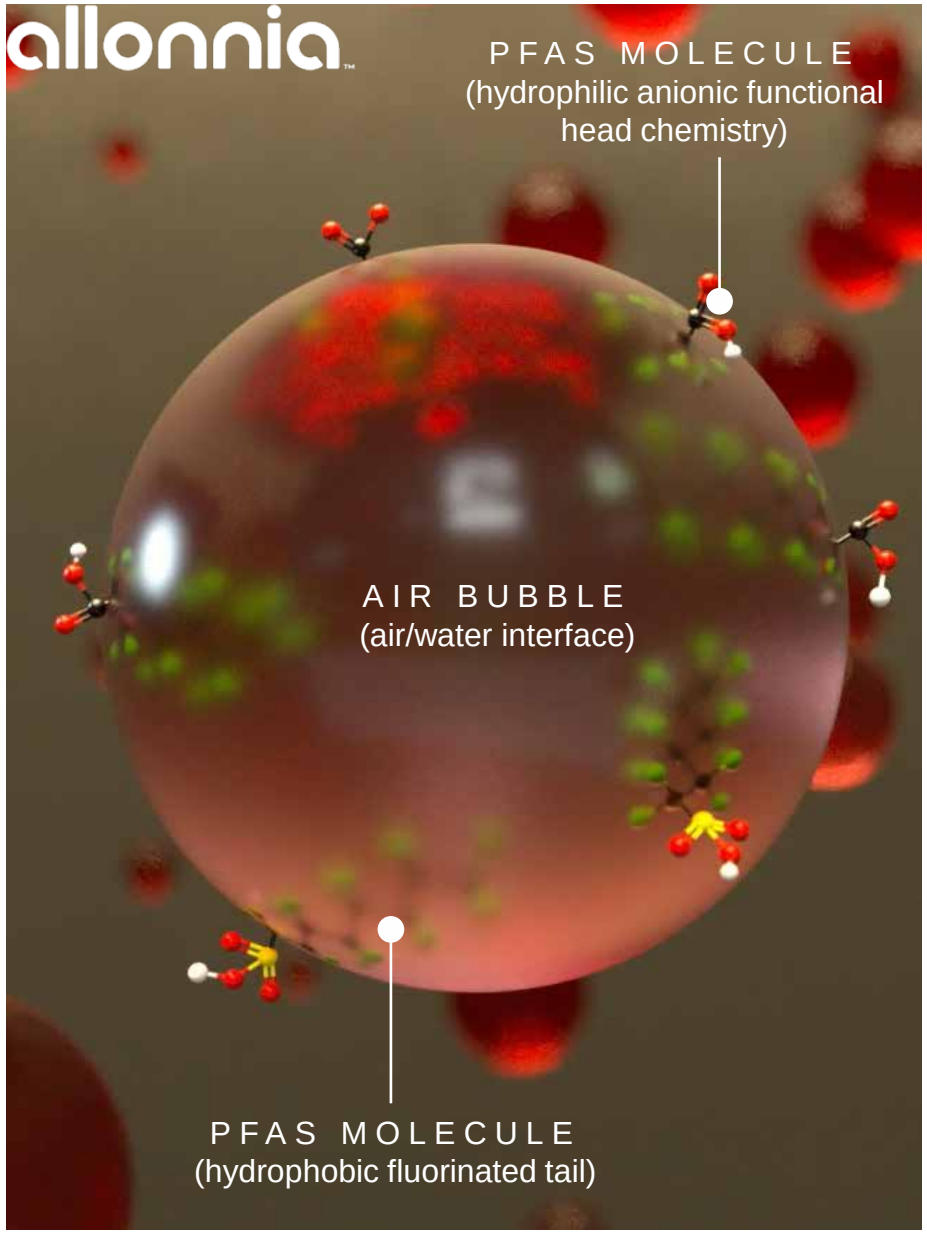
Surface Active Foam Fractionation (SAFF®)

Paired with

Plasma-Vortex Technology

For onsite PFAS separation, concentration, and destruction at Joint Base Cape Cod

SAFF® Process



SAFF Separation Mechanism

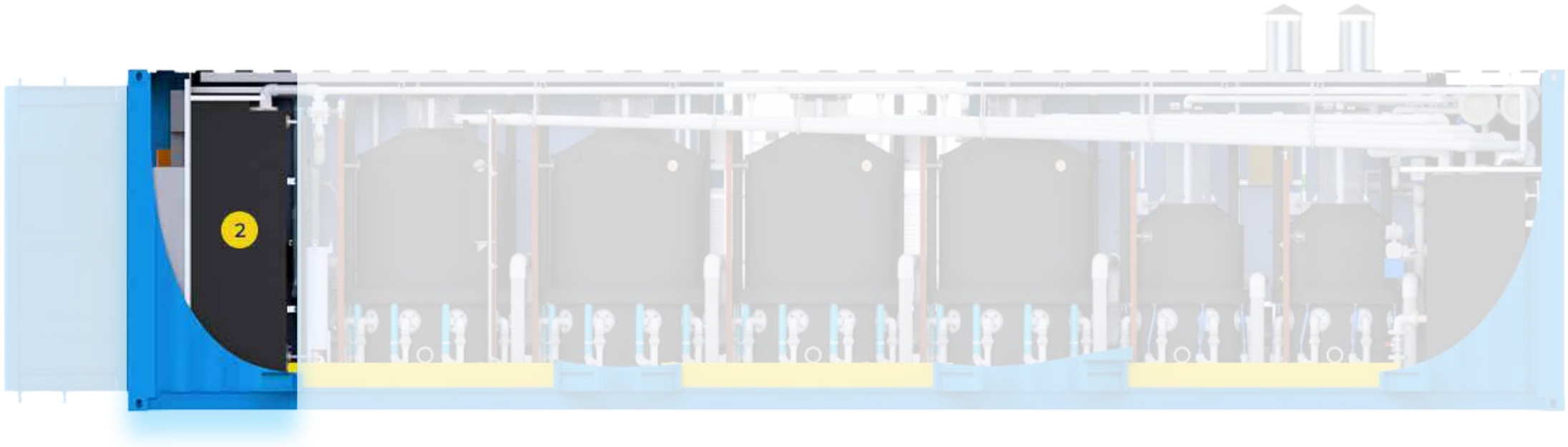
Rising air bubbles separate PFAS to surface

- Hydrophilic head: orients in water
- Hydrophobic tail: orients in air-bubble


1
2
3
4
5
6

CONTROL ROOM

Automated control of the system to include optimization with the Allonnia booster. Allows for 24/7 remote telemetry requiring minimal on-site operator supervision.



FEEDWATER INLET

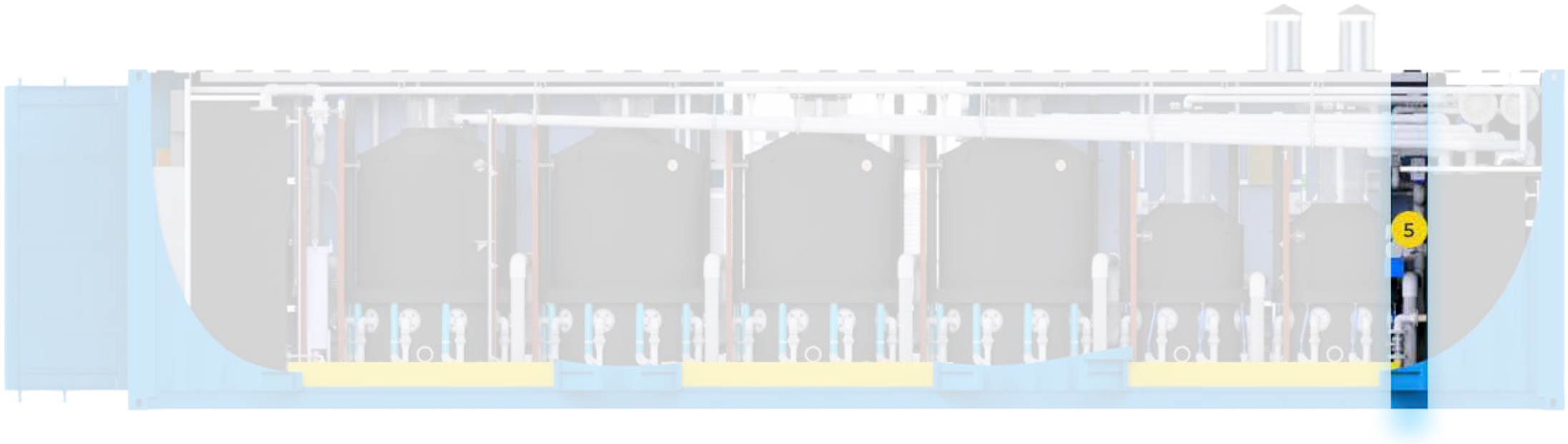
The system is capable of handling high TOC, TSS, TDS, and other metals. Zero pretreatment is required to start SAFF operations. SAFF can treat groundwater, surface water, drinking water, and landfill leachate.

PRIMARY TREATMENT STAGE

Air is introduced to the contaminated water and the foam fractionation process is initiated. Four vessels create a semi-batch process separating >99.9% of PFAS/PFOA compounds. Concentration factors 5-20x.

SECONDARY / TERTIARY TREATMENT

The PFAS concentrate from primary treatment moves into the secondary treatment vessels for 100-1,000x concentration. These vessels can also be used for tertiary treatment as needed, allowing final concentration factors of between 100,000 to one; and one million to one.



FOR DESTRUCTION

SAFF is designed to pair with any destruction technology to create a closed-loop system. For every 1 million gallons of groundwater treated by SAFF, it's capable of generating 1 gallon of concentrated PFAS for destruction.

FRACTIONATE TRANSFER TANKS

Once the contaminated water has been through the primary and secondary treatment, the hyper-concentrate is collected for appropriate disposal/destruction.

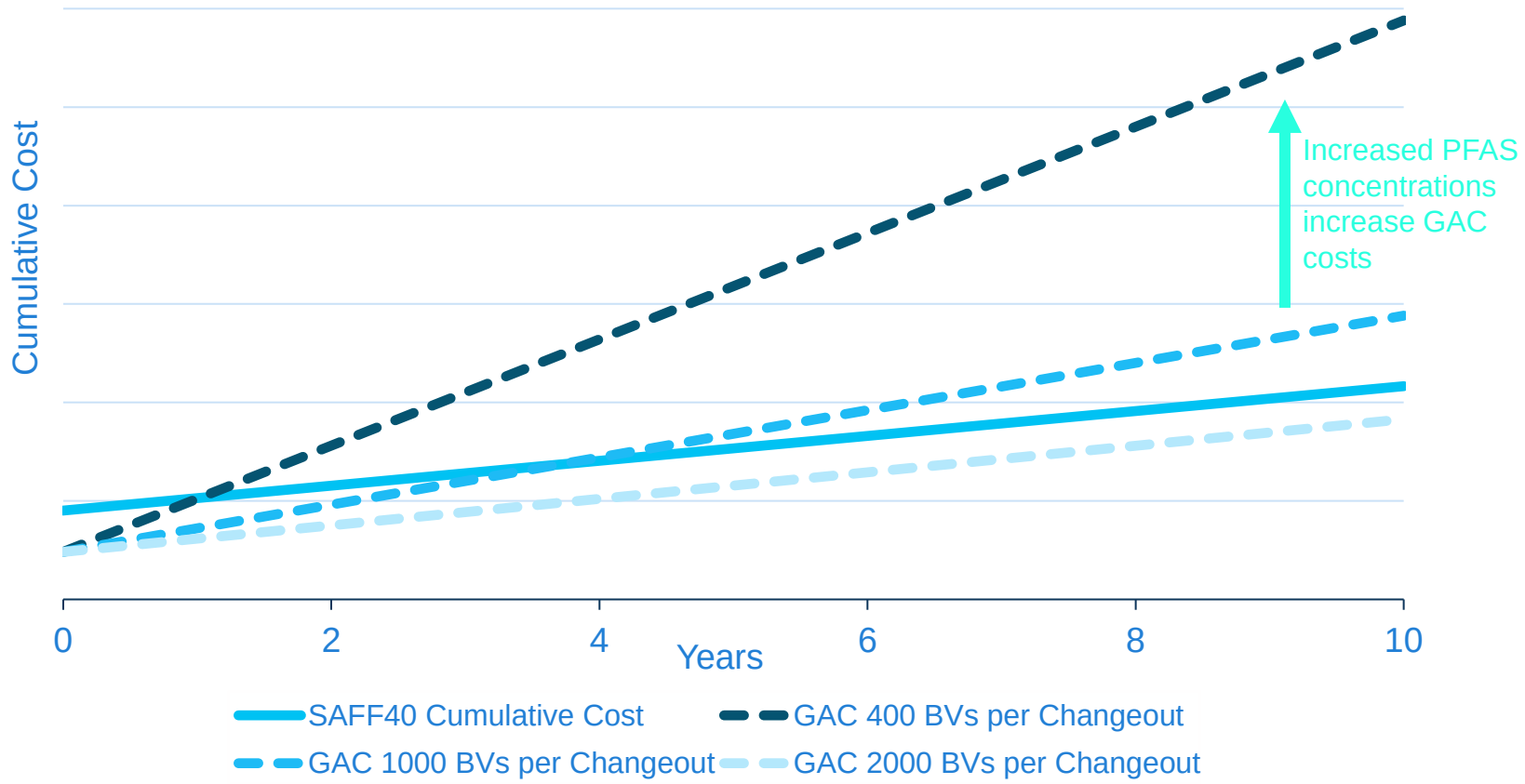
‘Conventional’ PFAS Treatment vs. SAFF®

	Conventional Treatment[1]	SAFF®
Spent media volume	High	None
Waste generated	High	Very low
Pretreatment required	High	None
High concentration removal efficiency	Inefficient	No impact
Cost	High cost per mass of contaminant removed	Lowest OPEX, lower lifetime costs but higher CAPEX
Influent concentration effect on cost	Higher costs at higher influent concentration	Cost not impacted by influent (effective from 0.005 to >50,000 ppb)
Sustainability performance	Low	High
Remote telemetry capabilities	None	Fully automated

SAFF® and GAC Cost Comparison[1]

SAFF PROVIDES HIGHER VALUE WITH HIGHER PFAS CONCENTRATION

- Higher PFAS concentrations lead to faster breakthrough of GAC and increase operating costs
- SAFF operating costs do not depend on influent PFAS concentrations



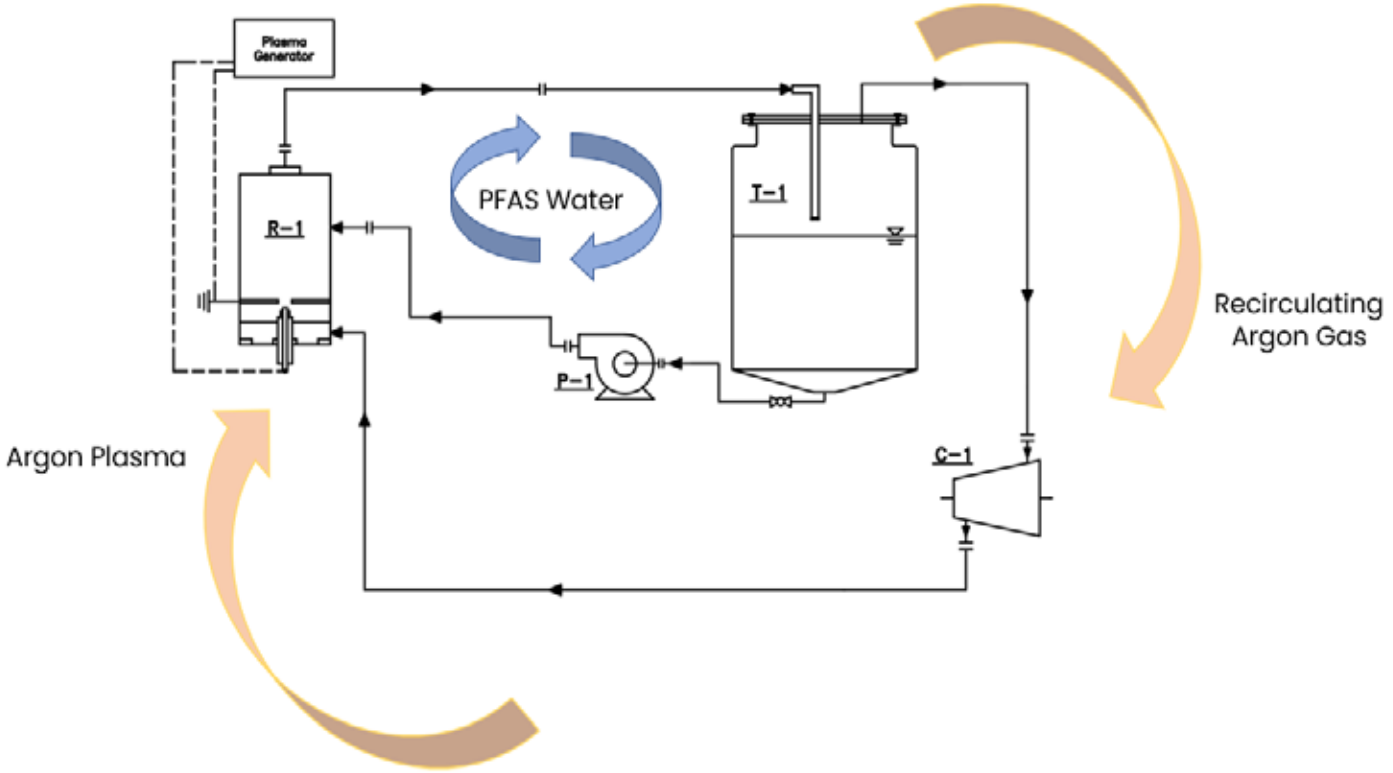
1Theoretical costs based on values provided by Langan for a 75 gpm system with two 10,000 lb GAC vessels

Onvector Plasma-Vortex Process

ONVECTOR

Plasma Vortex PFAS Destruction

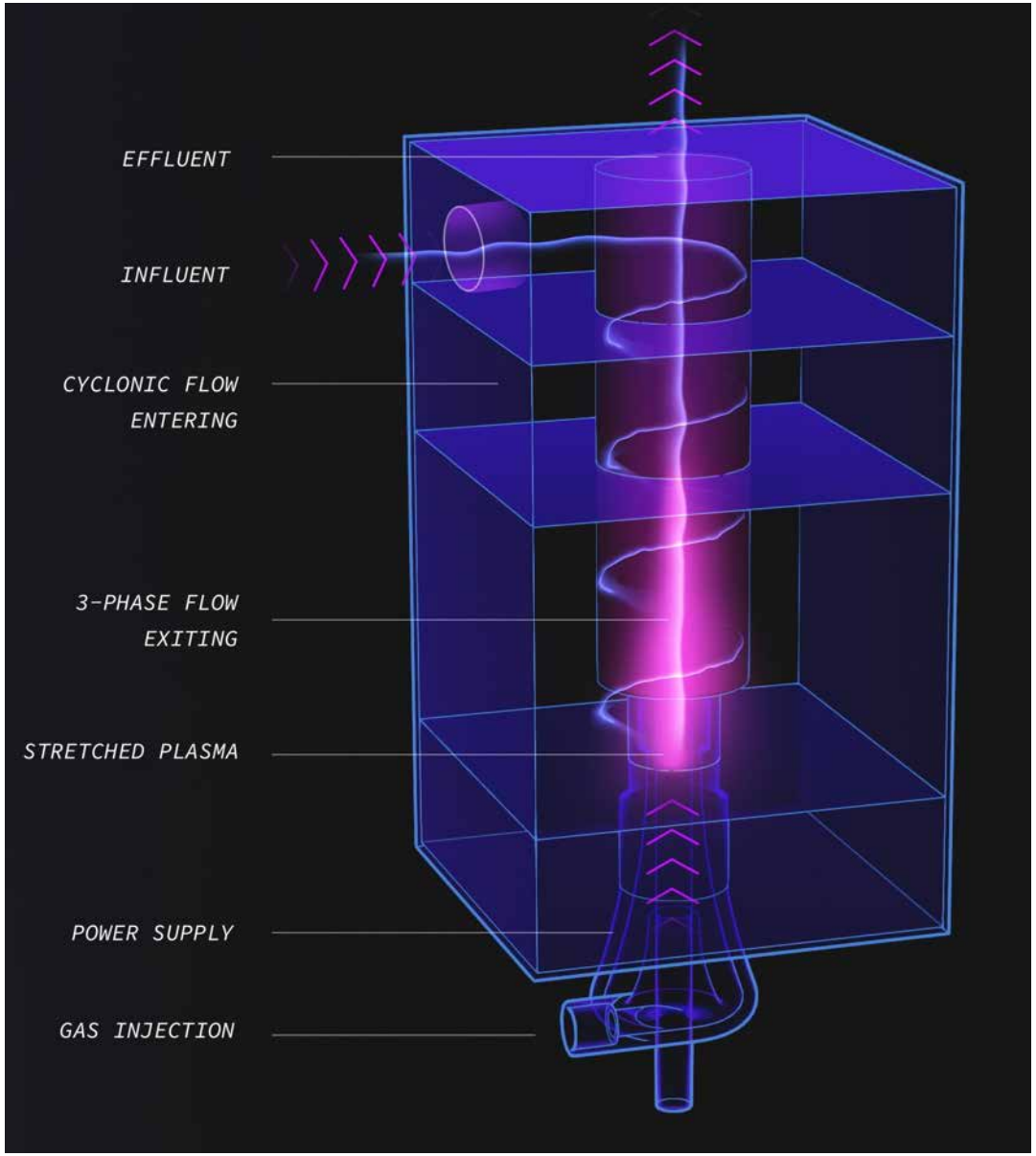
Sequential Batch Process for Highly Concentrated Liquid Wastes



ONVECTOR

Final Destruction of Concentrated PFAS Residuals with Plasma Vortex

- Low-cost destruction option
- Reductive not oxidative
- Operates at low pressure and temperature
- Powered by electrification
- Without costly electrode materials
- Without air emissions
- Without chlorinated byproducts
- Without HF
- Field piloted and validated



Generate a Closed-Loop Solution

1 SEPARATION

2 CONCENTRATION

3 DESTROY

ONVECTOR

Or Polish Plasma-Treated Effluent with RO

1 SEPARATION

2 CONCENTRATION

3 DESTROY

4 POLISH

Retentate

Case Study

SAFF Installation Overview

- Location: Joint Base Cape Cod, Massachusetts
- Partners: Onvector
- Application: Ex-Situ DoD Site Groundwater
- Duration: Dec. 2023 – Feb. 2024
- Product: SAFF40®
- Capacity: 40 GPM (limited by groundwater extraction well)

Joint Base Cape Cod Project Overview

- PFAS concentrations (primarily PFOS, PFOA, PFHxS) detected in groundwater onsite, likely due to historical firefighting activities
- Low TOC from sandy aquifer did not foam naturally, non-toxic additive was used to enhance foaming and PFAS removal
- Intake from new extraction well (70-90’ bgs), discharge to nearby ground surface
- Waste PFAS concentrate containerized onsite for later disposal
- System operated mostly autonomously 24/7, with reduced operations due to maintenance and optimization limitations as needed

JBCC SAFF Installation Overview

The Foaming Process

PRIMARY AND SECONDARY TREATMENT at JBCC

Met EPA MCLs & Successful Concentration Factor

GROUNDWATER | NEW ENGLAND

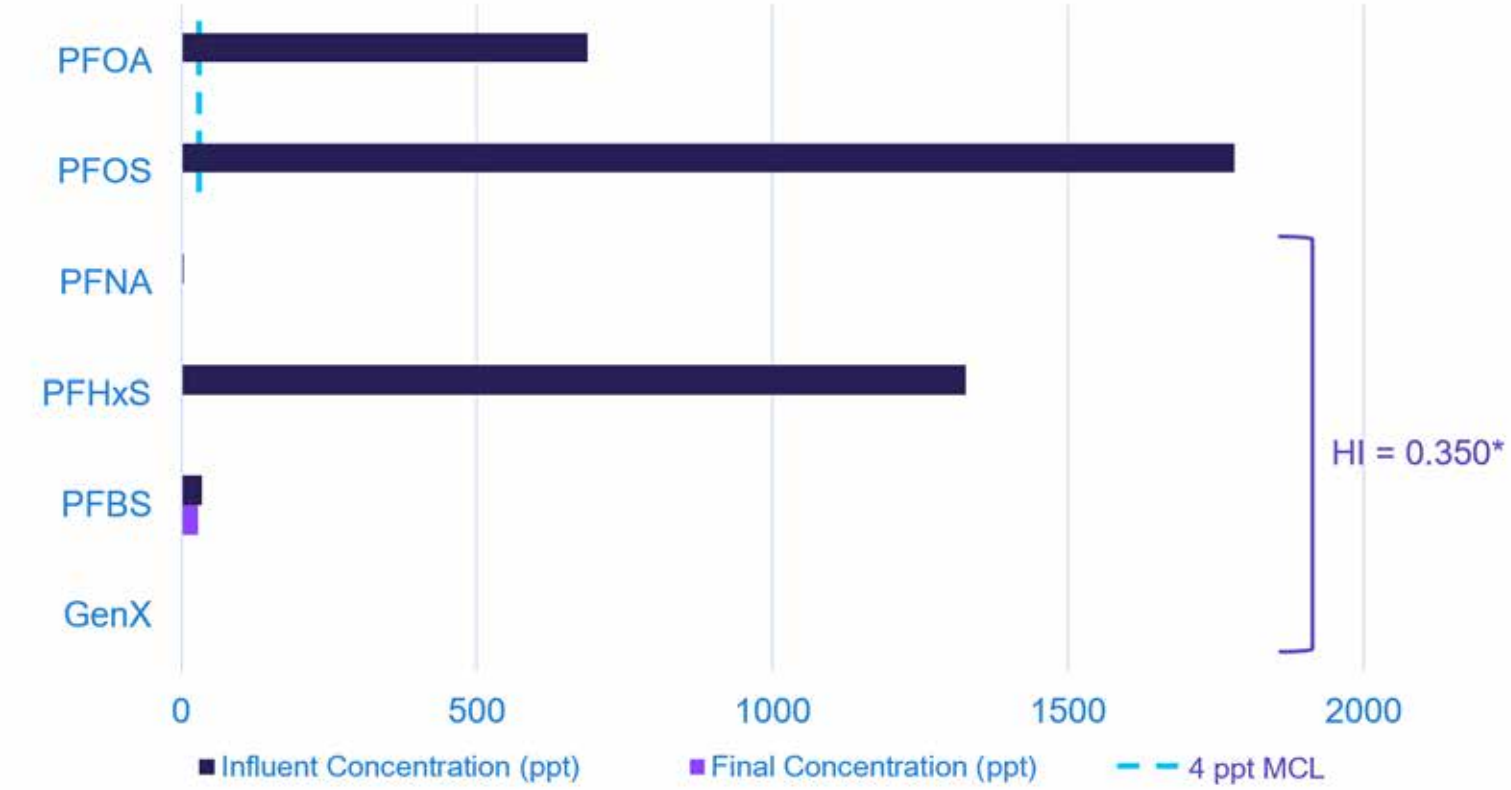
TOTAL PFAS REMOVAL

98%

MAXIMUM CONCENTRATION FACTOR

4,000x

	Influent Concentration (ppt)	Final Concentration (ppt)
PFOA	688	ND(2)
PFOS	1782	ND(2)
PFNA	4.06	ND(2)
PFHxS	1327	3.02
PFBS	35.8	28.6
GenX	ND(4)	ND(2)

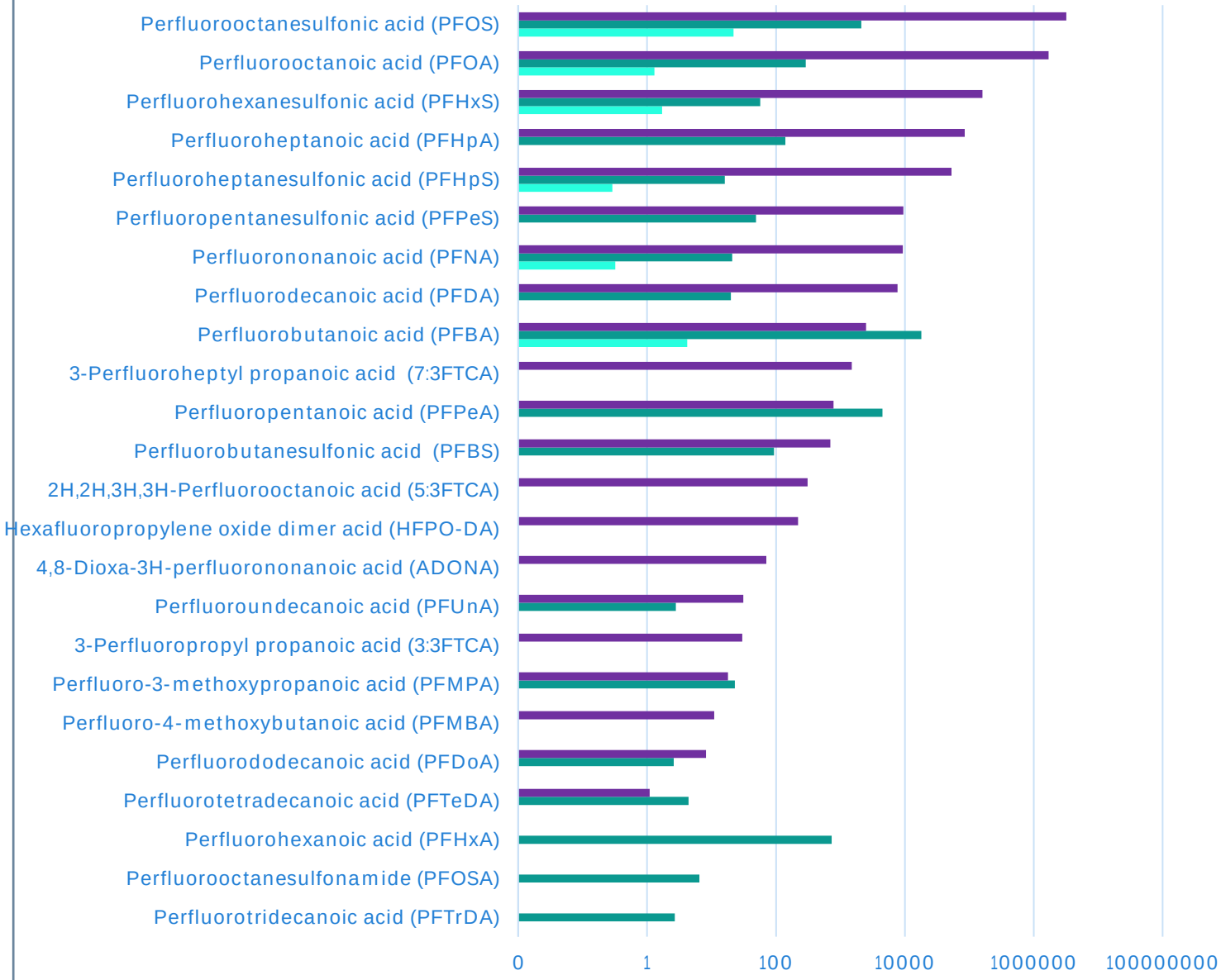


*0 ppt concentration used in calculation for analytes not detected

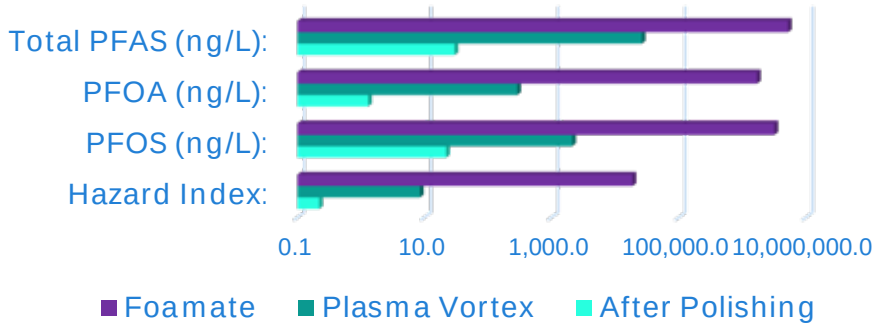
ONVECTOR

Plasma Vortex Destruction of SAFF Foamate from Groundwater Treatment

With RO Polishing Option



Concentrations of PFAS Groups and Regulated Compounds



	Influent	Plasmate		Polished	
Hazard Index:	18,730.1	8.5	99.95%	0.2	99.9988%
PFOS (ng/L):	3,200,000	2,100	99.93%	22	99.9993%
PFOA (ng/L):	1,700,000	290	99.98%	1	99.9999%
Total PFAS (ng/L):	5,230,680.3	26,058.0	99.50%	29.8	99.9994%

THANK YOU

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Please reach out to zpierce@allonnia.com
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for further questions and inquiries about Onvector's Plasma Vortex