CASE STUDY

An Integrated PFAS Destruction Solution for RO Concentrate at a Drinking Water Plant

CLIENT
West Morgan-East Lawrence Water and Sewer Authority

FACILITY
JD Sims-RM Hames Reverse Osmosis Water Treatment Facility

LOCATION
Hillsboro, Alabama

WATER MATRIX
Reverse Osmosis Concentrate from Surface Drinking Water Plant

CAPACITY
10 MGD

PFAS TREATMENT TECHNOLOGIES
Olift™ Foam Fractionation
Obreak™ Electro-Oxidation
GAC Media Adsorption

BREAK FREE FROM PFAS™

Olift™ FOAM FRACTIONATION

Obreak™ ELECTRO OXIDATION

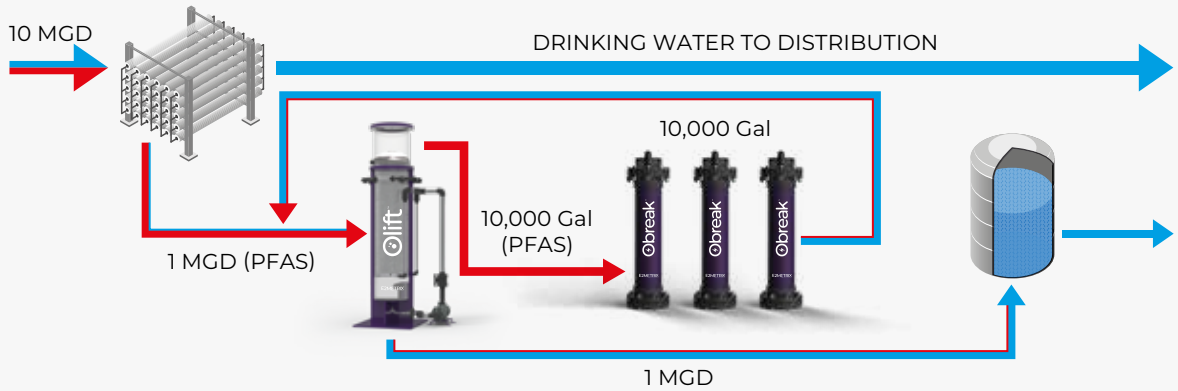
SUMMARY

In 2016, the West Morgan-East Lawrence Water and Sewer Authority (WMEL) faced a crisis when PFAS was detected above the then recently published Health Advisory levels in its drinking water supply. That same year, E2METRIX, an Ovivo Company, installed an emergency granular activated carbon (GAC) system until a long-term solution could be found. In 2021, WMEL installed a membrane filtration (MF)/ reverse osmosis (RO) system to protect potable water, with the RO Concentrate (ROC) directed to the existing GAC system before discharge back into the river. E2METRIX partnered with WMEL to demonstrate onsite PFAS removal and destruction on the ROC prior to the GAC with a pilot. The goal was to incorporate onsite PFAS destruction and reduce offsite disposal costs and liabilities associated with PFAS-concentrated GAC waste.

THE DEMONSTRATED SOLUTION

The treatment strategy involved an integrated use of Olift™ and Obreak™ technologies. Olift™ Foam Fractionation with ozone was utilized for the removal and concentration of PFAS, while Obreak™ Electro-Oxidation was employed to eliminate PFAS in the concentrate (Foamate). This approach effectively reduced the PFAS load to the GAC system, thereby extending media life and lowering associated disposal costs.

	Concentration	Destruction	Optional Polishing
Reverse Osmosis Followed by :	Olift™ FOAM FRACTIONATION	Obreak™ ELECTRO OXIDATION	ION EXCHANGE or GRANULAR ACTIVATED CARBON



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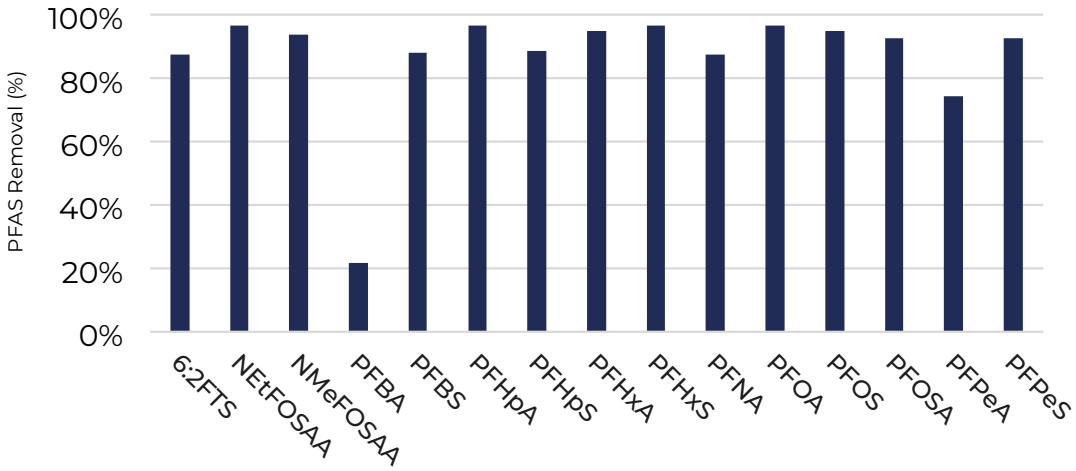
Average PFAS Removal - Ozone

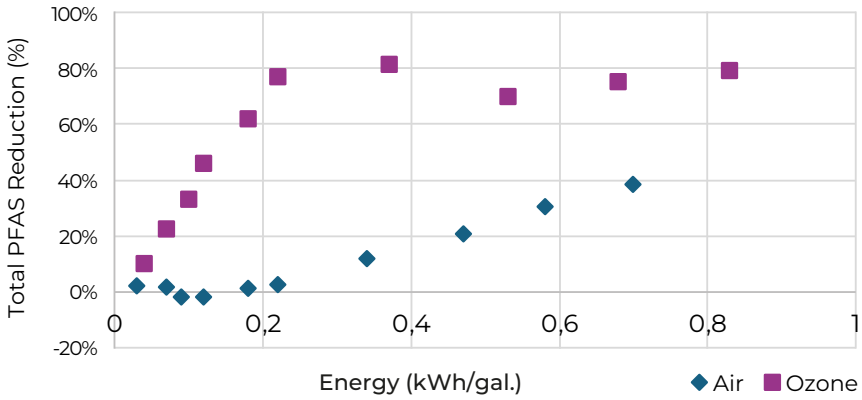


Compared to air-only foam fractionation solutions, using ozone with Olift™ produced a secondary volume of Foamate over 4 times smaller to treat downstream with Obreak™. The destruction performance of Obreak™ improved with the use of ozone in the Olift™ system due to the additional treatment provided to competing contaminants. The total energy demand for ozone-produced Foamate also decreased for the Obreak™ system as it treated smaller and more targeted volumes, saving operational and maintenance costs.

PFAS destruction can be costly from a capital expenditure (CAPEX) and operational expenditure (OPEX) standpoint; it is critical to concentrate the PFAS in the smallest volume of water possible. Olift™ produces a concentrated stream called Foamate, which lowers the hydraulic capacity requirements for Obreak™. By adding a booster surfactant and ozone, the Olift™ pilot system achieved over 90% removal for all six regulated PFAS compounds and an overall Total PFAS reduction of 84% in this application.

Adding ozone to Olift™ not only enhanced Obreak™ degradation performance but also delivered significant CAPEX benefits because of a lower foamate volume compared to air-only. When Obreak ™ is combined with Olift™, the overall treatment system can be optimized by determining the most energy efficient treatment time of the Foamate by Obreak ™ and then recycling the treated effluent back to the front of the Olift™ Foam Fractionation system. This closed-loop process allows for continual PFAS removal, concentration, and destruction at the highest energy efficiencies. The two technologies, Olift™ and Obreak™, must be evaluated in conjunction as one solution for an optimized solution not as separate individual technologies.

PFAS Destruction Efficiencies of Foamate

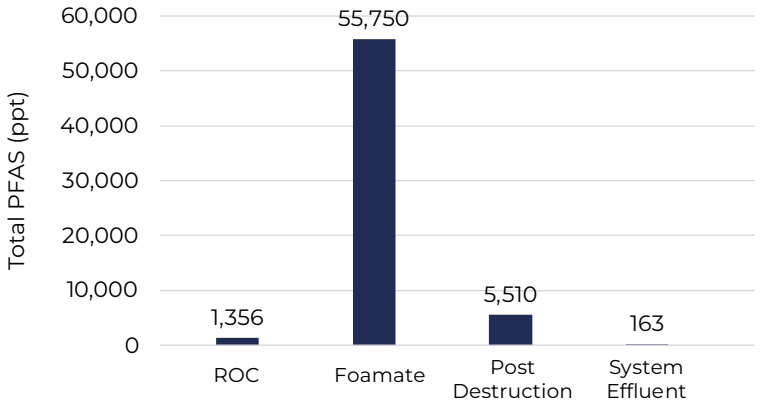


The following is a summary of the integrated treatment approach.

Integrated Solution Summary

PFAS Compound	Units	ROC	Foamate	Post Destruction	System Effluent
PFOS	**ppt**	**419**	**25,400**	**1,680**	**22**
PFOA	**ppt**	**346**	**3,040**	**30**	**12**
PFNA	**ppt**	**8**	**600**	**ND**	**ND**
PFHxS	**ppt**	**62**	**1,200**	**940**	**2**
PFBS	**ppt**	**96**	**500**	**440**	**12**
PFBA	ppt	121	1,400	400	95
PFPeA	ppt	36	1,420	310	9
8:2 FTS	ppt	94	410	ND	ND
PFHxA	ppt	13	3,000	340	5
PFPeS	ppt	64	110	170	ND
PFHpA	ppt	31	540	170	2
6:2 FTS	ppt	8	17,700	1,000	4
PFHpS	ppt	13	240	30	ND
PFDA	ppt	2	30	ND	ND
NMeFOSAA	ppt	15	80	ND	ND
NEtFOSAA	ppt	29	80	ND	ND
Total PFAS	ppt	1,356	55,750	5,510	163

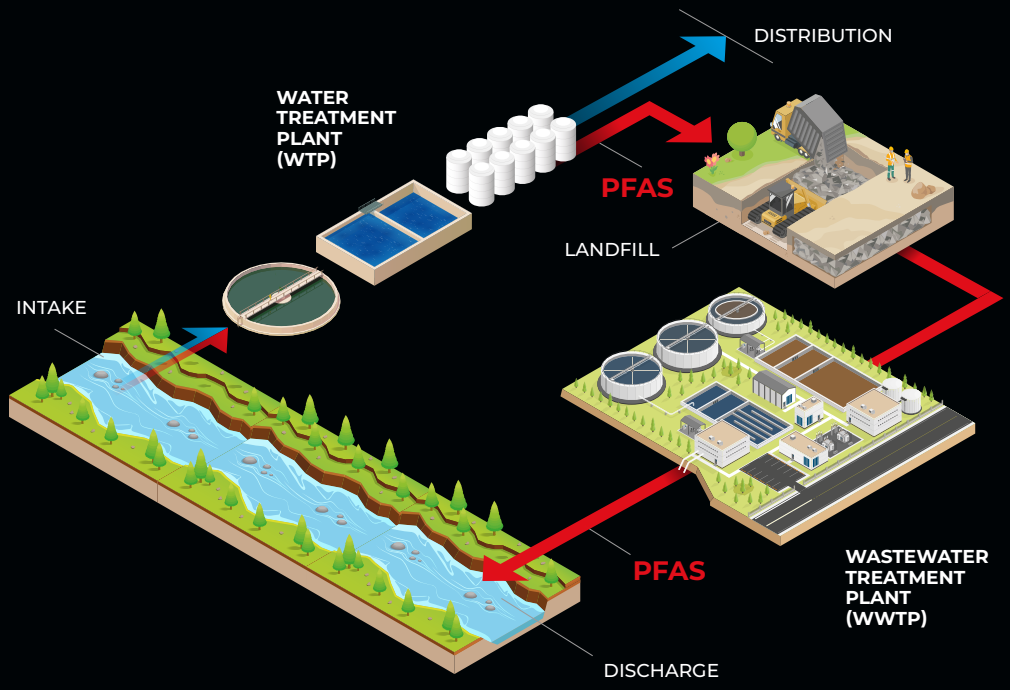
PFAS Concentration Across System



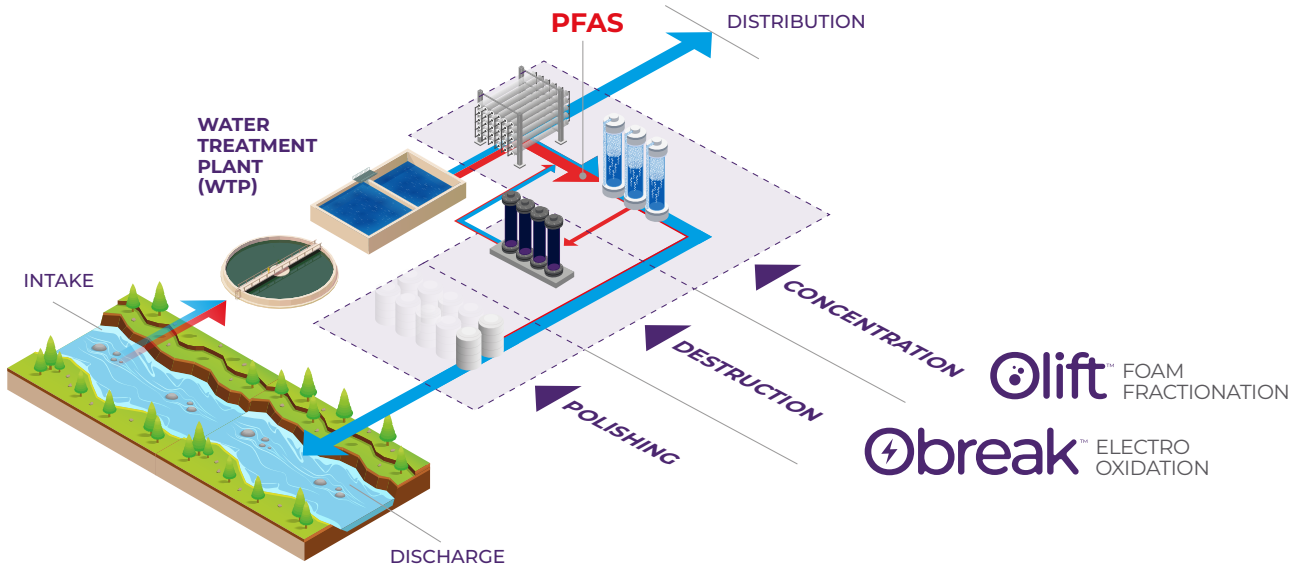
Conclusions Drawn from the Onsite Pilot Demonstration Include the Following

- Onsite destruction with Obreak™ reduces offsite disposal cost and liabilities associated with PFAS-concentrated GAC waste streams.
- When ozone is used, Olift™ Foam Fractionation PFAS removal and concentration factors improve.
- The use of ozone in Olift™ significantly improves Foamate destruction energy efficiencies of Obreak ™, when compared to air-only foam fractionation.
- Obreak™ can achieve over 80% Total PFAS destruction for less than 1 kWh/gal of Foamate.
- Combining Obreak™ and Olift™ into an advanced treatment system allows a closed-loop process for continual PFAS removal, concentration, and destruction at the highest energy efficiencies.

CURRENT APPROACH



THE E2METRIX SOLUTION



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