PFAS:
AN OVERVIEW

PRESENTED BY ROBIN DEAL,
PRODUCT MANAGER HUBBARD-HALL

NASF WISCONSIN

18.49
Hh
Hubbard-Hall

AGENDA

PFAS in metal finishing under current administration

History of PFAS in industrial applications

What we are seeing in metal finishing wastewater today

Different technologies in use today for metal finishing wastewater treatment

- Hydroxide Precipitation
- Microfiltration
- Evaporation with condensation
- Carbon Filtration

Different **types of carbon media**

New technologies not in use at metal finishing facilities

WHAT DOES THE FUTURE HOLD FOR METAL FINISHERS?

EPA "Powering the Great American Comeback" Initiative

On February 4, 2025, U.S. Environmental Protection Agency (EPA) Administrator Lee Zeldin announced the agency's Powering the Great American Comeback Initiative, to achieve the agency's mission while energizing the greatness of the American economy. This plan outlines the agency's priorities under the leadership of President Trump and Administrator Zeldin. The newly announced Powering the Great American Comeback initiative consists of five pillars that will guide the EPA's work over the first 100 days and beyond:

- Pillar 1: Clean Air, Land and Water for Every American
- Pillar 2: Restore American Energy Dominance
- Pillar 3: Permitting Reform, Cooperative Federalism, and Cross-Agency Partnership
- Pillar 4: Make the United States the Artificial Intelligence Capital of the World
- Pillar 5: Protecting and Bring Back American Auto Jobs

PFAS UNDER THE CURRENT EPA ADMINISTRATION

- Develop effluent limitations guidelines (ELGs) for PFAS manufacturers and metal finishers and evaluate other ELGs necessary for reduction of PFAS discharges
- Determine how to better use RCRA authorities to address releases from manufacturing operations of both producers and users of PFAS
- Add PFAS to the Toxic Release Inventory (TRI) in line with Congressional direction from the 2020 National Defense Authorization Act
- Enforce Clean Water Act and TSCA limitations on PFAS use and release to prevent further contamination
- Implement section 8(a)7 to smartly collect necessary information, as Congress envisioned and consistent with TSCA, without overburdening small businesses and article importers.
- Work with Congress and industry to establish a clear liability framework that operates on polluter pays and protects passive receivers

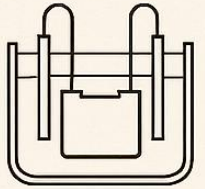
LATEST PFAS NEWS…

- **PFAS Requirements in National Pollutant Discharge Elimination System (NPDES) Permit Applications**: EPA notes that the list of pollutants in the NPDES application regulations has not been updated since 1987 and currently does not include PFAS. According to EPA, this proposed rulemaking seeks to update requirements for several of the existing NPDES permit applications to address monitoring and reporting of PFAS. EPA intends to issue a notice of proposed rulemaking (NPRM) in **November 2025**and a final rule in **May 2027**.
- **Revisions to the Metal Finishing Effluent Guidelines to Address PFAS Discharges in Chromium Electroplating Wastewater**: EPA is revising the Metal Finishing Effluent Limitation Guidelines at 40 C.F.R. Part 433 to address discharges of PFAS in wastewater from chromium electroplating facilities. EPA intends to issue an NPRM in **July 2026**.
- **Addition of Certain PFAS to the Toxics Release Inventory (TRI)**: EPA states that it is developing a final action to add individually listed PFAS and PFAS categories to the TRI list of toxic chemicals subject to reporting under the Emergency Planning and Community Right-to-Know Act (EPCRA) and the Pollution Prevention Act (PPA).
- **15 states oppose the EPA's proposed rollback of PFAS reporting rule:** The attorneys general—from California, Connecticut, Hawaii, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New Jersey, New York, North Carolina, Oregon, Rhode Island, Washington, and Wisconsin—are urging the EPA to preserve the current rule and begin collecting the required data without delay

HISTORY OF PFAS IN INDUSTRIAL APPLICATIONS

EVOLUTION OF METAL FINISHING

ANCIENT TIMES	Metal objects were decorated by hammering, chasing, and embossing
18TH CENTURY	Electroplating developed following the invention of the galvanic cell
20TH CENTURY	Anodizing and passivation processes were introduced
21ST CENTURY	Improved techniques emphasized sustainability and reduced environmental impact



Manufacturing Sections use of PFAS

PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES (PFAS) ARE A GROUP OF MAN-MADE CHEMICALS THAT INCLUDE PERFLUOROOCTANE SULFONATE (PFOS) AND PERFLUOROOCTANOIC ACID (PFOA). THESE ELEMENTS HAVE A NEGATIVE EFFECT ON THE HEALTH OF THOSE EXPOSED TO THEM. USED AS EARLY AS THE 1940S, PFAS WERE ONCE THOUGHT OF AS BENEFICIAL BECAUSE OF THEIR ABILITY TO REPEL FIRE, WATER, OIL AND STAINS. SINCE PFAS FUNCTIONED AS GREAT REPELLENTS, COMPANIES USED THEM TO PRODUCE A VARIETY OF PRODUCTS

Sector	Example Uses	References
Textiles & Leather	Factory- or consumer-applied coating to repel water, oil, and stains. Applications include protective clothing and outerwear, umbrellas, tents, sails, architectural materials, carpets, and upholstery.	Rao and Baker 1994; Hekster, Laane, and de Voogt 2003; Brooke, Footitt, and Nwaogu 2004; Poulsen et al. 2005; Prevedouros et al. 2006; Walters and Santillo 2006; Trudel et al. 2008; Guo et al. 2009; USEPA 2009a; Ahrens 2011; Buck et al. 2011; UNEP 2011; Herzke, Olsson, and Posner 2012; Patagonia 2015; Kotthoff et al. 2015; ATSDR 2015
Paper Products	Surface coatings to repel grease and moisture. Uses include non-food paper packaging (for example, cardboard, carbonless forms, masking papers) and food-contact materials (for example, pizza boxes, fast food wrappers, microwave popcorn bags, baking papers, pet food bags).	Rao and Baker 1994; Kissa 2001; Hekster, Laane, and de Voogt 2003; Poulsen et al. 2005; Trudel et al. 2008; Buck et al. 2011; UNEP 2011; Kotthoff et al. 2015; Schaider et al. 2017
Metal Plating & Etching	Corrosion prevention, mechanical wear reduction, aesthetic enhancement, surfactant, wetting agent/fume suppressant for chrome, copper, nickel and tin electroplating, and post-plating cleaner.	USEPA 1996; USEPA 1998; Kissa 2001; Prevedouros et al. 2006; USEPA 2009b; UNEP 2011; OSHA 2013; KEMI 2015; Danish EPA 2015
Wire Manufacturing	Coating and insulation.	Kissa 2001; van der Putte et al. 2010; ASTSWMO 2015
Industrial Surfactants, Resins, Molds, Plastics	Manufacture of plastics and fluoropolymers, rubber, and compression mold release coatings; plumbing fluxing agents; fluoroplastic coatings, composite resins, and flame retardant for polycarbonate.	Kissa 2001; Renner 2001; Poulsen et al. 2005; Fricke and Lahl 2005; Prevedouros et al. 2006; Skutlarek, Exner, and Farber 2006; van der Putte et al. 2010; Buck et al. 2011; Herzke, Olsson, and Posner 2012; Kotthoff et al. 2015; Miteni 2016; Chemours 2017
Photolithography, Semiconductor Industry	Photoresists, top anti-reflective coatings, bottom anti-reflective coatings, and etchants, with other uses including surfactants, wetting agents, and photo-acid generation.	SIA 2008; Choi et al. 2005; Rolland et al. 2004; Brooke, Footitt, and Nwaogu 2004; van der Putte et al. 2010; UNEP 2011; Herzke, Olsson, and Posner 2012

History and Use of Per- and Polyfluoroalkyl Substances (PFAS) found in the Environment (itrcweb.org)

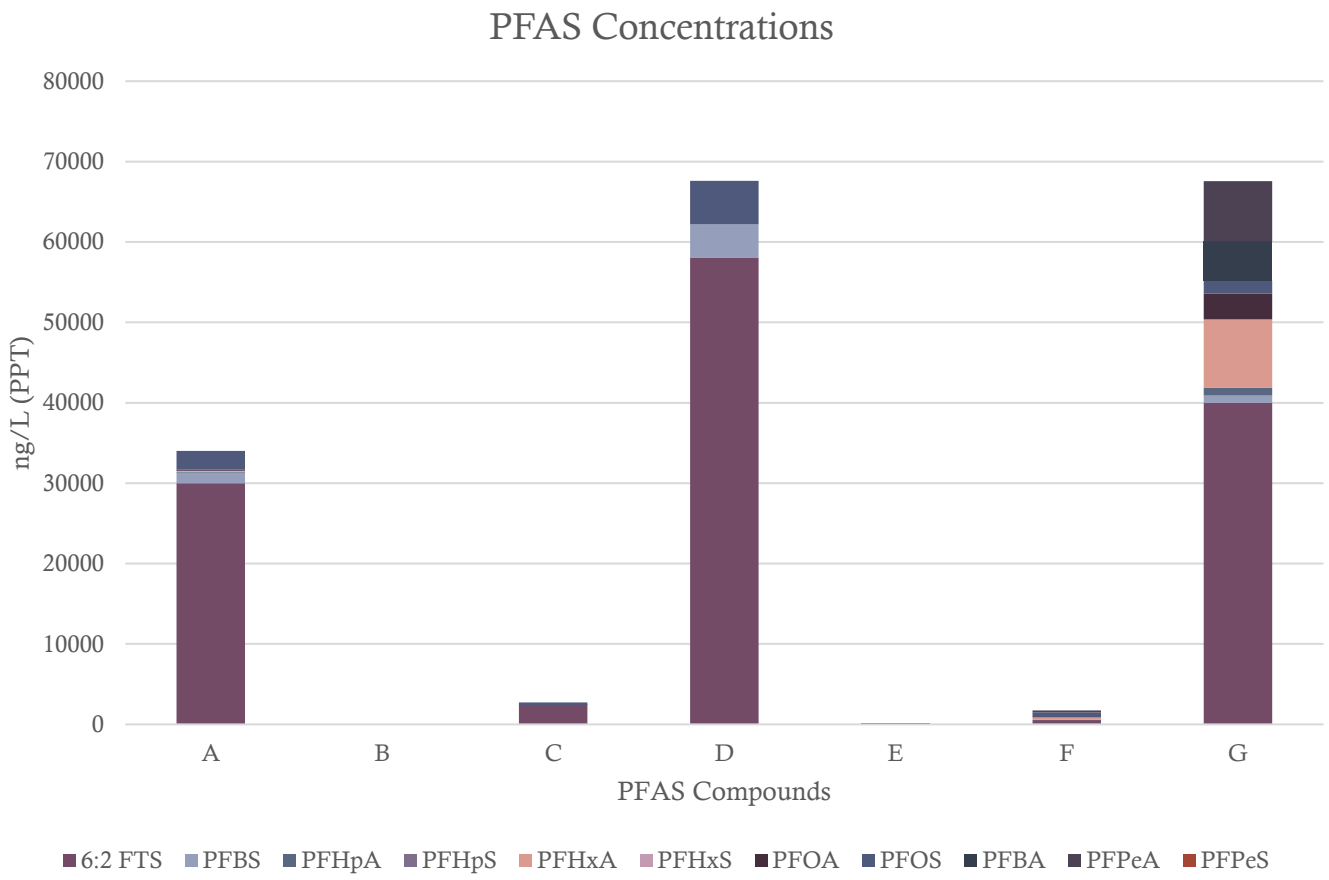
HISTORY OF PFAS IN PLATING

PFAS compound	Processes	Products	Time period of concern	Potential media impacted
Potassium or amine perfluoroalkyl sulfonate (PFSA)	Chrome plating and associated processes	WA/FS	1954 – late 1980s	Wastewater, air, solid waste, groundwater, soil
Potassium perfluoroethyl cyclohexyl sulfonate (PFECHS)	Chrome plating and associated processes	WA/FS	1954 – late 1980s	Wastewater, air, solid waste, groundwater, soil
Ammonium perfluorohexylethyl sulfonate (6:2 FTS-NH4)	Chrome plating and associated processes	WA/FS	1954 – late 1980s	Wastewater, air, solid waste, groundwater, soil
Perfluorooctane sulfonic acid and derived salts (PFOS)	Chrome plating, plating on plastics, etching, anodizing	Wetting agents, mist suppressants, WA/FS	Late 1980s - 2015	Wastewater, air, solid waste, groundwater, soil
Perfluorobutanesulfonate (PFBS)	Chrome plating	Mist suppressants	Unknown (registered product in EU)	Wastewater, air, solid waste, groundwater, soil
Fluorotelomer sulfonic acids (6:2 FTS and 6:4 FTS)	Chrome plating, plating on plastics, etching, anodizing	Wetting agents, mist suppressants, WA/FS	2000s – present	Wastewater, air, solid waste, groundwater, soil

Summary of key PFAS used in chrome plating and adjacent operations - Gilchrist, M. (2022, December).

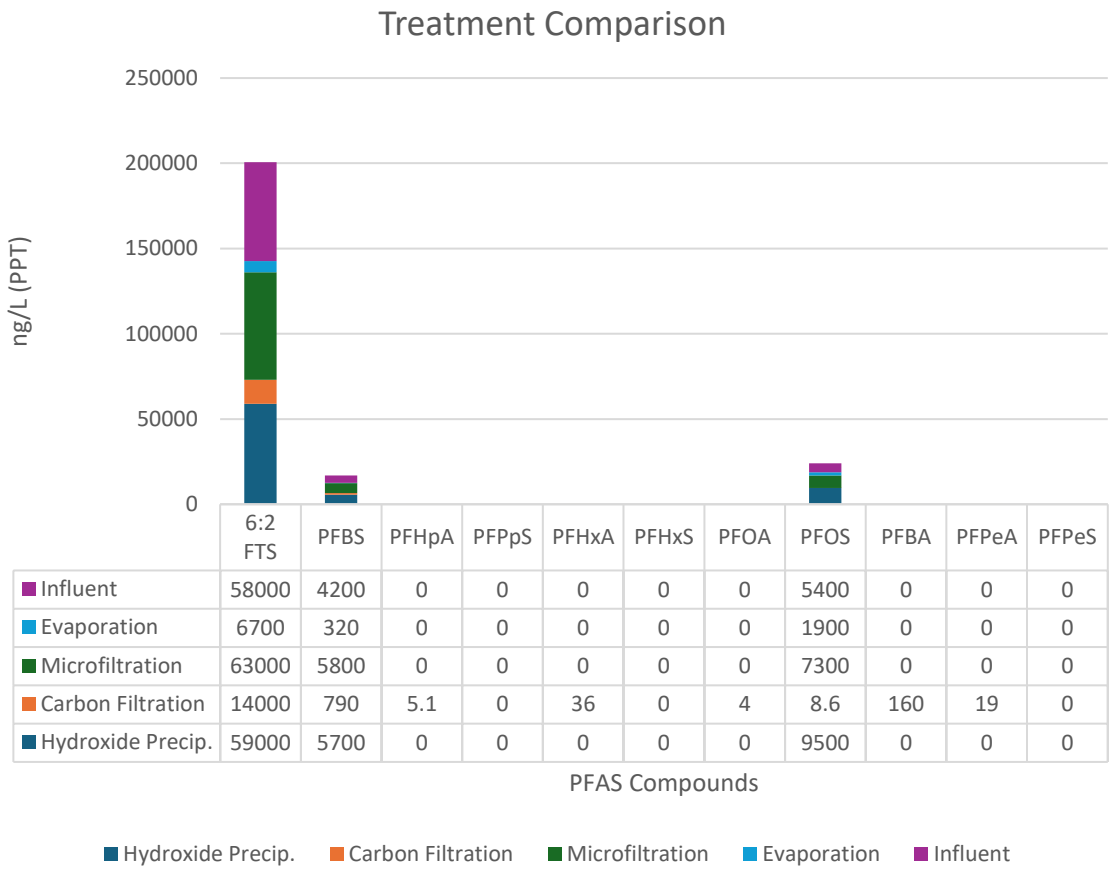
PLATING OPERATIONS

PFAS COMPOUNDS FOUND IN HEXAVALENT CHROME SHOPS



- 6:2 FTS- mist suppression
- PFBS- surfactant and defoamer
- PFHpA- mist suppression
- PFHpS- wetting agent and mist suppression
- PFHxA- wetting agent and mist suppression
- PFHxS- surfactant and defoamer
- PFOA- mist suppression and defoamer
- PFOS-wetting agent and mist suppression
- PFBA- mist suppression
- PFPeA- emulsifying agent
- PFPeS- lubricant

CURRENT TREATMENT METHODS



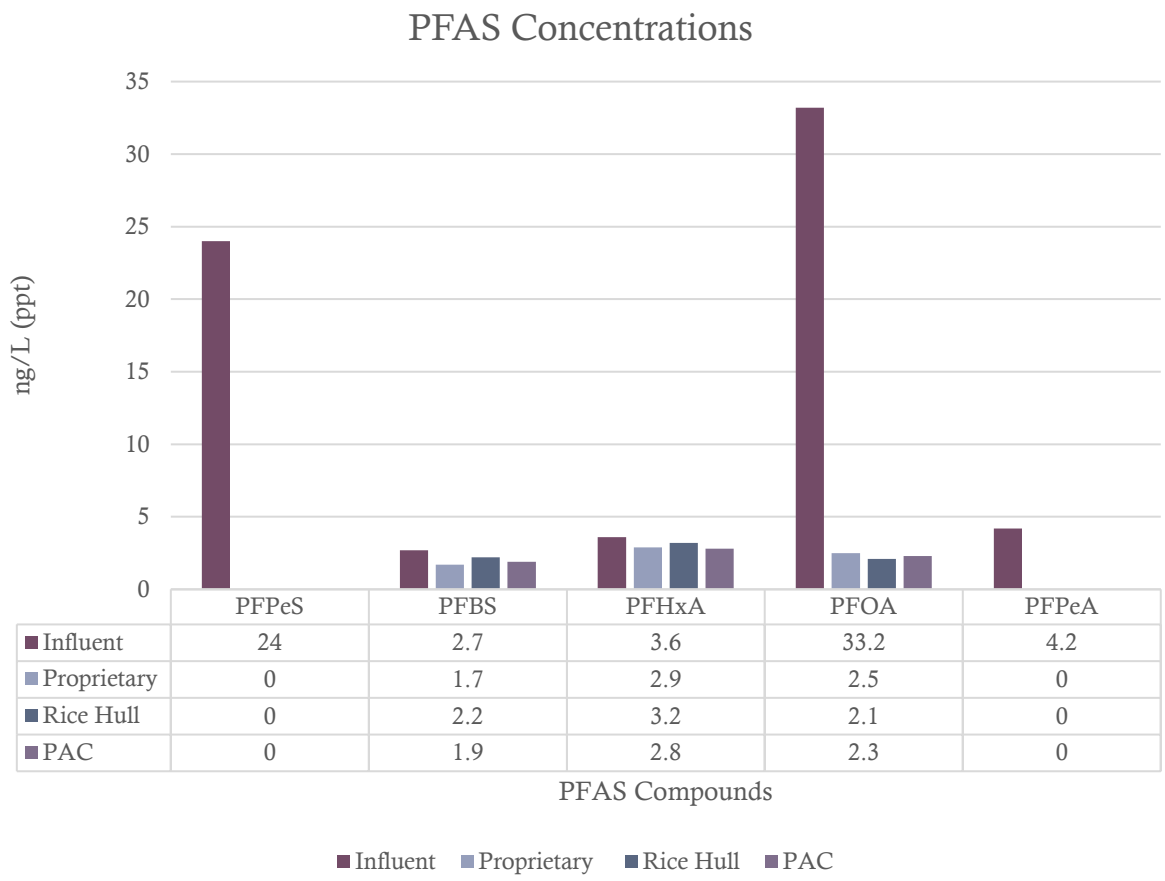
	6:2 FTS	PFBS	PFHpA	PFPpS	PFHxA	PFHxS	PFOA	PFOS	PFBA	PFPeA	PFPeS
Influent	58000	4200	0	0	0	0	0	5400	0	0	0
Evaporation	6700	320	0	0	0	0	0	1900	0	0	0
Microfiltration	63000	5800	0	0	0	0	0	7300	0	0	0
Carbon Filtration	14000	790	5.1	0	36	0	4	8.6	160	19	0
Hydroxide Precip.	59000	5700	0	0	0	0	0	9500	0	0	0

Total Influent Concentrations:
67,600ng/L

Removal Efficiencies:

- Evaporation: 87%
- Microfiltration: 0%
- Carbon Filtration: 78%
- Hydroxide Precipitation: 0%

SITE A: HEX-CHROME PLATING FACILITY



	PFPeS	PFBS	PFHxA	PFOA	PFPeA
Influent	24	2.7	3.6	33.2	4.2
Proprietary	0	1.7	2.9	2.5	0
Rice Hull	0	2.2	3.2	2.1	0
PAC	0	1.9	2.8	2.3	0

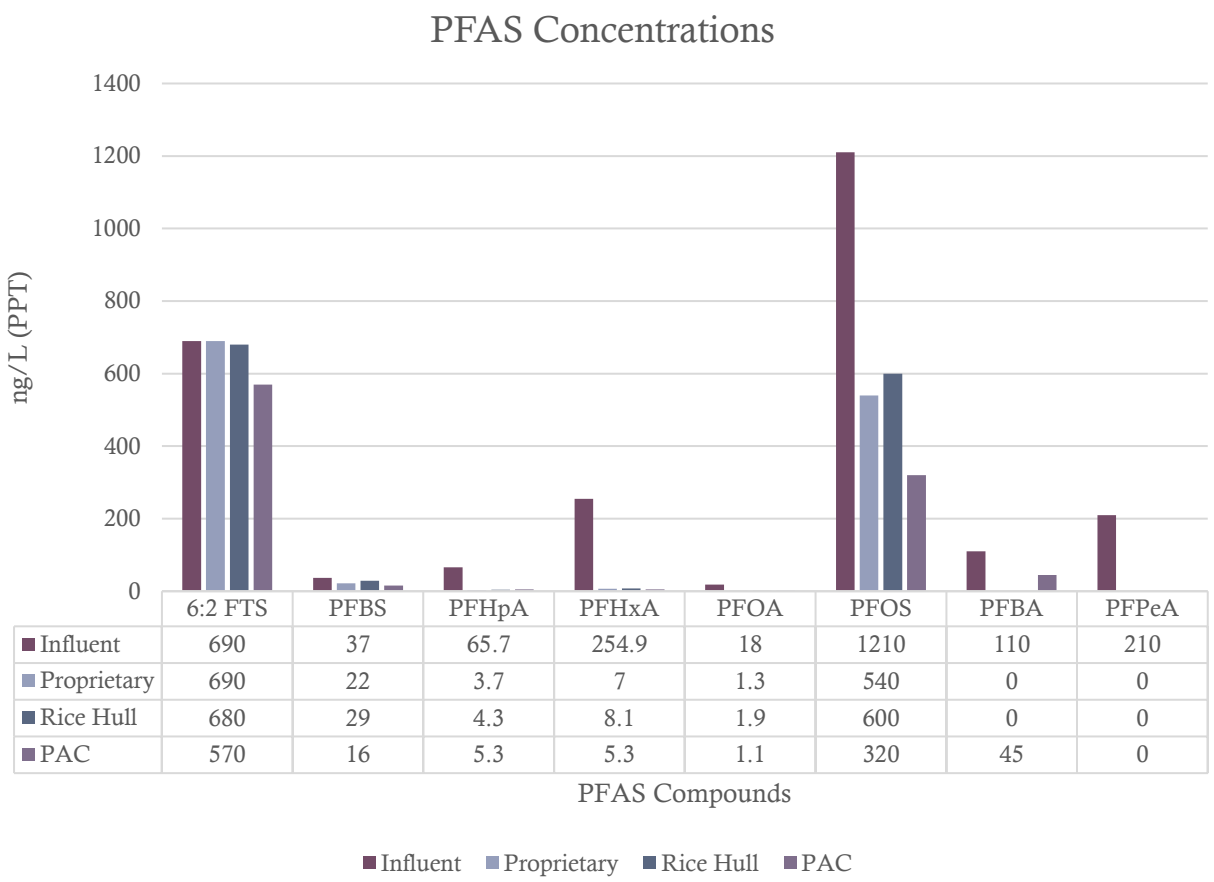
Total Influent Concentrations:

67.7ng/L

Removal Efficiencies:

- Proprietary: 70%
- Rice Hull: 65%
- PAC: 69%

SITE B: HEX-CHROME PLATING FACILITY



	6:2 FTS	PFBS	PFHpA	PFHxA	PFOA	PFOS	PFBA	PFPeA
Influent	690	37	65.7	254.9	18	1210	110	210
Proprietary	690	22	3.7	7	1.3	540	0	0
Rice Hull	680	29	4.3	8.1	1.9	600	0	0
PAC	570	16	5.3	5.3	1.1	320	45	0

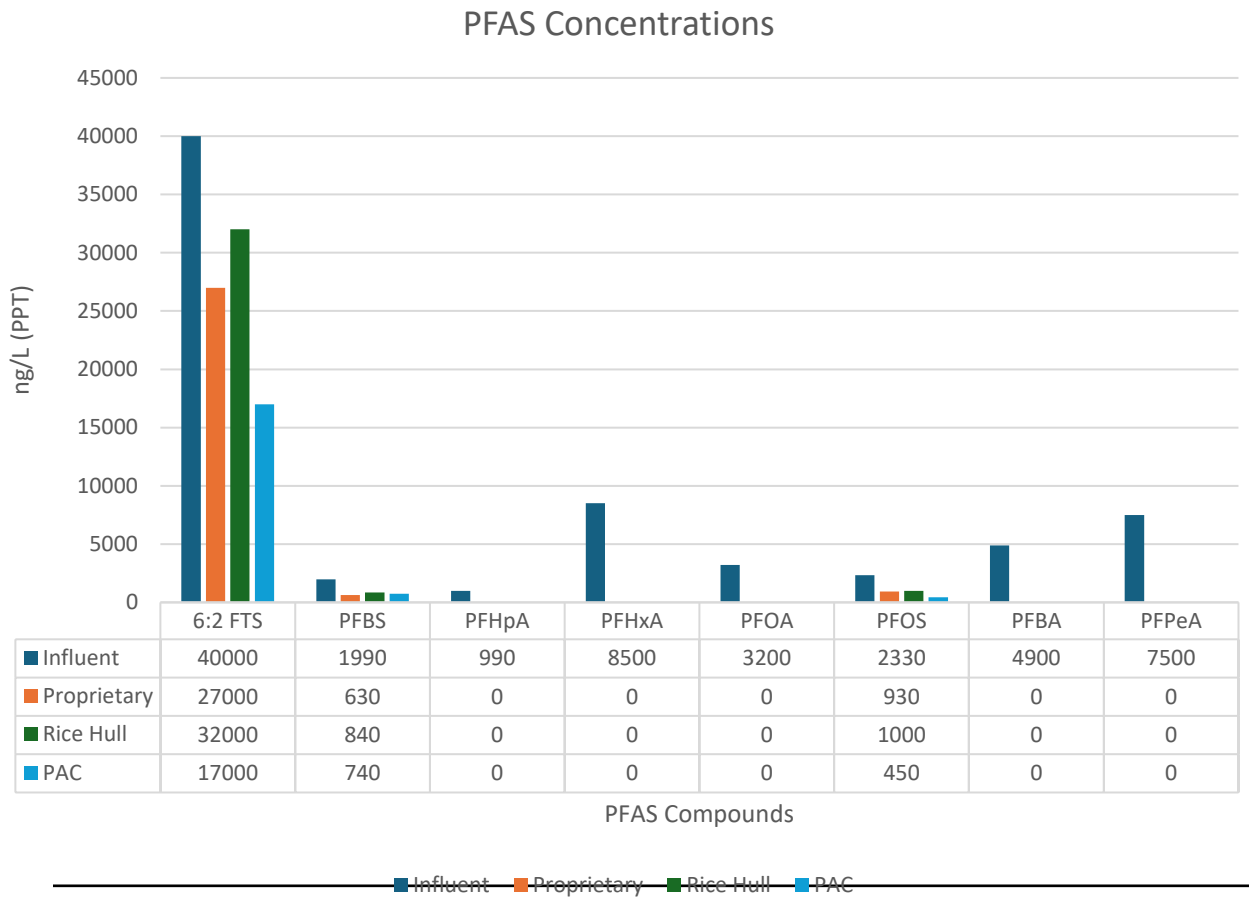
Total Influent Concentrations:

2595.6ng/L

Removal Efficiencies:

- Proprietary:73%
- Rice Hull: 69%
- PAC: 74%

SITE C: PLATING & ANODIZING FACILITY WITH HEX-CHROME SEAL



	6:2 FTS	PFBS	PFHpA	PFHxA	PFOA	PFOS	PFBA	PFPeA
Influent	40000	1990	990	8500	3200	2330	4900	7500
Proprietary	27000	630	0	0	0	930	0	0
Rice Hull	32000	840	0	0	0	1000	0	0
PAC	17000	740	0	0	0	450	0	0

Total Influent Concentrations:

69,410ng/L

Removal Efficiencies:

- Proprietary: 83%
- Rice Hull: 79%
- PAC: 88%

WHAT WILL THE FUTURE BRING?

Foam Fractionation

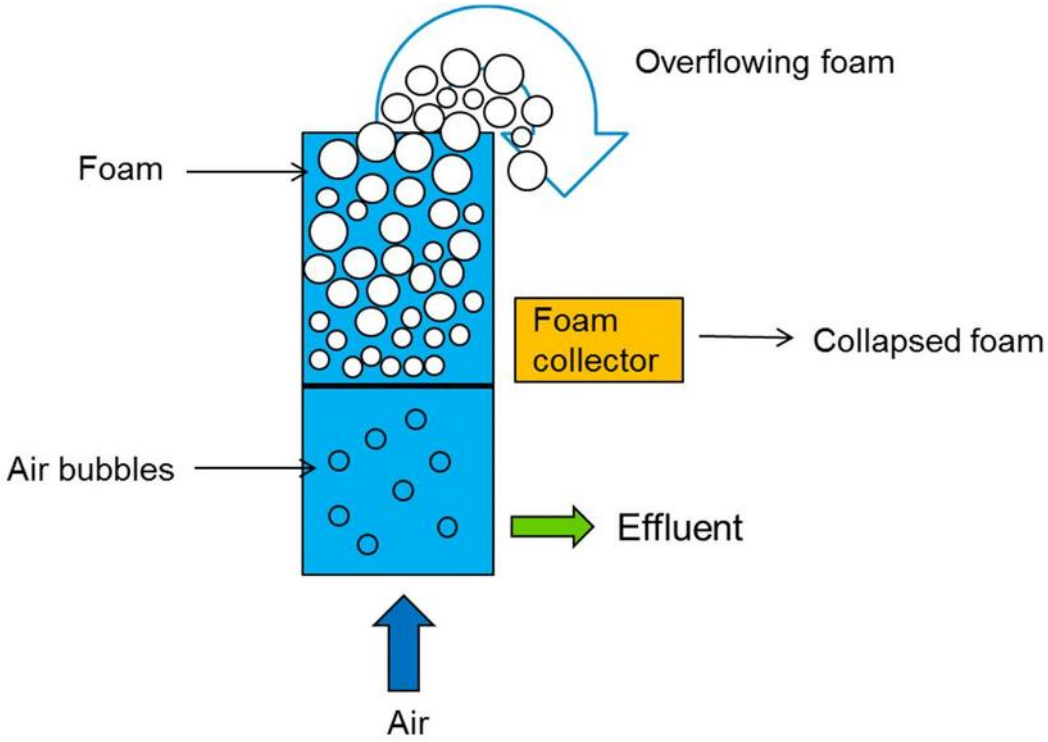
&

Oxidation Technologies

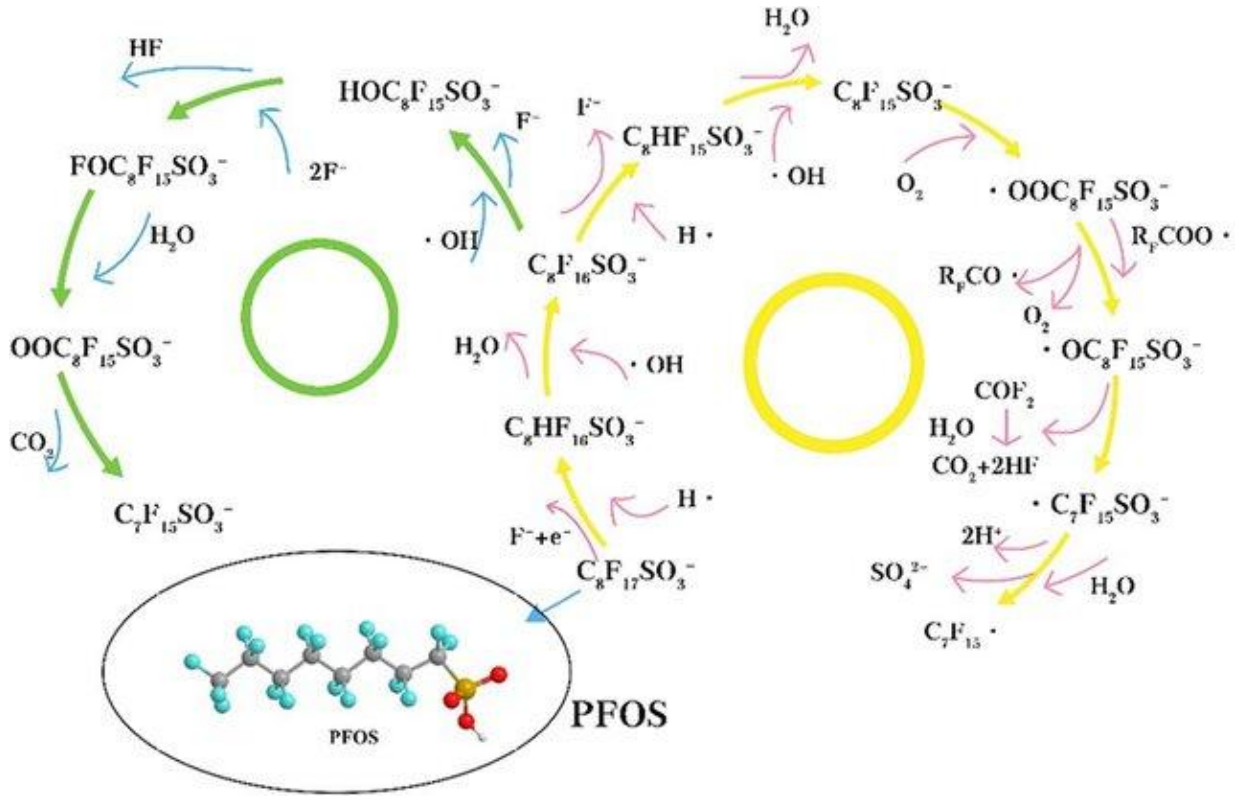
FOAM FRACTIONATION FOR PFAS REMOVAL

How It Works

- Foam formation: PFAS molecules are drawn to surface of bubbles
- Foam collection: foam layer rich in PFAS is skimmed from top of tank
- Concentration: PFAS rich foam is easier to handle and dispose of

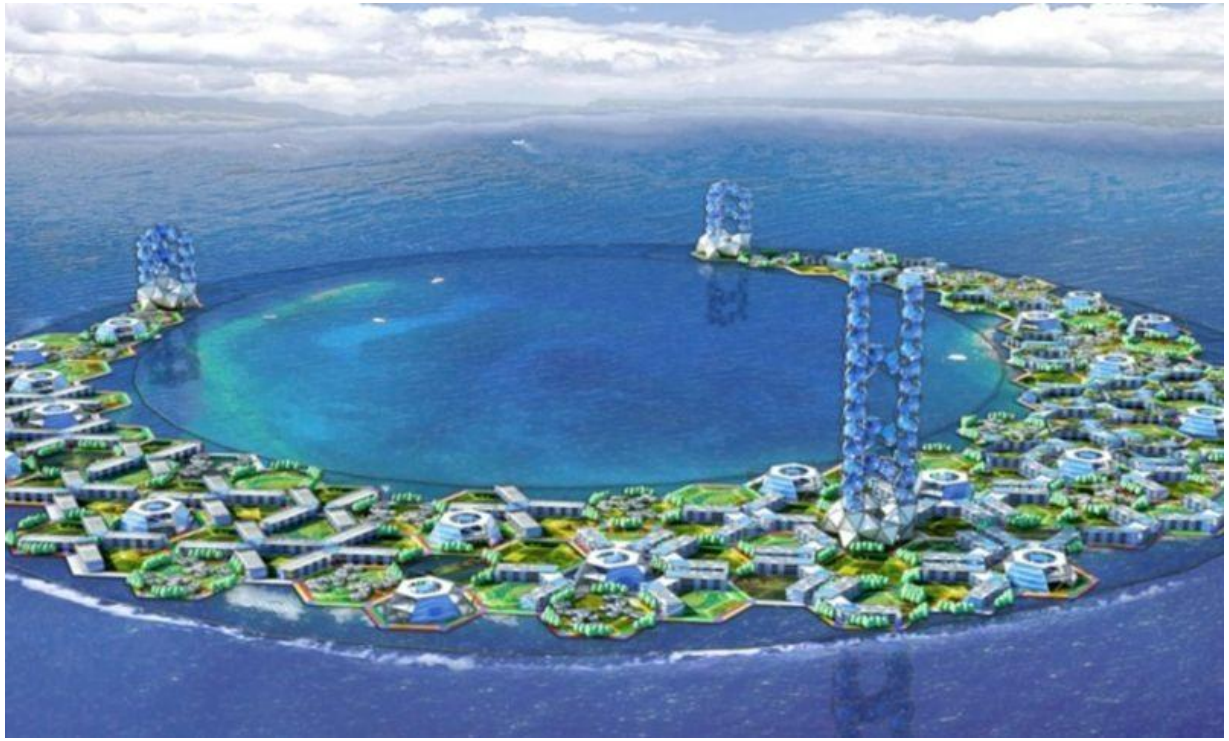


ADVANCED OXIDATION PROCESSES FOR PFAS DESTRUCTION



- Photodegradation
- Fenton Oxidation
- Electrochemical Oxidation

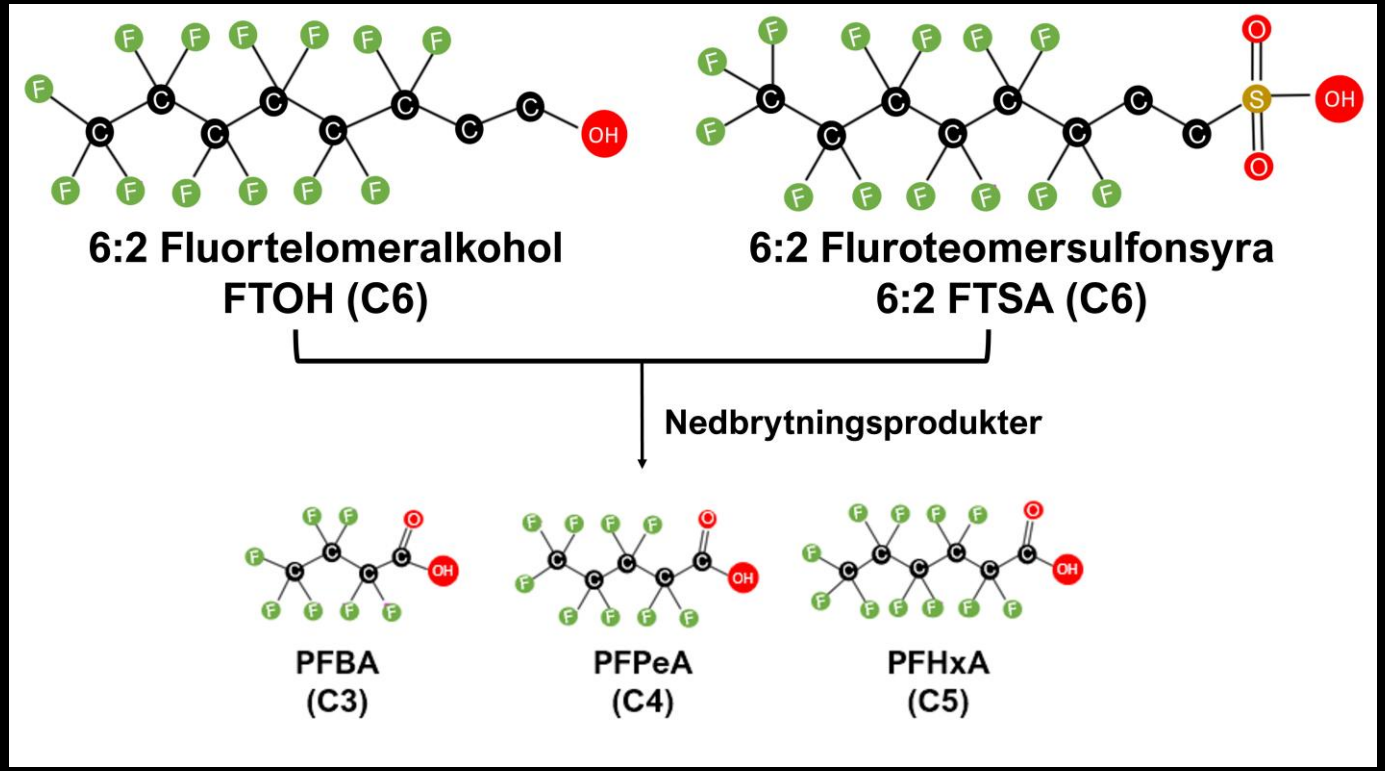
THE WAY, WAY OUT THERE!



- Ultrasonic Degradation
- Constructed Wetlands (Bio-treatment)
- Ball Milling

THANK YOU

Robin Deal, Product Manager
C: 317.850.6971
rdeal@hubbardhall.com
www.hubbardhall.com



Egenskaper