Northeast Waste Management Officials' Association (NEWMOA)
Virtual PFAS Webinar
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Electrochemical Oxidation of PFAS – Moving from Bench to the Field

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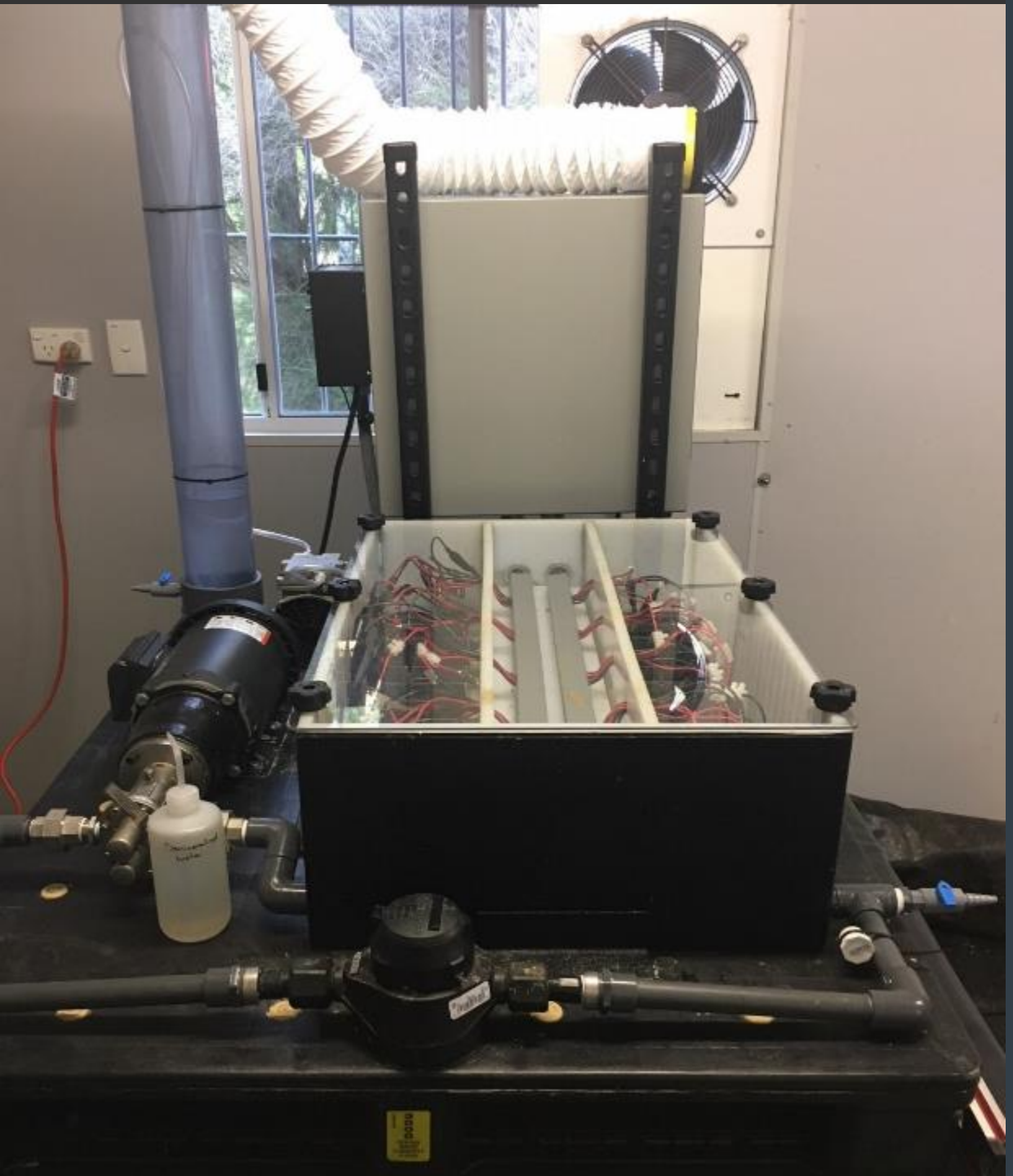
Outline

- Introduction
  - Electrochemical Oxidation Technology (EO) Background
  - EO Applications for PFAS Treatment
- Demonstration Project
- Field Pilot Demonstration
- Key Takeaways



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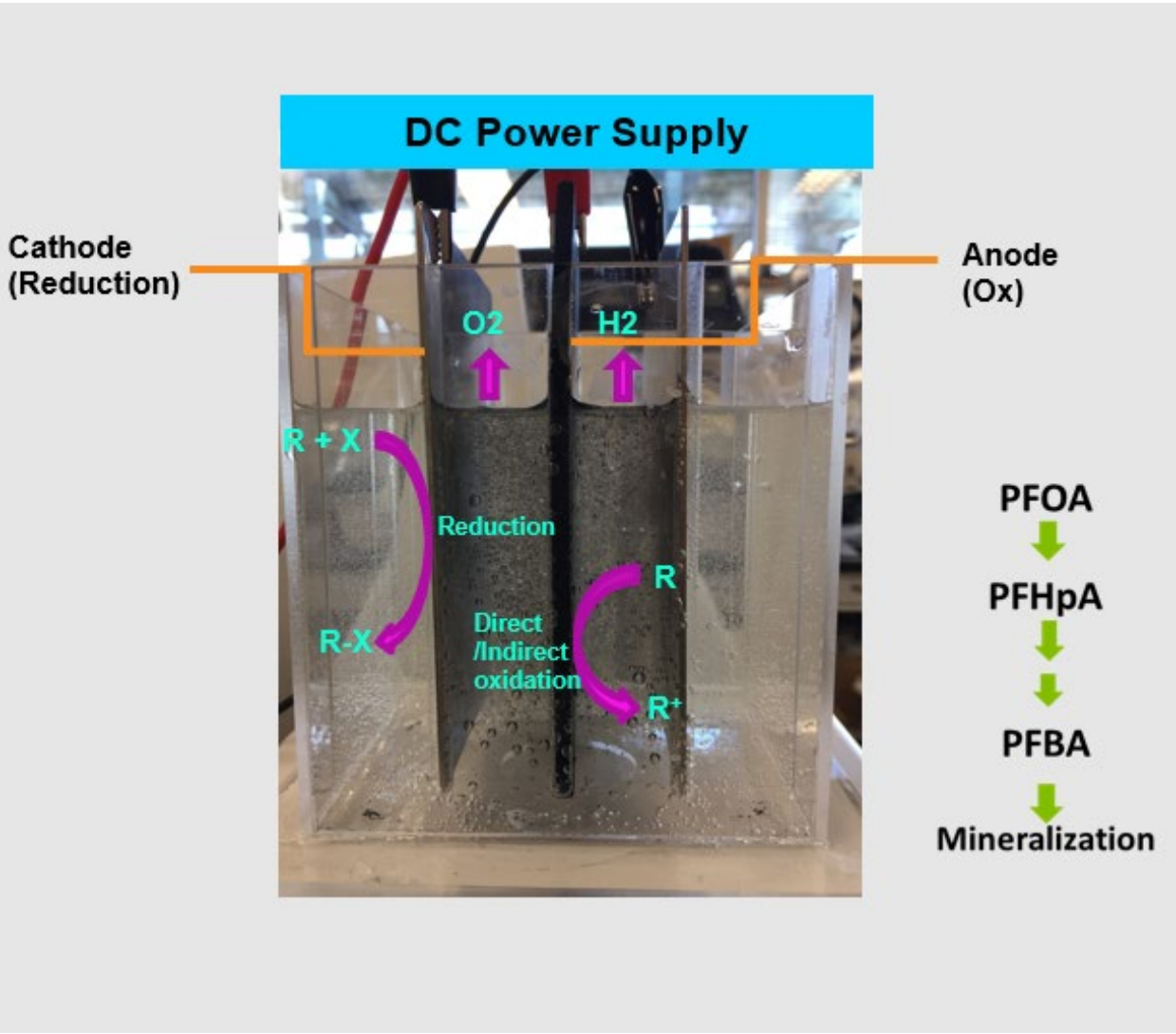
Introduction

Electrochemical Oxidation for PFAS Destruction

- Electrochemical oxidation (EO) is a proven technology that defluorinates and mineralizes short-chain and long-chain PFAS
- DE-FLUORO™ utilizes a proprietary, high durability and low-cost electrode that can be in different sizes, forms and shapes for different applications
- **DE-FLUORO™**: **D**egradation and **E**lectrochemical oxidation of per- and poly**fluoro**alkyl substances
- A compact, highly efficient, cost-effective mobile treatment unit for on-site PFAS destruction treatment
- It reduces environmental liability of transporting PFAS-impacted waste off site for treatment/disposal



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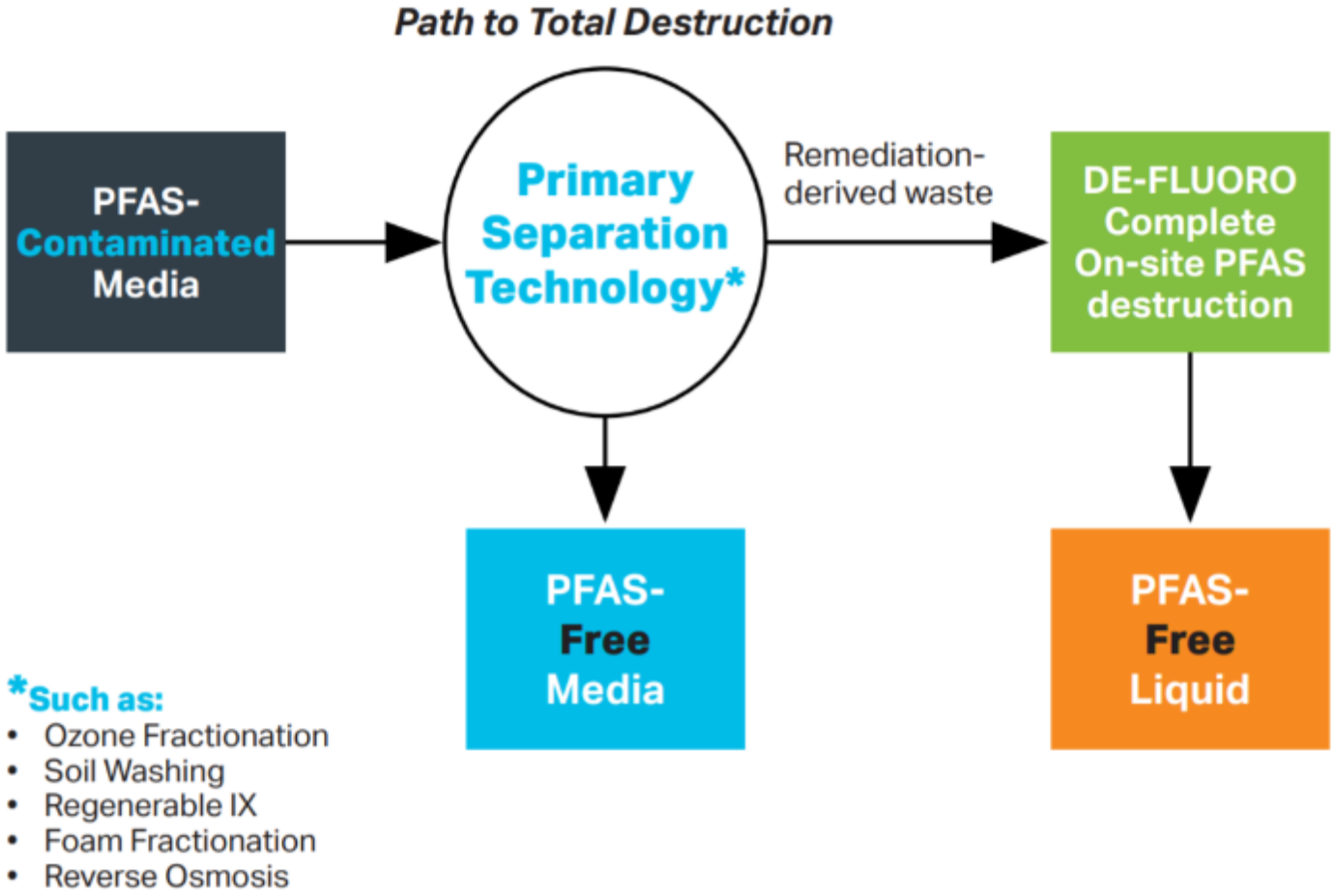
EO as a Stand-Alone Destructive Technology

- Applicable for smaller volumes and higher PFAS concentrations
- Can treat in batch or flow-through mode

Coupling EO with Separation Technologies

- Applicable for larger volumes and lower PFAS concentrations
- Primary technology separates PFAS from the waste stream
- Primary technology typically generates a concentrated waste stream, with higher PFAS
- EO destroys PFAS in the concentrated waste stream



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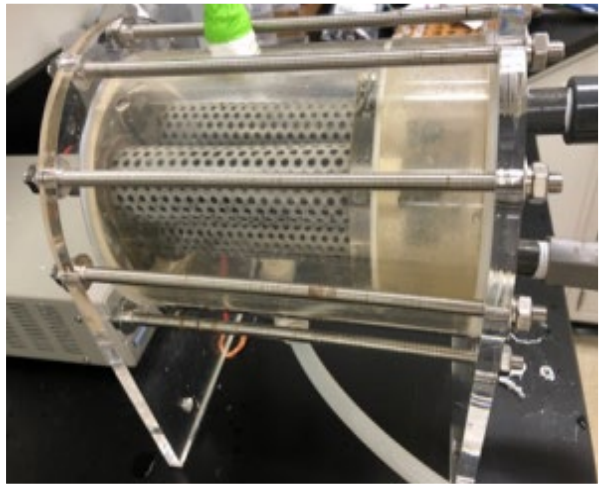
Demonstration Project

DE-FLUORO™ Demonstration Project



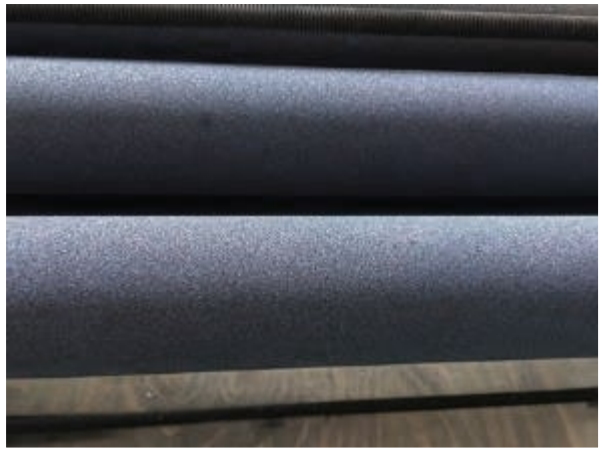


Plate Electrodes

- Batch mode
- Large Surface Area
- High reactivity

Membrane Electrodes

- Flow-through mode
- Large surface area
- Scalable

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Demonstration Results – Timed Tests

Trial #	Sample Description	Initial Total PFAS Concentration (ug/L)*	(PFOA + PFOS) Mass Reduction	Total PFAS Mass Reduction*
1	AFFF concentrate / product	6,380,000	42.7%	60.0%
2	IX-R regenerant waste (brine)	408,590	98.5%	92.9%
3	Remediation derived wastewater-soil washing	13,600	100%	99.2%
4	Spent C6 AFFF solution	4,620	80.5%	83.3%
5	Remediation derived wastewater-ozone fractionation	1,590	98.9%	90.7%
6	Source area groundwater 1	455	100%	99.7%
7	Industrial groundwater	411	100%	99.5%
8	Source area groundwater 2	27.3	98.3%	83.8%

* Based on concentrations of 27 PFAS compounds

Scalability

Model 1.0

Limited scalability

- Small volume, highly concentrated waste stream

(e.g., IX-R still bottom, foam fractionation waste stream)

Model 2.0

Scalable

- Small to large scale
- High concentrations
- Full-scale systems already in place for treating non-PFAS contaminants

03

Field Demonstration

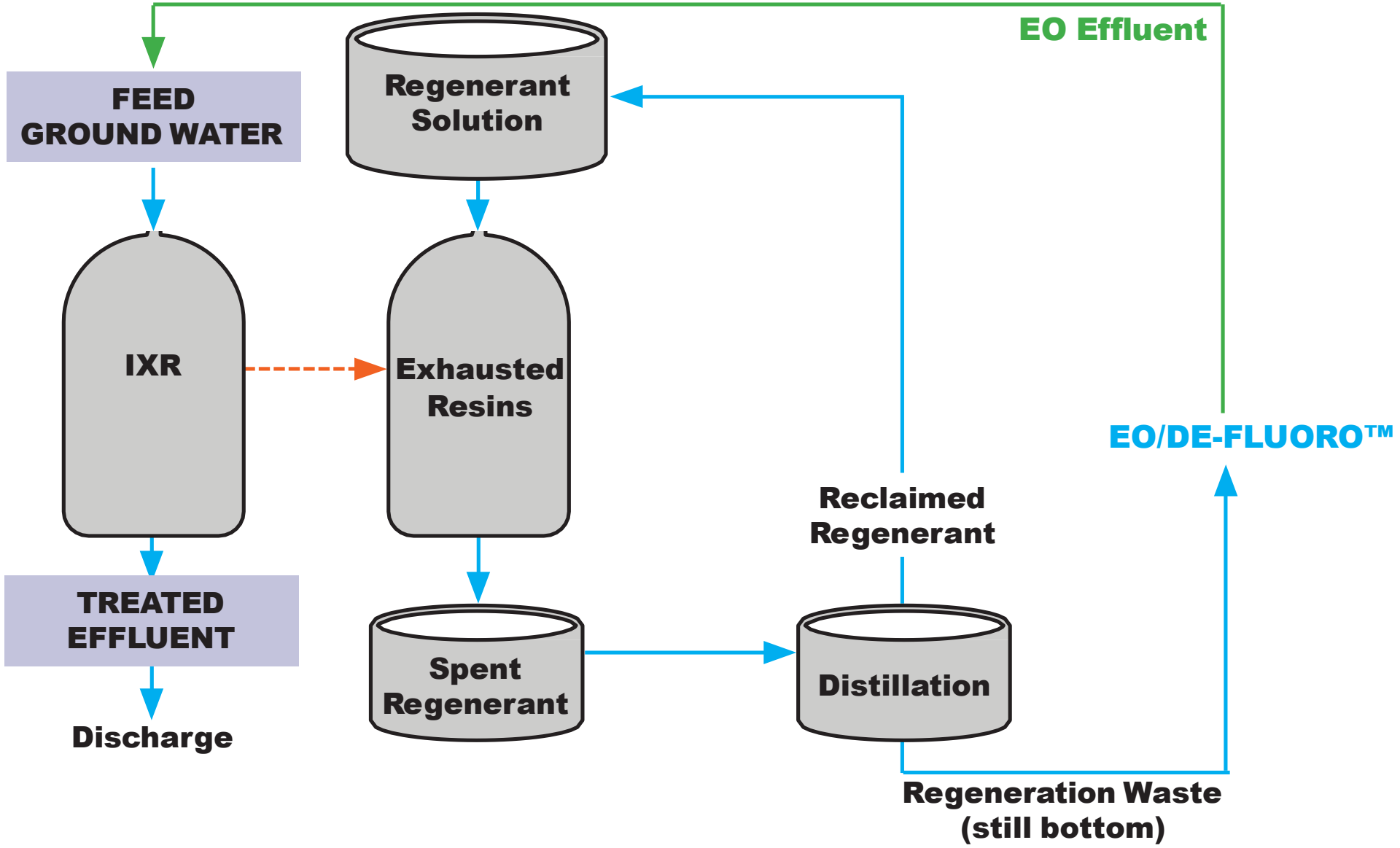
Field Pilot at WPAFB

Two Sites at Wright Patterson Air Force Base

Groundwater contaminated with AFFF

- Sites: Hangar, Fire Training Area (FTA)
- Elevated PFAS concentrations at both sites
- Generate performance data for different water quality

Approach - Coupling Approach of IX-R + EO



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Field Pilot – Operation

- IX-R groundwater treatment flow rate: 2 to 5 gpm
- Designed to treat 7,000 – 15,000 ppt total PFAS
- Treatment goal: PFOS + PFOA < 70 ppt (Hangar) and ND for PFOS (FTA)
- Treated ~500,000 gallons of groundwater over 5 months at two sites

Field Pilot – Separation & Concentration

Feed Groundwater

Ion Exchange Resin Vessels

Discharge

Resin Regeneration and Distillation Equipment

Still Bottom Waste

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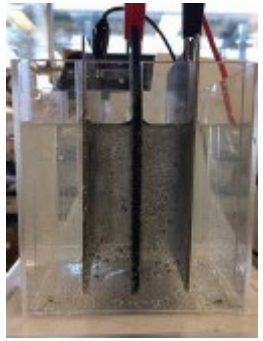
Field Pilot – Destruction

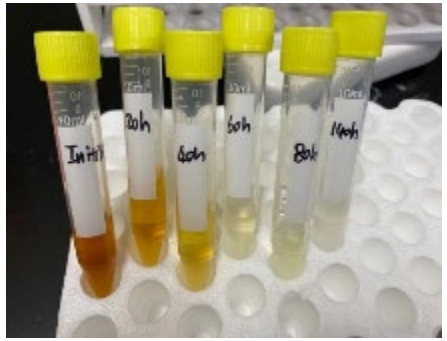
Still Bottom Waste

On-site pilot treatment

Pilot EO Reactor

UGA Bench Treatment





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Key Takeaways

- Our testing has shown that EO can destroy PFAS in multiple types of waste streams with varying water chemistry
- EO can be effective as a stand-alone or coupled treatment technology for PFAS, depending on the treatment scenario
- The EO technology is scalable
- Field pilots and treatability tests are currently being performed with larger pilots near-term
- EO can destroy PFAS on-site; reducing the associated liability of off-site disposal of PFAS-laden wastes

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Imagine it.
Delivered.

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