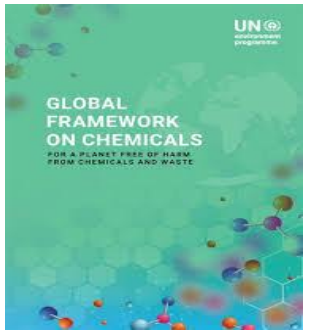
CWFPF ROUNDTABLE MEETING

Forever no More: Advanced Electrochemistry for PFAs Destruction

Goh Yeow Hwee

Sales Manager, Hydroleap Pte Ltd



ADB

gef global environment facility INVESTING IN OUR PLANET

UNIDO

STOCKHOLM CONVENTION

MINAMATA CONVENTION ON MERCURY

Company Introduction

Hydroleap, founded in 2016 in Singapore by Mohammad Sherafatmand, specializes in *chemical-free electrochemical technologies* for industries such as data centers, food production, and pharmaceuticals. Its solutions are designed to lower operational costs, enhance sustainability, and improve water efficiency

R&D Centre

(Singapore HQ)

Office & Factory

(Singapore HQ)

Office & R&D Centre

(Australia)

Company Feature

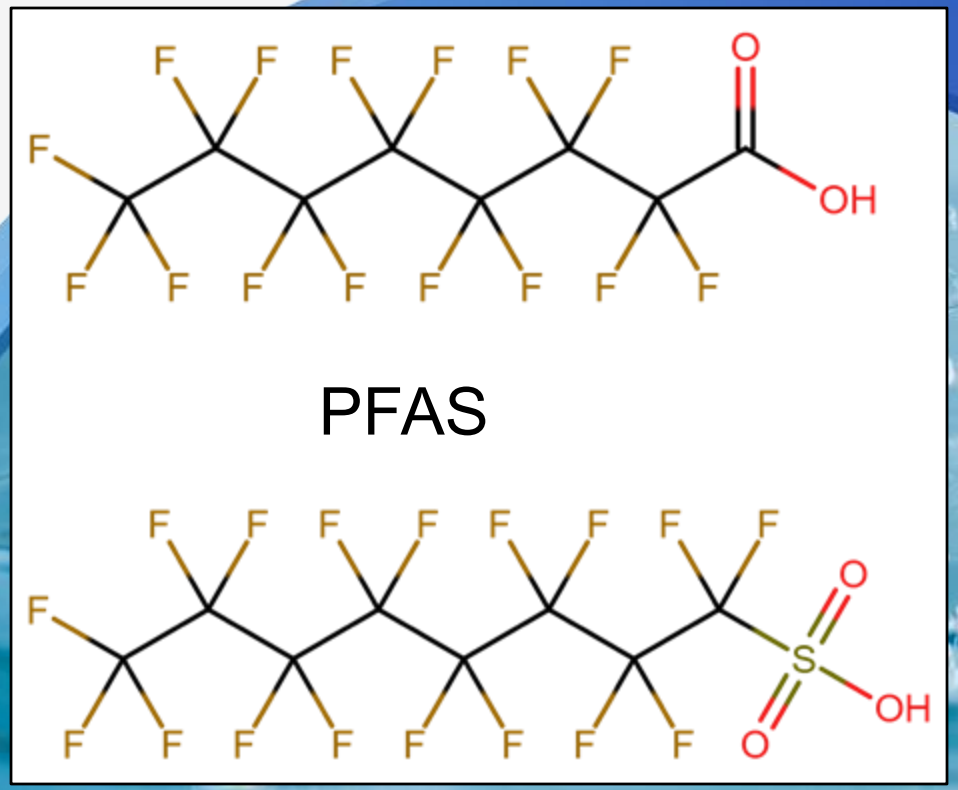
Hydroleap Named an Awardee of the NextGen Tech 30 List 2025 for Innovation in Sustainable Water Treatment in September 2025 by Granite Asia.

Hydroleap

What is PFAS

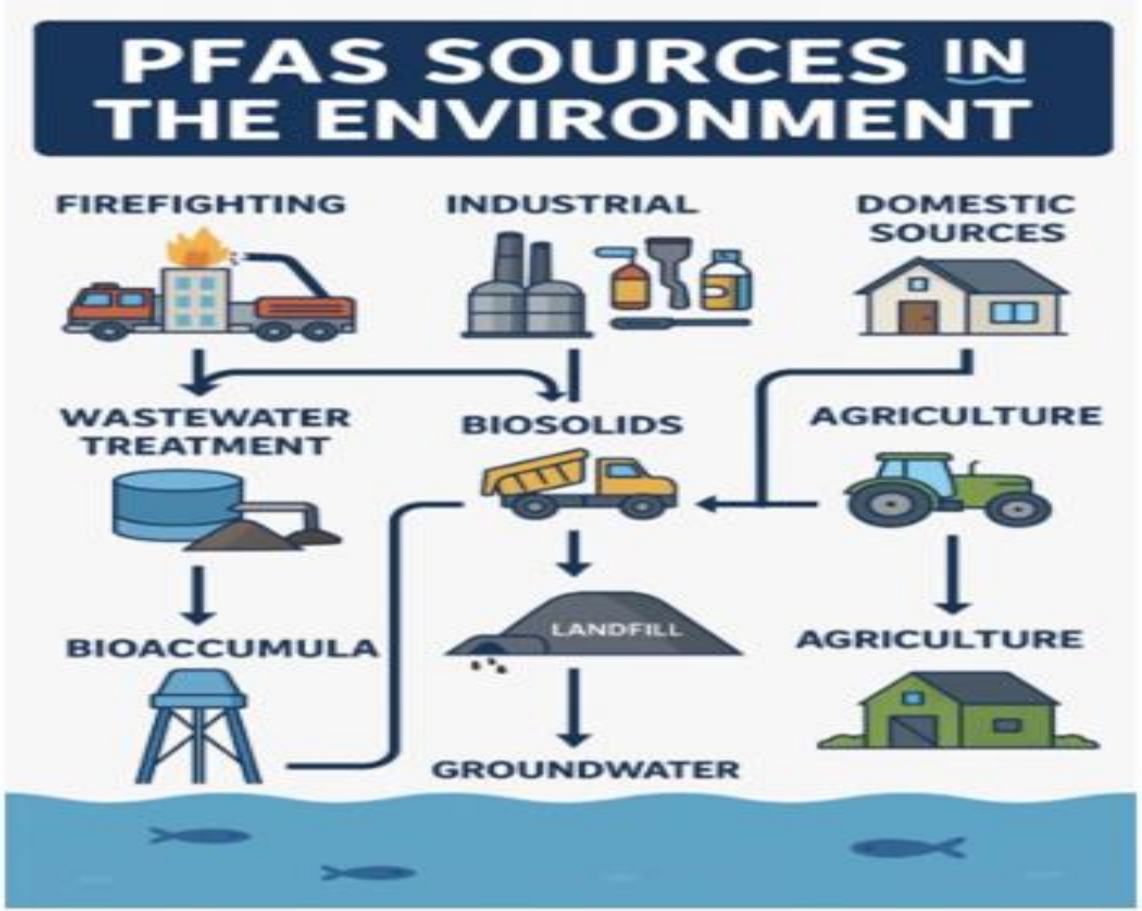
PFAS or Per- and Polyfluoroalkyl Substances

- synthetic chemical
- term “Forever chemicals”
- Found in many products
- **PFOS** (perfluorooctane sulfonic acid) and **PFOA** (perfluorooctanoic acid) are both **subsets of PFAS**.
- Most studied and widely used PFAS compounds, historically found in:
  - PFOS: stain repellents, firefighting foams
  - PFOA: non-stick cookware, waterproof fabrics
- Challenge to break down PFAS



Hydroleap

Where is PFAS



Hydroleap

PFAS Impact On Human Health, Environment & Industrial Manufacturing

Understanding the Impacts

- **Human Health Impact**
  - *Liver toxicity & cancer*: Alters gene expression *Immune suppression*: Weakens vaccine response
  - *Reproductive harm*: Low birth weight, hypertension
  - *Hormonal disruption*: Affects thyroid, testosterone, cholesterol

- **Environmental Impact**
  - *Persistence*: “Forever chemicals” resist breakdown *Bioaccumulation*: Build-up in wildlife and food chains
  - *Water contamination*: Pollutes drinking sources, aquatic life
  - *Soil/Air pollution*: Emitted during production, long-term presence

- **Industrial manufacturing impact**
  - *Semiconductors*: Used in etching; wastewater often exceeds PFAS limits *Electronics & Aerospace*: Found in coatings, gaskets, cables; hard to replace
  - *Packaging*: Common in wrappers, containers, non-stick layers; phase-out underway
  - *Regulatory pressure*: EPA & global bodies enforcing phase-outs; compliance by 2029; rising costs

Hydroleap

PFAS: The Global and Local Challenge

Understanding the urgency and regulatory momentum

Global Challenges

- PFAS are persistent, bioaccumulative, and toxic—known as “forever chemicals”
- Found in water, soil, food, and human bloodstreams
- Over 14,000 compounds identified; few are regulated
- Slow in enforcement: US EPA now enforce 4ppt in drinking water.
- EU moving towards near total ban under REACH.
- Stockholm Convention targets PFOS, PFOA, PFHxS for elimination

Singapore Context

- PFAS detected in seafood and drinking water (PUB monitoring since 2016)
- NEA regulates PFOS, PFOA, PFHxS under EPMA
- Firefighting foam phase-out by 2026. replace with fluorine free formulation
- SFA to align WHO guidance for drinking water standards

Hydroleap

PFAS Regulation in APAC Countries (2025 Overview)

Regional PFAS Trends

- **Australia**: Revised national plan restricts PFAS in drinking water, industrial discharge; targets phase-out in consumer goods
- **Japan**: PFAS designated under CSCA as Class I Specified Chemical; broader inclusion under review
- **China**: PFOA listed as priority chemical; national plan focuses on industrial discharge, product safety, and environmental monitoring
- **South Korea** included PFAS as hazardous substance in K-REACH) and align with EU REACH and OECD guidelines

Hydroleap

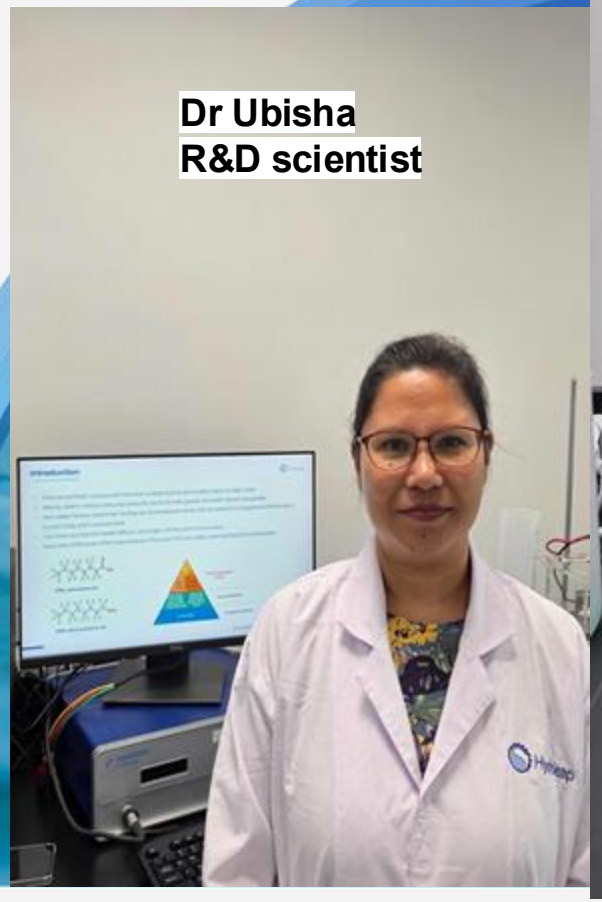
PFAS Treatment Technologies

Chemical (Fenton)	**Granulated Activated Carbon (GAC)**	**Reverse Osmosis, Ion Exchange**	**Electro Oxidation**
hydrogen peroxide,, ferric chloride, ferric sulphate used	No chemical used	Anti-scalant and cleaning chemicals used	No chemical used
Power consumption low	Medium	High	High
Secondary waste • sludge	Secondary waste • Backwash water • Exhausted carbon reused after incineration	Secondary waste • Brine generated • Exhausted membrane and IX resin	Complete destruction with little sludge
high carbon footprint, limited scalability	high, scalable	high, complex scalability	low, scalable by module

Hydroleap

Innovative PFAS Treatment: Hydroleap's Electro-Oxidation Technology

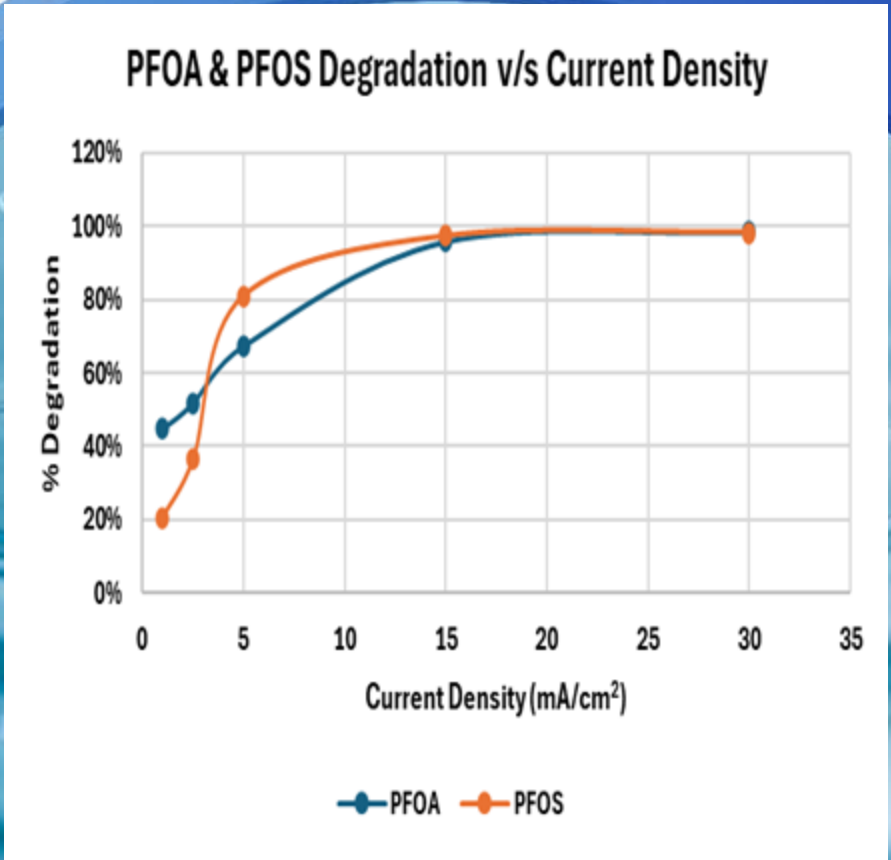
- Hydroleap approach is to concentrate and destroy
- Prefer PFAS concentration in ppb or ppm level
- This is more efficient and cost effective
- Lab trials from April 2025, treatability test
- Pilot from January 2026
- Uses Special coated Anode for better degradation
- Generates hydroxyl radicals for PFAS mineralization
- Mobile-ready, low chemical input, scalable for industrial wastewater



Hydroleap

Innovative PFAS Treatment: Hydroleap's Electro-Oxidation Technology (Update)

- Both PFOA and PFOS can be degraded up to 98%
- Current density and Treatment time are two of the important parameters to achieve efficient degradation
- Effect of different electrodes and wastewater is studied
- Comparing EDR, EO-IEM and RO/NF for concentration step is in progress
- Optimization for lowering the total energy consumption



Thank you!

Explore sustainable, chemical-free Electrochemistry with us.

www.hydroleap.com

yh.goh@hydroleap.com