

IF WE DRINK THROUGH
OUR COVID MASKS,
MAYBE IT WILL
FILTER-OUT THE
CARCINOGENS?

WARNING
EXCESSIVE PFAS
IN GROUNDWATER



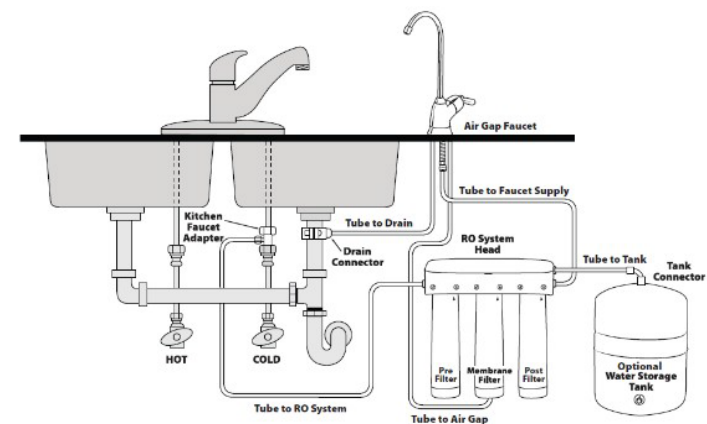


Final Barrier Solutions to PFAS in Drinking Water

Presented at the 2024 Emerging Water Technology Symposium

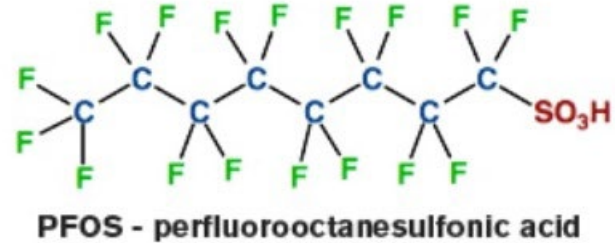
Eric Yeggy, Technical Affairs Director

Water Quality Association



Two PFAS: PFOA and PFOS

These are the two “per- and poly-fluoroalkyl substances”, or PFAS, that we know the most about:



Both were voluntarily phased out of production in the U.S. by 2015, but they can still be imported.

Where do PFAS come from?

Sources include:

- *Non-stick Coatings*
- *Fire fighting foams*
- *Packaging*
- *Clothing*
- *Carpet*
- *Biosolids*
- *And many others...*



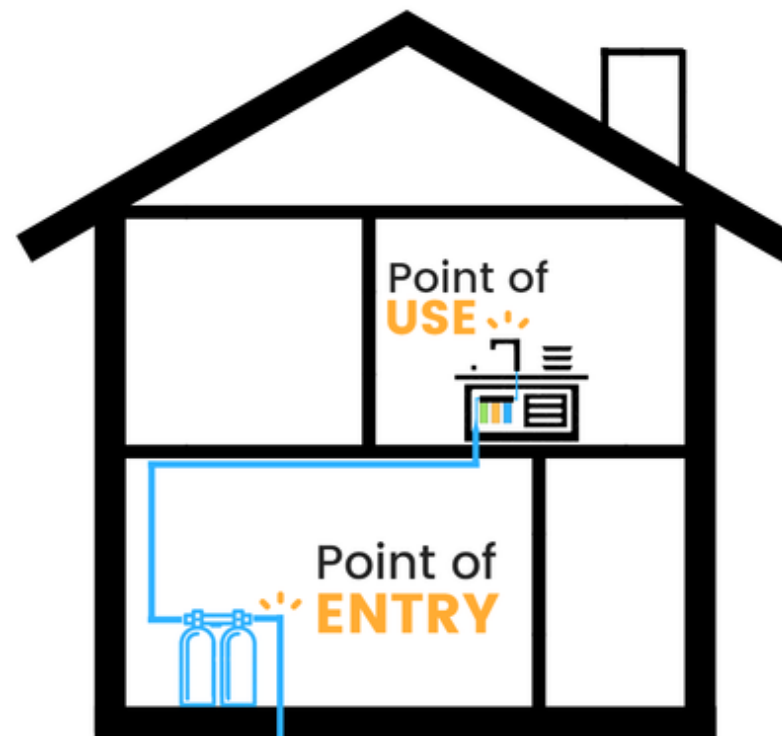
Final Barrier Treatment

Point of Use (POU)

- Units used to treat the drinking/cooking water at a single tap or multiple taps

Point of Entry (POE)

- Units used to treat the water supply at the entry of a building or home for drinking, cooking, dishwashing, bathing, toilets, and other uses



Source: Aquaspace Water Systems

Final Barrier Treatment

POU

- Pitcher filters
- Countertop filters
- Faucet-attached devices
- Under-the-sink filters
- Refrigerator filters
- Reverse osmosis systems

POE

- Anion exchange
- Whole-house filtration



A Note About Water Usage and ROI

Total of 322 Bgal/d of water withdrawals – 2015 USGS

- 90% for thermoelectric power, irrigation & public supply
- 41% Thermoelectric power withdrawals
- 37% Irrigation withdrawals
- 12% Public Supply withdrawals
 - Of this 12% only 1-2% is used for drinking or cooking
 - Majority of INDOOR water used to flush the toilet, and after that, to take showers and baths
 - Significant portion of total water used for home OUTDOOR use
- 3% Withdrawals for livestock and aquaculture

Focusing on treatment of the 1-2% of water that is actually used for drinking reduces the quantity of PFAS laden waste you have to deal with.

<https://pubs.usgs.gov/fs/2018/3035/fs20183035.pdf>

POU/POE
technologies
which have
been widely
tested for
PFAS removal

Reverse Osmosis (RO)



Carbon Filtration



Anion Exchange



These systems are available in a variety of configurations, with various options, and there are advantages unique to each technology

Reverse Osmosis

- The first POU products certified to remove PFAS through a Minnesota Department of Public Health study in 2008;

- ✓ Highly effective – generally not impacted by chain length
- ✓ RO can remove a wide variety of contaminants
- ✓ Membranes can last a very long time

- Certification for removal of PFAS compounds will be listed under NSF/ANSI 58
- Prefilter must be changed out to protect the membrane
- Post filter for polishing and taste
- Air-gap design to prevent backflow
- Need to avoid metal pipe, fittings and faucets containing lead downstream
 - ❖ Typically installed at the POU, with plastic tubing that leads to a separate non-leaded air-gap faucet



Carbon Filtration

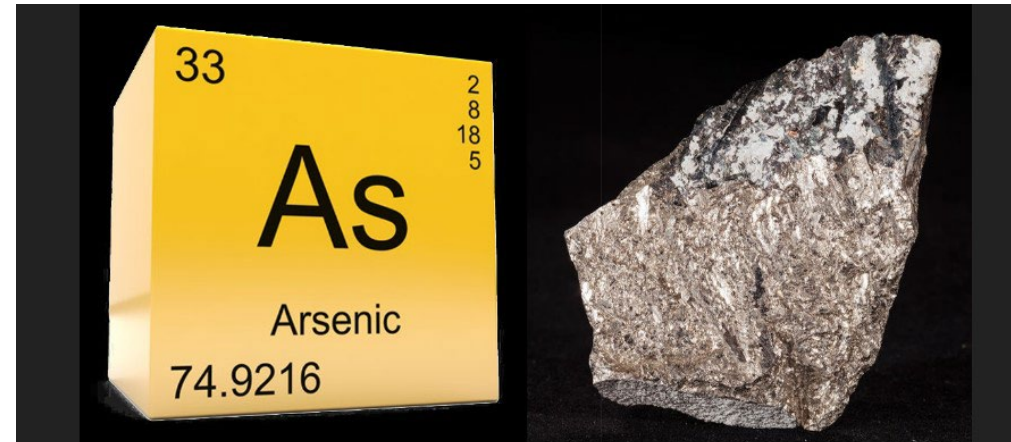


- Carbon manufacturers have developed formulations that target PFAS removal
 - ✓ Well understood, proven technology
 - ✓ Can be used at POU or POE
 - ✓ POU systems are widely available with certified performance indicators that tell the consumer when it is time to change the filter
- Certification for removal of PFAS compounds will be listed under NSF/ANSI 53
- If installed at the POE, the carbon will also remove residual disinfectant



Non-certified carbon can contain arsenic

- These standard certifications ensure that the carbon has been tested for arsenic:
 - ✓ NSF/ANSI 42 (aesthetic claims)
 - ✓ NSF/ANSI 53 (contaminants that impact human health)
 - ✓ NSF/ANSI 61 (material safety only for larger systems and components, including certified media)



What should I do if I find a certified carbon filtration product that leaches arsenic?

1. Check the product literature to see if there are any flushing or conditioning steps needed;
 2. Inform the manufacturer;
 3. Also inform the Certification Body!
- The Certification Body is performing regular audits at the production facility
 - Every accredited Certification Body is required to have Corrective Action procedures in place to deal with situations like this and ensure ongoing compliance

Certification Bodies

- Canadian Standards Association (CSA)
 - <https://www.csagroup.org>
- International Association of Plumbing and Mechanical Officials (IAPMO)
 - <http://www.iapmo.org/>
- NSF International
 - <http://www.nsf.org/>
- Truesdail Laboratories
 - <https://www.truesdail.com/>
- Underwriter Laboratories (UL)
 - <https://www.ul.com/>
- Water Quality Association (WQA)
 - <https://www.wqa.org>



Anion Exchange

- PFAS becomes an anion in water, and is easily removed with anion exchange
 - ✓ Very fast kinetics
 - ✓ Larger systems, generally installed at the POE
 - ✓ Tank-exchange service
- Pre-treatment used to protect ion exchange media from any residual disinfectant
- Because of the high capacity and flow rates, these systems are generally certified under NSF/ANSI 61 for material safety only
- Test data on PFAS removal is often available through the manufacturer

Anion Exchange & Corrosion

- Increased risk for corrosion occurs at startup of a PFAS-selective resin that starts with the resin being in the chloride form.

Sulfate



Alkalinity



Chloride

Ask the manufacturer if they offer a “buffered version of the resin” to avoid the short-term corrosion concerns at startup

Look for
Certified
Products or
Ask for Test Data

- Not all RO systems, carbon filters and anion exchange resins will remove PFAS
 - You can find RO systems and carbon filters which have been certified by IAPMO, NSF and WQA to remove PFAS
 - Some anion exchange resins and various carbon products have been independently tested for removal of PFAS through the Water Research Foundation (WRF)

NSF Standards vs the EPA PFAS Rule

	2021 NSF/ANSI Standards		2022 NSF/ANSI Standards			Final EPA Rule		
	Influent	Total PFAS criteria	Influent	Total PFAS criteria	Individual PFAS criteria	Final MCLG	Final MCL	Mixtures containing two or more of PFHxS, PFNA, HFPO-DA, and PFBS
PFOA	1000 ppt	Total PFAS <70 ppt	1000 ppt	Total PFAS <20 ppt	<20 ppt	Zero	4 ppt	
PFOS	500 ppt		500 ppt		<20 ppt	Zero	4 ppt	
PFHpA			40 ppt		<20 ppt			
PFHxS			300 ppt		<20 ppt	10 ppt	10 ppt	HI <1 (denominator 10)
PFBS			260 ppt					HI <1 (denominator 2000)
PFDA			10 ppt					
PFNA			50 ppt		<6 ppt	10 ppt	10 ppt	HI <1 (denominator 10)
HFPO-DA (GenX)							10 ppt	10 ppt

2022 NSF Standards Challenge Water

Filters (NSF/ANSI 53)

- Sulfate 200 mg/L +/-20%
- Chloride 100 mg/L +/-20%
- Alkalinity 200 mg/L +/-20%
- pH 7.5 +/-0.5
- Temperature 20 °C +/-2.5
- Turbidity < 1 NTU

RO (NSF/ANSI 58)

- TDS 200 – 500 mg/L
- pH 7.5 +/-0.5
- Temperature 25 °C +/-1
- Turbidity \leq 1 NTU

Strategies that help with Maintenance

- Look for systems with a Performance Indicating Device (PID) that provides a warning when it is time for maintenance;
- Consider IoT options that will send you a message when maintenance is needed;
- In warm climates consider installing systems in secure boxes that allow maintenance access from outside the home (like your cable box is installed outside for easy access by the maintenance technician).



Bring in a Water Treatment Professional

- *If you would like to know more about the treatment solutions, WQA provides education and professional certification on how to correctly design, configure and install all of these technologies*
- *Or we can link you to a trained or certified water treatment professional in your area*



Need Technical Assistance with POU/POE solutions?



Contact Eric Yeggy (eyeggy@wqa.org) or Bryanna Poczatek (bpoczatek@wqa.org) in the Technical Affairs Department of the Water Quality Association.

Technical Assistance is free to public officials, public health organizations and NGOs. WQA does not sell any products, and we cannot recommend specific brands or models. We can provide general information about technologies, proper use, maintenance, limitations and product certifications.