NEWMOA PFAS Webinar Series – 4/27/2021

State Efforts to Address PFAS in AFFF: Fluorine-Free Foam (F3) Evaluation

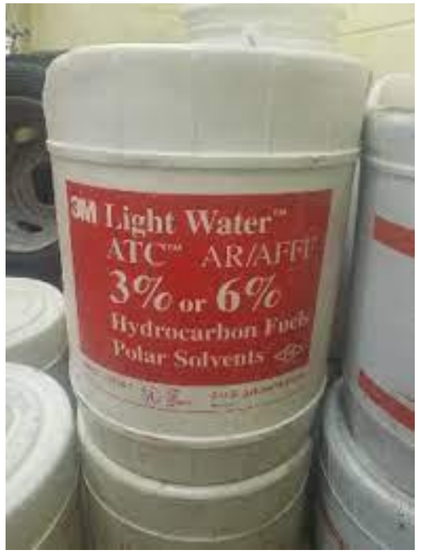
Speakers: Nick Child, MA DEP, retired, and Shannon Pociu, CT DEEP Remediation Division

BACKGROUND

Both CT and MA recognize:

- AFFF contains PFAS
- PFAS releases to the environment should be avoided
- Fire Departments need to extinguish flammable liquid fires to save lives and property

- Need for an environmentally friendly(er) alternative to AFFF for emergency service to use



CT Next Generation Foam Committee

Convened March 2019 by the CT Dept. of Emergency Services & Public Protection's Commission on Fire Protection & Control

- **Objective: Identify a fluorine-free, environmentally friendly replacement for AFFF used in CT's regional foam trailers**

- **Members**
  - CT DESPP, State Fire Administrator
  - CT DEEP, Emergency Response Unit and Remediation Division
  - CT municipal fire department leaders
  - Petroleum terminal representative
  - Expanded to include representatives of MassDEP, RI DEM, and ME DEP who wished to observe

Fluorine-Free Foam (F3) Evaluation

- Invited vendors of several "fluorine-free" fire-fighting products to speak to the group, answer questions, and in some cases perform a live fire demonstration.
- Reviewed GreenScreen™ (2018) list of certified foams
- Consulted with LASTFire representative

- Replacement foam requirements:
  - Effective on both polar and nonpolar flammable liquids
  - Meet NFPA 11 – Standard for Low-, Medium-, and High-Expansion Foams
  - Meet UL-162 GRGV
  - Foam trailer equipment compatibility (aeration nozzles)
  - Favorable laboratory report – Fluorine-free + no regrettable substitutions

Fluorine-Free Foam (F3) Evaluation

Laboratory Parameters Tested

- Products tested were purchased by CT DEEP and analyzed by MA DEP at Alpha Analytical and subcontracted labs (Harvard Univ. and Sterling Analytical).
- PFAS – List of 24 compounds Modified EPA 537 using isotope dilution
- Total Oxidizable Precursor (TOP) assay – 18 PFAS
- Semi-volatile Organic Compounds (SVOCs) – EPA 8270D (limited analysis)
- Inorganic Halides by Ion Chromatography (Fluorine/Chlorine/Bromine) (Harvard)
- Total Halogens by Combustion Ion Chromatography (Fluorine/Chlorine/Bromine) (Harvard)
- Total Organic Halogens – EPA 9076 or Extractable Organic Halides – EPA 9023 (Sterling)
- Cost: $3,500 per sample run

List of AFFF Alternatives Tested to Date

Round 1

- National Foam, Universal Green AR
- PhosChek Fluorine-Fee
- FireStopper XL Plus FFC (*meets MilSpec – confirmed it contained PFAS)

Round 2

- F-500
- Novacool
- Knockdown

	Alpha Labs PFAS by Isotope Dilution	Alpha Labs Total Oxidizable Precursor (TOP) Assay (Pre-Treatment)	Alpha Labs TOP Assay (Post-Treatment)	Alpha Labs Semivolatile Organics by GC/MS (EPA 8270)	Harvard U. Inorganic halides by ion chromatography	Harvard U. Total halogens by combustion ion chromatography	Sterling Analytical Total organic halogens/ extractable halides (DL: 50 ppm)
Universal Green AR	Non-detect	Non-detect	Non-detect	Non-detect	Non-detect	Non-detect	Non-detect (NOTE: SW-846 Method 9076, Total organic halogens)
PhosChek Fluorine Free	Non-detect	Non-detect	Non-detect	Non-detect	Non-detect	Cl	Non-detect (NOTE: SW-846 Method 9076, Total organic halogens)
NovaCool	PFHxDA (J)	Non-detect	PFBA PFPeA (J) PFHxA (J)	Not analyzed	Fl, Cl	Non-detect (Cl not quantified)**	Non-detect (NOTE: SW-846 Method 9076, Total organic halogens)
Knockdown	PFHxA (J)* - det in field blank	PFHxA (J)*- det in method blank	PFBA (J)* - det in method blank PFHxA (J)* - det in method blank PFHpA (J)	Not analyzed	Cl**	Non-detect	Non-detect (NOTE: SW-846 Method 9023, Extractable organic halides)
F-500	PFHxA (J)* - det in field and method blank	PFHxA (J)*	PFBA (J)* - det in method blank PFPeA (J) PFHxA (J)* - det in field/method blank PFHpA (J)	Not analyzed	Non-detect	Non-detect	Non-detect (NOTE: SW-846 Method 9023, Extractable organic halides)
Firestopper XL Plus FFC	PFBA, PFPeA, 4:2 FTS, PFHxA, 8:2 FTS, 6:2 FTS (dupe), 10:2 FTS	PFBA, 6:2 FTS PFHxA	Non-detect*** Reporting limits very high	Non-detect	Cl**	Fl, Cl	Non-detect (NOTE: SW-846 Method 9076, Total organic halogens)

*Also found with J value in field and/or method blank analysis

**Also found in temperature blank at similar concentration.

Note 1 - "J values" are above the detection limit but below the reporting limit for the analysis. This means that there is high degree of certainty that PFAS are present in the sample but the quantitative concentration values are uncertain.

Note 2 - Knock Down and Fire Stopper had detects of Chlorine in the Harvard Concentration of inorganic halides. Since similar results were detected in the temperature blank, the result is likely to be a false possitive.

MassDEP AFFF Take-Back Program

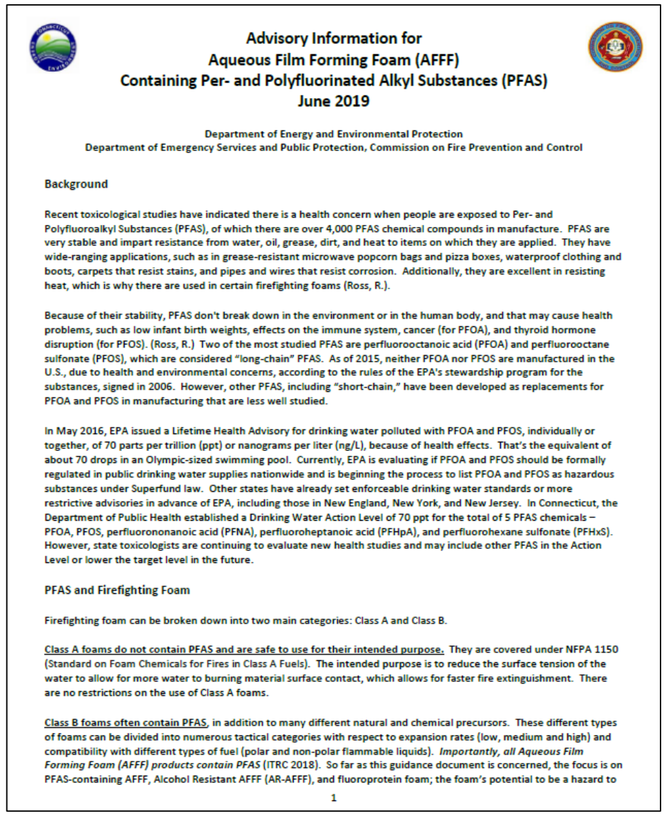
Focused on Legacy Foam

- **Purpose:** remove all pre 2003 “Legacy Foams”.
- **Framework:** “Take Back”, not “Buy Back”.
- **Program run**: August 2018 – ???
- **Partnership** with Mass Fire Marshal’s office.
- **Disposal to date:** 100,000+ lbs / 25,000 gallon of concentrate
- **Cost to date:** $213k (FY-19 $125k / FY-20 $55k / FY-21 33k)
- **Challenges:** Decontamination & Disposal

CT DEEP AFFF Take-Back Program

Kick-off 2021

- Purpose – **Collect and dispose of <u>all</u> AFFF stock** (est. 40,000 gallons) from state and municipal fire services
- Completed: **Laboratory testing of fluorine-free alternatives**
  - PFAS-free foam for regional foam trailers selected by DESPP with DEEP input – February 5, 2021
- Phases and **anticipated program schedule**
  - Container collection and storage/disposal: Spring-summer 2021
  - Decontamination pilot study: Spring-summer 2021
  - Remove AFFF from and decontaminate apparatus: Fall 2021
- **Challenges:** Decontamination, disposal/destruction methods



Advisory Information for
Aqueous Film Forming Foam (AFFF)
Containing Per- and Polyfluorinated Alkyl Substances (PFAS)
June 2019

Department of Energy and Environmental Protection
Department of Emergency Services and Public Protection, Commission on Fire Prevention and Control

Background

Recent toxicological studies have indicated there is a health concern when people are exposed to Per- and Polyfluoroalkyl Substances (PFAS), of which there are over 4,000 PFAS chemical compounds in manufacture. PFAS are very stable and impart resistance from water, oil, grease, dirt, and heat to items on which they are applied. They have wide-ranging applications, such as in grease-resistant microwave popcorn bags and pizza boxes, waterproof clothing and boots, carpets that resist stains, and pipes and wires that resist corrosion. Additionally, they are excellent in resisting heat, which is why there are used in certain firefighting foams (Ross, R.).

Because of their stability, PFAS don't break down in the environment or in the human body, and that may cause health problems, such as low infant birth weights, effects on the immune system, cancer (for PFOA), and thyroid hormone disruption (for PFOS). (Ross, R.) Two of the most studied PFAS are perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS), which are considered "long-chain" PFAS. As of 2015, neither PFOA nor PFOS are manufactured in the U.S., due to health and environmental concerns, according to the rules of the EPA's stewardship program for the substances, signed in 2006. However, other PFAS, including "short-chain," have been developed as replacements for PFOA and PFOS in manufacturing that are less well studied.

In May 2016, EPA issued a Lifetime Health Advisory for drinking water polluted with PFOA and PFOS, individually or together, of 70 parts per trillion (ppt) or nanograms per liter (ng/L), because of health effects. That's the equivalent of about 70 drops in an Olympic-sized swimming pool. Currently, EPA is evaluating if PFOA and PFOS should be formally regulated in public drinking water supplies nationwide and is beginning the process to list PFOA and PFOS as hazardous substances under Superfund law. Other states have already set enforceable drinking water standards or more restrictive advisories in advance of EPA, including those in New England, New York, and New Jersey. In Connecticut, the Department of Public Health established a Drinking Water Action Level of 70 ppt for the total of 5 PFAS chemicals – PFOA, PFOS, perfluorononanoic acid (PFNA), perfluoroheptanoic acid (PFHpA), and perfluorohexane sulfonate (PFHxS). However, state toxicologists are continuing to evaluate new health studies and may include other PFAS in the Action Level or lower the target level in the future.

PFAS and Firefighting Foam

Firefighting foam can be broken down into two main categories: Class A and Class B.

<u>Class A foams do not contain PFAS and are safe to use for their intended purpose.</u> They are covered under NFPA 1150 (Standard on Foam Chemicals for Fires in Class A Fuels). The intended purpose is to reduce the surface tension of the water to allow for more water to burning material surface contact, which allows for faster fire extinguishment. There are no restrictions on the use of Class A foams.

<u>Class B foams often contain PFAS</u>, in addition to many different natural and chemical precursors. These different types of foams can be divided into numerous tactical categories with respect to expansion rates (low, medium and high) and compatibility with different types of fuel (polar and non-polar flammable liquids). ***Importantly, all Aqueous Film Forming Foam (AFFF) products contain PFAS*** (ITRC 2018). So far as this guidance document is concerned, the focus is on PFAS-containing AFFF, Alcohol Resistant AFFF (AR-AFFF), and fluoroprotein foam; the foam's potential to be a hazard to

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[Link to Advisory Information]

MassDEP AFFF Take-Back Program

Next Phase – Decontamination

- Current BMP is triple rinse with water and dispose with foam.
- Anecdotal data that residual PFAS may bleed out of container / piping (fire engine foam tank, regional foam trailer, etc.) and contaminate new foam
- Benchtop decontamination experiment with sampled legacy foams
  - ❖ Ethanol / Glycol solutions
  - ❖ Other solutions?

Conclusions

- F3 vast improvement over legacy and modern AFFF
- Documenting (maybe sampling) foam used per incident
- High detection limits are a problem when compared to very low drinking water standards (compare ppb to ppt)
- Confounding sources for PFAS / Cl / Fl
- More data needed

QUESTIONS?

CT DEEP PFAS Webpage

MassDEP PFAS Webpage

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