



# Migration of Firefighting Foams to Fluorine-free Alternatives

## How does this affect your company?

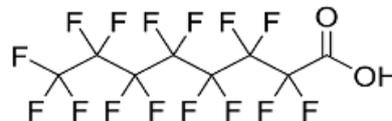
In response to growing concerns over the **environmental and health impacts** of PFAS chemicals, environmental agencies and legislative bodies have been moving towards **stricter regulations on the use of various types of PFAS containing products**, also leading to a **phased ban on AFFF**.

Many of our customers are following the lead with stringent rules where they operate and have already begun to convert their AFFF systems & equipment to SFFF or water-only systems & equipment. It is highly advised, that companies start the planning of the conversion as soon as possible and check with local regulations to comply with mandatory timelines.

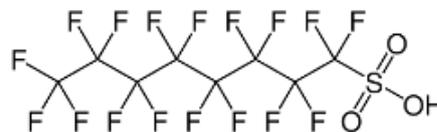
## What are PFAS?

PFAS is an abbreviation for per- and polyfluorinated alkyl substances. This is a group of at least 4,700 chemical substances according to the EU. They raise health and environmental concerns because **they are very persistent, can accumulate in organisms and can be toxic**. PFAS are often called "Forever Chemicals" because they hardly degrade in the natural environment. They are manufactured industrially, among the best-known substances of this group are:

### PFOS\* (perfluorooctane sulfonic acid)



### PFOA\*(perfluorooctanoic acid)



## Why is PFAS in firefighting foams concerning ?

Aqueous Film Forming Foam (AFFF) is the most effective and versatile foam ever developed. Film Forming Fluoroprotein (FFFP) is considered to be equivalent to AFFF. Both agents are PFAS and contain fluorine, which gives the foam **excellent fuel repellent properties** and also allows for the formation of a film that **seals the vapors**. On polar solvents, AFFF has an additive that forms a polymeric membrane on the surface of the fuel.

AFFF was initially developed by the US Navy and 3M for use on aircraft carriers. It quickly became the primary foam used on **ignitable liquids hazards** and the standard firefighting foam for most fire brigades worldwide.

\*This very long bond structure, which makes them so resistive

## What is the difference between AFFF and SFFF?

The main difference between AFFF and Synthetic Fluorine Free Foam (SFFF) is the type of surfactants used in their formulation. AFFF contains fluorinated **surfactants**, which are chemicals that are effective in extinguishing fires involving flammable liquids.

SFFF, on the other hand, **does not contain fluorinated surfactants and instead uses surfactants** that are derived from natural sources, such as plant extracts. While SFFF is still effective in extinguishing fires involving flammable liquids, **it may not be as effective as AFFF in certain situations or under specific conditions.**

Another key difference between AFFF and SFFF is their environmental impact. AFFF contains chemicals that can be harmful to the environment. SFFF is considered to be more environmentally friendly as it does not contain fluorinated surfactants.

## Challenges on the conversion from AFFF to SFFF

- Re-design might be required,
- Higher viscosity may require replacement of suction piping of foam concentrate,
- When higher application rate is required :
  - Flow rate and volume of foam concentrate change (new pump and foam storage),
  - New protection piping and discharge device,
- Contamination of piping/equipment :
  - What is the level of fluorine contamination which be accepted in an existing system ?

## About Tokio Marine HCC

- TMHCC forbid the installation of new AFFF systems. Past recommendations for AFFF that have not been implement should be discussed
- For existing AFFF system a discussion should be done with the current **maintenance provider** about replacement strategy.
- SFFFs or other water additive should be the last choice. (This is because of the possibility of future issues with the replacements could be found. The industry has already experienced this with Halon replacements).
  - When this option is chosen we need to be sure that the replacement is suitable for closed head sprinklers when we intend to use it that way.
  - For polar solvents, only some solvents are specifically listed or approved. Other products need to be evaluated either by test or the manufacturer. This is rapidly evolving as the SFFFs continue to be improved.
  - Always look for SFFF foam listed by FM or UL
- The best choices are water only designs (These are also the most expensive because water only will often require drainage and significant increased densities).
- For some spaces, a hybrid system of nitrogen and ultra fine water mist could be effective.
- For manual applications through hose streams and monitors, a general listing will be acceptable. Besides UL, LASTFIRE, EN 1568 is acceptable.

### References

- FMDS 4-6 : Hybrid (water and inert gas) extinguishing systems
- FMDS 7-32 : Ignitable Liquid Operations
- FMDS 7-29 : Ignitable liquid storage in portable containers
- EU Directive 2006/122 PFOS
- EU Directive 2017/1000 on PFOA
- EU Directive 2024/2462 on PFHxA

## Contact us

To obtain copies of the Tokio Marine HCC PFAS- Migration of firefighting foams to fluorine-free alternatives please contact your local Tokio Marine HCC office or contact:

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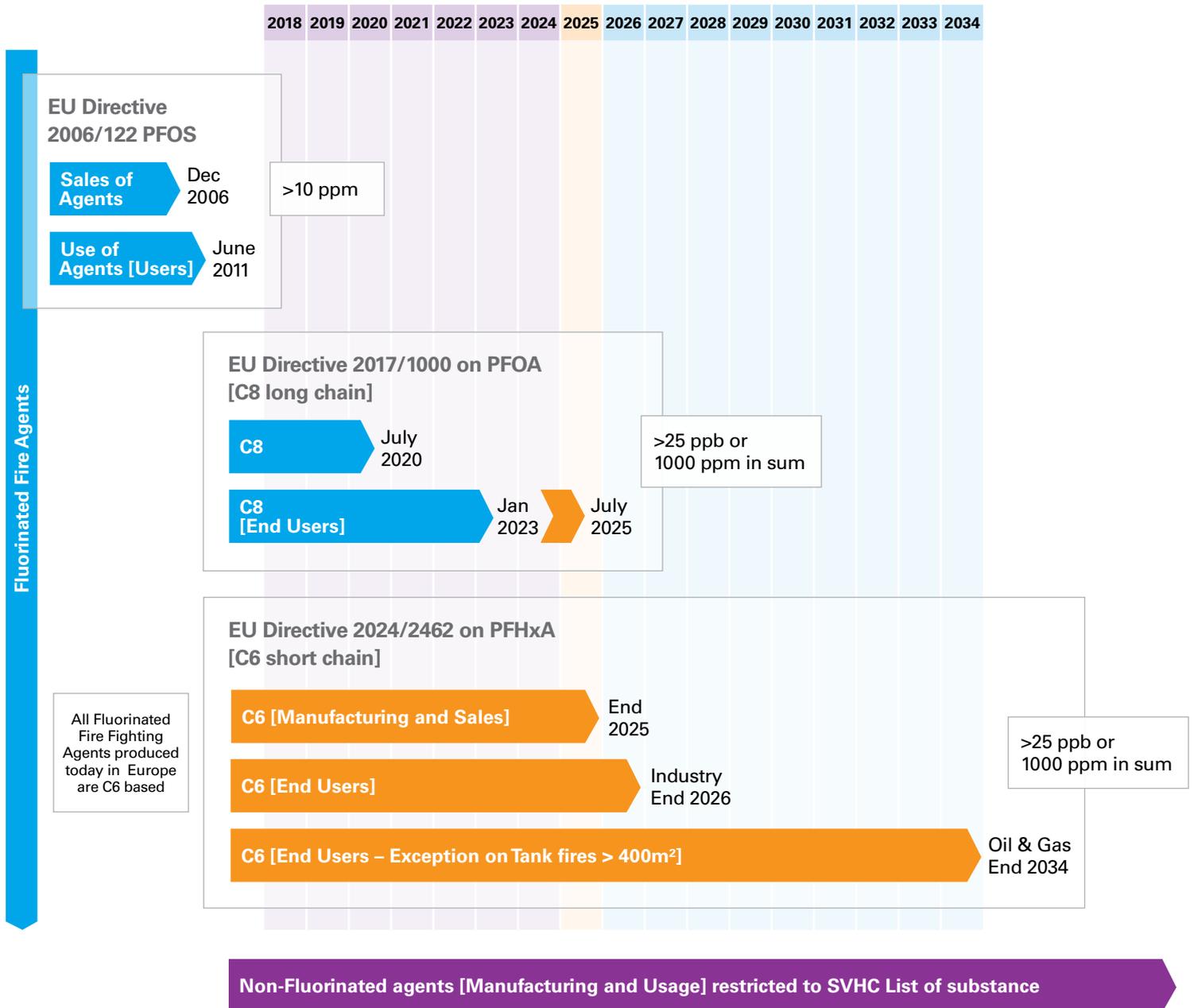
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## Appendix : PFAS Timeline Ban

### EU Regulation



**Note:** This document is not aimed to provide legal advice. Please refer to published EU directives obligations.

**C8=** Molecule with an 8-atom carbon chain  
**C6 =** Molecule with an 6-atom carbon chain

