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Position Paper

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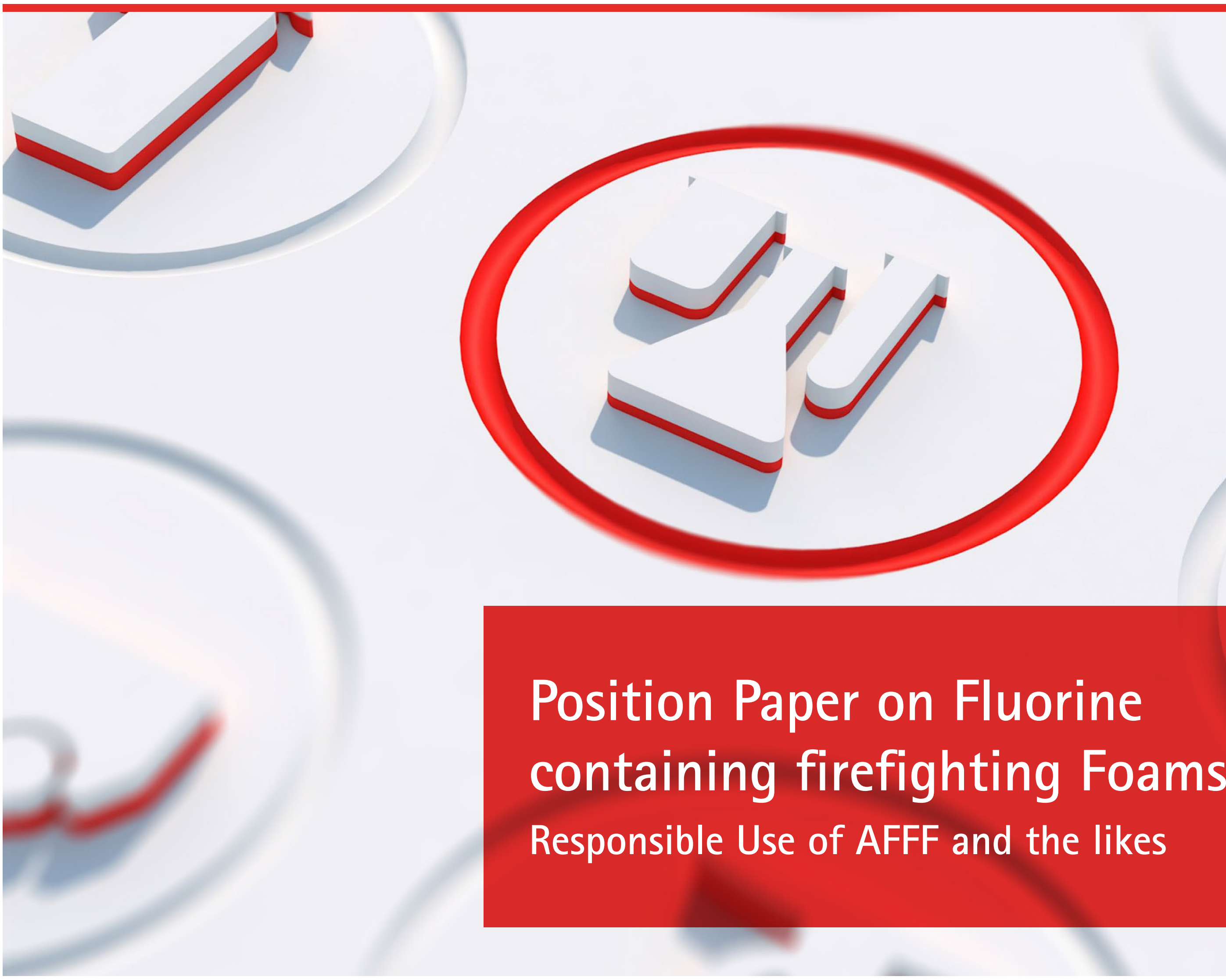
Fire Fighting Agents



Position Paper on Fluorine containing firefighting Foams

Responsible Use of AFFF and the likes

Eurofeu Secretariat General
Koellikerstraße 13
97070 Würzburg

GERMANY

www.eurofeu.org

1 Executive Summary

Any release of a persistent and/or harmful chemical into the environment is generally not acceptable and every possible measures should be taken to reduce or fully avoid these releases. Exempts from this rule should be limited to cases where avoiding the persistent chemical would result in even larger and/or more serious contamination of the environment or fatalities.

Even then exempts should be temporary and only accepted if being accompanied by a serious search for non-persistent alternatives. EUROFEU fully supports all initiatives to replace persistent chemicals in firefighting agents by non-persistent ones. Guidelines are given to develop an informed and sound decision on what foam type is required for a certain risk scenario.

2 Foreword

So called Per- and/or polyfluorinated chemicals[1] (PFAS) have been and still are widely used in numerous applications in our daily lives. These chemicals share as a common property a chain of completely or partly fluorinated carbons which is responsible for the unique chemical and physical properties these chemicals bring to the table.

The range of applications using PFAS covers packing and wrapping materials, textile coatings, printer inks, leather impregnation, safety clothing (bunker gears, hazmat suits, biohazard suites, etc.), firefighting foams, and non-stick cookware just to name a few.

When first studies were published indicating that certain PFAS may have adverse effects on health and environment particularly so called "long chain"-PFAS[2] came under suspect. Consequently, regulators around the world initiated programs to further investigate and regulate the use of PFAS.

Even though manufacturers of PFAS developed so called "short chain" alternatives[3] providing a much better toxicological profile PFAS still are subject to a broad public discussion – particularly their use in firefighting foams.

This paper seeks to provide background information and recommendation on the safe and responsible use of firefighting foams with or without PFAS and their disposal.

3 Overview on the use of AFFF and the likes

3.1 Fluorine Compounds in Firefighting Foams - Historical Background

In the mid 20ies of the last century the ability was discovered to use foam made from a watery solution of soap or protein for fighting fires. Whereas in the beginning firefighting foams were somewhat exotic and didn't really have great market share the growth of oil- and chemical industry and consequently the rising presence of flammable chemical products – namely liquids – in daily life applications created a new level of fire protection demand for which firefighting foams appeared to be the ideal solution:

Their ability to float on any flammable liquid was key to extinguish fires thereof. Stable foam blankets enabled the sealing of surfaces of flammable liquids from exchange of flammable gasses/vapours with the ambience thus securing them in cases of emergency or as precautionary measure. Still one key problem of firefighting foams remained as a serious issue for extinguishment:

[1] The entire group is referred to as PFAS – per- and polyfluorinated alkyl substances. This acronym has meanwhile also been adopted by OECD

[2] For this paper "long-chain" can be simplified to describe a substance with a chain of more than six consecutive perfluorinated carbon atoms

[3] PFAS consisting of a per- or polyfluorinated chain of six or less carbons

Containing surfactants (which are needed to make foam[4]), firefighting foams also have the disadvantage to emulsify[5] carbon hydrate fuels into the foam. This destroys the foam and makes it "flammable" as bursting bubbles release their carbon hydrate freight exposing a fire risk. In the mid 60ies the US military started a research on reducing or inhibiting the fuel pick-up seeking to improve the performance of firefighting foams. This research programme yielded in the development of foams containing Fluorosurfactants and -polymers, both subclasses of the so called per- and/or polyfluorinated compounds referred to as PFAS.

3.2 Effect of Fluorocompounds[6] on Performance of Firefighting Foams

The use of fluorocompounds containing foams revolutionized the extinguishing of flammable liquids: not only did they almost eliminate the fuel pick-up they even did so in water miscible fuels allowing for low viscosity alcohol resistant foam concentrates. They were also found to provide a so called aqueous film – a thin layer of water - floating on top of the specific lighter non water miscible medium[7]. These two effects boosted the performance of firefighting foams dramatically creating a new class of firefighting agents: the so called AFFF – aqueous film forming foams[8].

AFFF and the likes turned out to be very effective and also very forgiving with respect to application, proportioning and foam expansion. They made firefighting foams easy to use at a very high level of reliability and performance. New application techniques were developed never thought to be possible with foams:

- Injection of expanded foam into a non-water miscible Class-B-liquid at ground level of a storing tank[9] with the foam traveling through the liquid towards its burning surface where it develops a fully functional sealing and extinguishing foam blanket. This technology is the so called sub-surface-technology.
- Extinguishment of class B fires with AFFF applied at very low expansion ratios e.g. delivered by sprinklers, hollow-jet nozzles, non-aspirated hand lines and monitors.

Consequently, firefighting foams became the most powerful tools to mitigate fire risks of liquid fuels (so called Class B-fires).

These agents changed the market drastically: A tool like that to manage fire risks made the growth of liquid fuel storage areas to the sizes we see today possible. Almost any international standard for performance testing of firefighting foam agents is more or less written around AFFF. AFFF today still are the performance benchmark and gold standard globally for firefighting foams.

3.3 Environmental and Toxicological Issues with AFFF

While it was known that PFAS are persistent[10] in the environment around the year 1995 researchers discovered that certain PFAS additionally seem to be having adverse effects on the environment and human health. One of the first Fluorocompounds used in firefighting foams - PFOS[11] - was identified to develop toxic effects in mammals and build up in their tissue[12]. Further investigation resulted in similar findings for many other so called long chain PFAS.

[4] Foam is a dispersion of a gas into a liquid so that the gas forms bubbles surrounded by the liquid.

[5] Emulsification means mixing two liquids which are not miscible with each other by the help of chemicals stabilizing micro droplets of the one liquid within the respective other. Dish washing agents emulsify fat and oil into water to enable washing it off. In firefighting this effect is called fuel pick-up

[6] Fluorocompounds in this text include fluorosurfactants and –polymers that are used in firefighting foams

[7] Water has a higher specific gravity compared to most carbon hydrate liquids hence drowns if applied onto them. The formation of a water film on top of a liquid having a lower specific gravity is therefore a quite unique feature provided by fluorosurfactants.

[8] Another type of aqueous film forming foam agents are FFFP – film forming protein foams – which use protein hydrolysates as the foaming compound instead of carbon hydrate surfactants. Both types are available also as alcohol resistant versions: AFFF-AR and FFFP-AR.

[9] This application technique is referred to as sub-surface-injection or just sub-surface application. Another similar application is the semi sub surface application. Here the foam is injected also below fuel surface, but not freely into the fuel but into a special hose which floats up to the surface and expels the foam there to form the extinguishing blanket.

[10] Meaning a substance is extremely stable against any degradation in the environment hence literally is non-degradable in nature

[11] PFOS = perfluor octyl sulfonate (CAS 45298-90-6 for the anion)

[12] A substance's concentration builds up in the body if the organism is not able to eliminate it as fast as it's being taken in. This effect is called bio-accumulativeness.

This combination of an acute toxicological effect on mammals with the substance being around in the environment for extremely long periods of time raised serious concerns with legislators and environmental protection organisations and triggered two major things:

- The start of a broad global campaign to investigate into the adverse effects of the entire group of PFAS (still ongoing)
- the start of international legislative initiatives to regulate the use of PFAS.

Today substances consisting of perfluorinated chains of eight and more Carbons are identified to be toxic and bioaccumulative as well as persistent hence meet the so called PBT-criterion of the European chemical legislation REACH[13]. Particularly the eight carbon PFAS are regulated in numerous international legislations such as the European Union (see chapter 4 Regulatory status).

3.4 New Technologies

3.4.1 The C6-Technology

Manufacturers of fluorocompounds developed so called C6-compounds – chemicals consisting of a per- or polyfluorinated six carbon chain. Although per se slightly less effective in means of fire performance compared to their eight carbon counterparts, the C6-telomer[14] based compounds (also referred to as 6:2-Telomers) used in firefighting foams today are not considered bioaccumulative in mammals "seem to display a lower" compared to C8 compounds. However, they are still resistant to degradation in the environment. Needless to mention that fluorocompounds based on C6-Technology cannot degrade into hazardous perfluorinated C8-chain.

The aforementioned slightly lower fire performance of the C6-Telomers was compensated by formulation and dosage of the fluorocompound so that recent C6-based AFFF, FFFP and their corresponding alcohol resistant versions are true step-in products for their respective C8-based predecessors.

3.4.2 F3-Foams

Aside from novel C6-based Fluorine containing foam agents the manufacturing industry also looked at fully fluorine free alternatives. While C6-technology was very successfully built into foam agents making them true step-in products, the development of fluorine free foams in the same performance level turned out to be a challenge. Particularly since high risk areas (e.g. chemical/petrochemical industry, aircraft, etc.) require foam agents with the highest possible performance which fluorine free foams known at the time were not able to deliver.

Intense research and development work yielded the first high-performing fluorine free foams capable to achieve ratings according to the European foam standard EN 1568 which were originally solely populated by AFFF and the likes. Consequently the most recent revision of the standard defined a new foam type F3[15]. Fluorine free foams do not use any fluorinated carbons hence shall not contain any PFAS[16]. Consequently, the F3-fire performance cannot build on the unique effects contributed by PFAS: There is no help of an aqueous film and no suppression of fuel pick-up. F3s can only extinguish as a physical foam barrier between the fuel and the ambience.

Observations by users, testing organizations as well as manufacturers show that F3s may behave different in several ways:

- F3 seem to show a broader spread of possible interactions and their respective intensity with different liquid fuels compared to AFFF
- F3 seem to respond to different levels of fresh water qualities (e.g. hardness) with varying fire performance (particularly observed with F3-AR on polar fuels)

[13] REACH is the overarching law covering any aspect of chemical products used in Europe. The regulation 1907/2006 EC regulates the Registration, Evaluation, Authorisation and Restriction of Chemicals

[14] 6:2-Telomer describes a specific molecular structure in which a perfluorinated chain of six carbons is connected to a non-fluorinated shorter chain of two carbons

[15] According to EN1568:2018 defined as "Fluorine free foam concentrates (F3): these foam concentrates are dedicated to meet fire performance ratings and are targeting applications similar to AFFF and/or AR-foams without using fluoroorganic compounds. These foam concentrates are based upon mixtures of hydrocarbon surface-active agents and non-fluorine containing stabilizers."

[16] Except for maybe trace amounts at or close to the detection limit: On the one hand some PFAS are widely distributed in the environment as trace contaminants. On the other hand, chemical analytics improved a lot to detect decreasing levels of PFAS. Detection limits today are far below any functional concentration. Therefore, it has become difficult to grant a zero content. Also A concentration close to the detection limit can be considered non-functional hence rather is an impurity than an intended addition of PFAS into the foam concentrate. Still foam concentrates have to comply to current legal requirements.

- F3 can have very high viscosities which go even further up if the temperature changes
- Some F3 seem to pass the stability test according to EN1568 yet still separate after some time under real world storage conditions.

Because of the aforementioned F3s are not simple step-in products for AFFF and the likes and need more attention and pre-planning prior to selecting a foam agent, installing and using it.

4.3 Non-emergency use of firefighting foams and -concentrates

A reasonable share of firefighting foam agents is consumed for trainings, hardware or application calibration or functional testing of hardware and systems. While in the past foam agents were used almost unlimited for the above purposes, today constraints of current legislation and economic as well as public pressure have made the pendulum to swing to the other end: there are almost no hot[17] trainings any more, even cold trainings are limited and calibration as well as functional testing is being looked at very carefully.

Firefighting foam concentrates are built to meet certain performance expectations such as fire performance, frost resistance, storage stability, viscosity, etc. Activities like cold trainings, hardware or system calibration or function testing only do not require all properties of a firefighting foam concentrate but only certain ones.

The manufacturers of firefighting foam agents responded to these changing conditions and do offer so called training foams which are readily and fully bio-degradable and offer a much better toxicological profile as well as economic benefits to the user. These foams do not need to meet any performance criterion on fires but behave like real foam agents if expelled through standard foam hardware.

Fixed systems[18] in fire protection despite of being assembled from very similar components are usually individual installations which are all different. Hence whether or not a system can be operated for calibration with simulation fluids needs to be checked individually and is subject to the ability to separate the circuits for real foam concentrate from those for simulation fluids. Any contamination of the system's foam stock must be avoided.

Another requirement for systems is to run a live operation test equal to emergency operation conditions. This requires the use of the foam agent which the system operates with in case of emergency. For those cases it is important to develop and implement sufficient run-off collection systems to be able and fully contain run-off and dispose of it.

It is recommended to regularly challenge the use of a real firefighting foam concentrate - particularly AFFF or the likes - for cold trainings, hardware calibration and/or function testing and look for environmentally more benign agents for the respective purpose.

4 Using firefighting foams today

Any fire poses risks for health, life, property and environment. Today not only the impact of the fire is in focus, but also the environmental impact of fighting a fire involving firefighting agents is being looked at carefully. People in charge can be held responsible for their choice of firefighting agents.

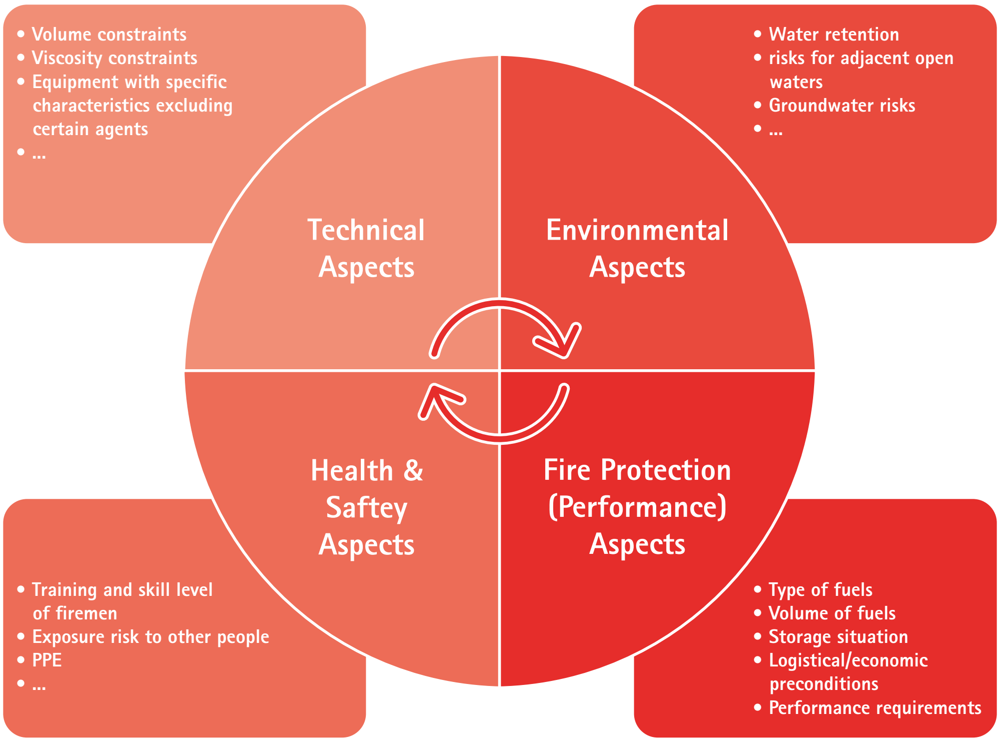
4.1 Risk analysis

Selecting the agent that fits the fire best is critical to success. It requires a comprehensive risk analysis to understand the risk-portfolio to manage as well as the constraining factors of the site to protect. It also does require solid understanding of the properties and capabilities of firefighting agents to finally spot the best fit.

[17] "hot" training is often used as synonym for trainings involving fire whereas "cold" trainings only deal with generating and applying foam onto targets but do not involve fires.

[18] Fixed systems can be tested for their hydrodynamic function ability which covers any properties and function related to the liquids managed by the system. A full function test in turn also covers those parameters which are relevant to the extinguishing function ability (i.e. foam quality, foam heights, filling times of text volumes etc.). Obviously a full function test cannot be run with simulation fluids.

The following drawing indicates some of the most influencing factors to look at during a risk analysis:



The quadrants hold the information needed to select a type of foam agent and also an individual product: Depending on the individual preconditions of a site this model could be used to assign weighing factors for the required levels of performance and eco-friendliness as well as the maximum acceptable hazardousness of a foam agent.

Example: a chemical facility in close proximity to a housing area or city has lots of highly flammable, toxic and environmentally harmful products on site. It has a potent system to retain and dispose of firewater run offs and spills and a well trained and and -equipped fire brigade. In this case the highest priority for a foam agent would be performance. Its eco-friendliness is secondary as it can be retained and disposed of properly. Likewise, would a higher level of toxicity be acceptable as the agent is only used by well trained and equipped professionals who know the site and stored materials.

In another case a municipal fire brigade faces completely unpredictable very broad portfolio of fire risks with unknown fuels and a high likeliness of fire water run offs entering into sewer systems or the environment in an uncontrolled way. The skill level of staff and quality of equipment is moderate. In this case the hazardousness of a foam agent to human health and environment would be key driving factors whereas a lower level of performance may be acceptable.

4.2 Which Foam Type for Which Fuel Type

The following general guidance helps to distinct fire hazard scenarios which may still require AFFF from those which already can be managed using F3s.

4.2.1 Fires of liquid fuels – Class B-Fires

One of the biggest challenges for F3s generally is their interaction with liquid fuels:

1 A significantly higher susceptibility to fuel pick-up in general and
2 A higher selectivity for different fuels even of the same chemical family

Ad 1.: Any mixing of the foam with the fuel it is applied onto reduces the foam quality, weakens the foam blanket and introduces flammable fuel into the foam blanket. Application therefore generally should avoid turbulence as much as possible. The foam should be applied gently by spraying against obstacles or walls of containments. A direct plunging in is not recommended.

Rule of Thumb:
Avoid forceful/direct application of F3-foams on liquid fuels!

Ad 2.: any foam is very effective on some fuels (particularly those they have been tested on for their listings) and less on others. While this effect is almost neglectably low with AFFF and the likes it is much stronger with some F3s. Even to the extent that a foam works well on one fuel but does not extinguish another fuel of the same chemical family. It is therefore recommended to check for a certain F3's performance or compatibility with specific fuels by seeking advice of the manufacturer or testing.

Rule of Thumb:
Check compatibility of F3-foam with certain liquid fuel types!

Aqueous film forming foam agents (AFFF, FFFP and the respective alcohol resistant versions) were developed to particularly fight fires of liquids – so called Class B-fires. Their two key features – formation of an aqueous film on non-water miscible fuels and the ability to suppress emulsification of fuel into the foam – have the biggest impact on fire performance if foam needs to be applied directly (forcefully) onto a burning liquid having a certain depth[19].

So predominantly today AFFF are still amongst the first choice agents for scenarios where the foam needs to be applied over certain distance (vertical and/or horizontal) onto liquid fuel having a certain depth (like large tank farms of flammable liquids).

On fires of shallow fuel spills emulsification does not play a major role in overall fire performance of the foam agent because there simply isn't enough depth of the fuel for the foam to dive in. These fires (e.g. damaged cars or even road tankers) likely may not require an AFFF.

Rule of Thumb:
Fires of shallow spills of liquid fuels do not require AFFF or the likes!

Foam quality is absolutely crucial for the performance of a F3-type foam agent. While AFFFs are very forgiving with respect to the impact of foam quality on their fire performance F3s are not: below a certain foam quality performance drops rapidly or disappears completely. The interaction between a F3-foam agent and the hardware used to make and apply the foam is a very important aspect of firefighting with F3-foams.

Rule of Thumb:
Check compatibility of F3-foam with hardware to achieve minimum required foam quality*!
*given by the foam's manfacturer

4.2.2 Fires of solid fuels – Class A-Fires

Class A-Fires unlike liquid fuel fires do not just take place at the surface of a fuel stock but often also migrate into the depth of a fuel stock forming glowing embers or three dimensional fires. In turn the surface of class A-fuels stays solid hence the mixing of fuel and firefighting agent and all of the associated adverse effects do not happen.

On fires of solid combustibles – so called Class A-fires the presence of Fluorine compounds in firefighting foam agents has very limited if not no contribution to the fire performance of a foam agent. Class A fires do not require any of the specific performance contributors of AFFF. Normal Class A agents, wetting agents or fluorine free foam agents (F3, HiEx, Protein) can do the job.

Rule of Thumb:
Class A-Fires do not require AFFF or the likes!

[19] The European standard EN 15565 defines fuel in depth hazard as "depth of flammable liquid greater than 25 mm" and a fuel depth of 25mm or less as "spill hazard".

4.2.3 Fires of melting Fuels

Fires of melting fuels are special as they start from a solid which under the influence of the heat becomes liquid. These fires combine aspects of class A- and class B-fires: three dimensional structures (non-molten material and chars) with fires/ embers in the depth as well as liquefied material running off.

Rule of Thumb:
Fires of melting fuels do not require AFFF or the likes!

Most of the melting solids (e.g. plastic materials) melt to liquids which are significantly more viscous hence far less quickly spreading compared to water[20]. Some melting class A-fuels however melt to very low viscous liquids (e.g. fats or waxes). Both have in common that they partly or completely return to their solid state with cooling. Therefore fuel-foam interactions as described above (see 3.1.1 Fires of liquid fuels – Class B-Fires) do not occur. These fire risks can be addressed with modern high performing fluorine free foam agents.

4.3 Biodegradation

The ultimate goal of biodegradation processes, in the best case, is complete mineralization of a substance. This means that all carbon atoms are transferred into carbon dioxide and all other present elements as well reach a very simple compound: e.g. nitrogen oxides, sulphur dioxide etc., depending on the elements present in the compound.

Fluorocompounds used in firefighting agents contain fluorinated carbon chains. The chemical bond between Carbon and Fluorine is so strong that it cannot be split by natural biodegradation processes. As a consequence, the PFASs that give AFFFs their unique properties are not completely biodegradable, since the fluorinated part does not break down to carbon dioxide and fluoride[21].

The degradation reaches a so-called biodegradation endpoint. These end-products of biodegradation persist in the environment for a long time. This does not necessarily mean that they cause harm to the environment. They simply do not disappear quickly by natural processes. The normal operational use of firefighting foam agents implies a potential release into the environment of PFASs which cannot be fully avoided. However, the concentrations of fluorocompounds in foam solutions for use on fires are very low (about 0,03% up to about 0,1% for the most common 3% AFFF foam concentrates).

4.4 Bioaccumulation

Humans, animals and plants use water and food for living. Some substances that are taken in with water and food, or through breathing air or through skin contact, are not metabolized[22] in the organism. They are excreted unchanged after a time.

Bioaccumulation means that the excretion of such substances from the body is slower than the intake. So the concentration of these substances in living organisms increases over time. Long-chain-PFASs are known to have a bioaccumulation potential, increasingly so with longer perfluorinated chains.

Some long-chain PFASs have been formerly used in AFFFs. Some of these products or their degradation products are bioaccumulative. They can possibly be incorporated by humans (and all animals, or plants) via the food chain or water and can persist in the body for a very long time[23]. This, however, does not mean that all of them are automatically harmful, although some are proven to be.

[20] Waxes and solid fats are an exempt of that rule of thump: they melt to very fluid medial having very low viscosities and showing a flowing behaviour very similar to water.

[21] Fluorine bound in inorganic materials such as Calcium Fluoride is called Fluoride indicating its ionic nature. Inorganic Fluorides have completely different properties compared to so called organic Fluorine compounds (Fluorine bound to carbon). Fluorine connected to carbon does not biodegrade in the environment to give Fluorides.

[22] Metabolizing means any kind of processes taking place in a living creature which are dedicated to gain energy from converting chemicals.

[23] PFOS (perfluorooctane sulphonic acid), for example, as a typical representative of the so-called C8 substances (which are long-chain substances), has a half-life of 2-4 years in the human body, and partly for this reason the use of this substance is restricted.

Long-chain products are no longer used in firefighting agents which are placed on the market today. They may however still be around in older stocks of foam.

Short chain products in AFFFs (so-called C6-telomer based fluorocompounds) are generally not bioaccumulative.

4.5 Mobility

Short-chain fluorosurfactants have a higher mobility in soil than their long-chain predecessors. Once these compounds get into the environment, they may move with water through soil into natural aquifers (ground water).

One major concern is that drinking water sources may be contaminated, and that it is difficult to remove PFASs from the environment, once they are present. But today methods are evolving to eliminate PFASs from water (e. g. with activated carbon, ion exchange techniques or membrane osmosis, along with other specialized techniques).

For reasons of mobility and difficult elimination from soil and ground water it is recommended to provide sufficient containment volume to be able to collect fire waters in case of an incident, and generally prevent the AFFF from being released into the environment. Again, fire effluents contain many different toxic and hazardous substances from the fire itself, depending on the fuel type. Fluorocompounds are not necessarily the most important and hazardous ones.

4.6 Toxicology

The toxicological footprint of AFFF, apart from the above discussed, is similar to non-fluorinated products. The toxicological profile of a product is defined by all components, including, in case of firefighting agents, organic solvents, synthetic surfactants and water. Additionally, there may be polysaccharides in case of AR products.

The chemicals used in the firefighting agents are on the whole similar, with AFFF containing additionally a small amount of ca. 1-3% of Fluorosurfactants and fluorine free products using a higher load of chemicals to achieve performance.

The fluorosurfactants are not automatically harmful and do not lead to a toxicological classification after CLP[24].

4.7 PFOS/PFOA

PFOS and PFOA are the best studied fluorosurfactants. They are considered particularly critical. They are highly bioaccumulative, toxic, etc. PFOS and PFOA can be found in trace concentrations worldwide in human blood.

PFOS has been banned for most applications in the EU since 2011 (Directive 2006/122/EC). It is classified as a persistent, bioaccumulative and toxic (PBT) substance. Limit value for placing PFOS-containing products on the market is 0.001% w/w (10ppm).

PFOA is regulated in its use by Commission Regulation (EU) 2017/1000 and is subject to strict restrictions on its concentration in products from 4 July 2020.

PFOS has not been used in the production of AFFF for a long time, and PFOA was not used at all.

[24] CLP

5 Regulatory Status

Several years after restricting the use of PFOS in the EU (2006), the EU Commission has adopted in July 2017 Commission Regulation (EU) 2017/1000 restricting the use of perfluorooctanoic acid (PFOA), its salts and PFOA-related substances. All substances that can potentially degrade to PFOA are defined as "PFOA-related substances" and are within the scope of the aforementioned Restriction. The threshold for the maximum acceptable content in any product is set to be 25 ppb (parts per billion = 1µg/kg) for PFOA and its salts, and 1000 ppb (=1ppm =1mg/kg) for the sum of all PFOA-related substances. The EU Commission agreed on a three years' transition period, and the Restriction is set to be implemented as of 4 July 2020.

Taking into account comments submitted by the fire-fighting foam industry and several of its downstream users, the EU Commission has granted an exemption for AFFF placed on the market before 4 July 2020. These products can de facto be used without any time limit given they were purchased and/or installed before the implementation date. Therefore, statements such as "AFFF will be banned as of July 2020 in the EU" or "The use of fluorine in fire-fighting foams will be restricted in the EU" is incorrect and should be dismissed.

At the international level, and following the assessment of PFOA in the EU, the EU Commission submitted a notification to include PFOA in the list of Persistent Organic Pollutants (POP), also referred to as the Stockholm Convention (SC). The dossier is currently being evaluation by the SC Secretariat and its technical committees. A derogation similar to the one adopted under the EU Restriction is expected to be applied within the SC, although the current proposal refers to a 10 years time-limited exemption.

Several other PFAS substances are currently being evaluated at the EU level, some of which may potentially impact the use of AFFF in the future:

- Restriction of C9-C14 PFCAs (per- polyfluorocarboxylic acids) is in its final stage of evaluation (Socio-Economic Assessment Committee) at ECHA. The current version proposes the same fire-fighting foam exemptions as the one granted under Commission Regulation (EU) 2017/1000. It should also be noted that the threshold has been lowered compared to the PFOA Restriction: 25 ppb for the sum of C9-C14 acids, and 260 ppb for the sum of all related compounds. The regulators intent is to implement this Regulation at the same time (July 2020) as its PFOA counterpart.
- The proposal to list PFHxA[25] into the Candidate list (SVHC) was eventually withdrawn by the German Competent Authorities (CA) during the Member States Committee in December 2018. Since then, German CA confirmed their intention to submit a Restriction Dossier[26] with an expected date of submission on 27 September 2019. The intended scope of the restriction is PFHxA and its related substances.

In summary, PFAS compounds are currently being evaluated and the focus of many different regulatory assessment processes. Some of these have been triggered by historical training practices that used fluorine-containing foams.

It is therefore crucial for this industry to adopt all possible measures to limit emissions to the envrionment as much as possible. This can only be achieved by adopting strict rules as to when and how these products should be used.

[25] PFHxA stands for perfluorhexanoic acid which is a carboxylic acid with a 5-member chain of perfluorinated carbons. This compound is considered as one of the main degradation end point of the telomer-based C6-technology. It should not be mixed with another acronym, the PFHxS which stands for perfluoro hexanoic sulfonate. This compound is not a carboxylic acid but a sulfonic acid. Fluorocompounds of this type have never been used in firefighting foams nor can compounds used in firefighting foams form PFHxS in the environment.

[26] https://echa.europa.eu/registry-of-restriction-intentions/-/dislist/details/0b0236e18323a25d

6 Summary

Any release of a persistent and/or harmful chemical into the environment is generally not acceptable!
The following key points shall be considered when evaluating the need of using AFFF and the likes for firefighting:

- Fluorine containing firefighting foam agents are not required on class A fires
- Municipal firefighting does not require use of AFFF and the likes. Fluorine free synthetic agents, class A foams or F3-foams are suitable to fully cover
- Trainings should generally only be done with firefighting foam agents if the training involves real fires of certain sizes. So called "cold" trainings should use foam concentrates with the lowest environmental impact.
- Calibrations and functional testing of proportioning systems should be done with hydrodynamic simulation fluids as much as possible.
- When use of AFFF and the likes is not avoidable without unacceptable lowering of fire safety levels the runoffs shall be fully contained and disposed of properly.

Exempts from this rule should be limited to cases where avoiding the persistent chemical would result in even larger and/or more serious contamination of the environment or fatalities. Even though exempts should be temporary and only accepted if being accompanied by a serious search for non-persistent alternatives.

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