

Transitioning to Fluorine Free¹ Foams

The switch from fluorine-based to fluorine-free firefighting foam concentrates - so-called F3² - is in full swing and will continue keeping us busy in the coming years.

However, this changeover is not just a simple exchange of two firefighting foam agents of the same type and nature, as with the transition from C8- to C6- based AFFF. At that time, the physical chemical properties, application and extinguishing effect of the old and the new product were almost identical, hence in most cases no special measures were required.

In turn moving from AFFF to F3 rather means transitioning to a new foam technology. Therefore, many more aspects have to be considered and looked at in much more detail in order to make this transition successful.

This document informs you about the most important aspects to consider.

1.1 The legal situation

In recent years, several regulations have been passed in the EU that ban or at least severely restrict the use of certain fluoroorganic substances (so-called PFAS)³.

They all have in common that mostly extremely low thresholds are set for the respective restricted substances and, that entire groups of substances are regulated, the extent of which is not known in detail.

The restrictions also all have in common that they only apply to the **placing on the market** of products, articles and (in the case of firefighting foam agents) solutions made from them. However, meeting the legal limits does not provide any protection from legal liabilities because of environmental contamination with PFAS even below the thresholds:

Since there are no harmonised European limiting values for an acceptable environmental contamination by PFASs, it is up to the respective local competent authorities to set threshold values dedicated to triggering action. These values can be (and typically are) considerably (in some cases several magnitudes) lower compared to the legal limits called out by PFAS restrictions!

1.2 The changeover

When filling fluorine-free firefighting foam agents into in-use vehicles, it is therefore very important to bear in mind that they can be contaminated by residuals of the previous fills to such an extent that their release into the environment could trigger authority action. The following procedure is recommended:

¹ So called "fluorine-free" firefighting foam agents are those having been manufactured without the intentional addition of fluoroorganic compounds for the purpose of improving performance in such a way that they do not contain any PFAS in excess of the ubiquitous regional background contamination (e.g. in the drinking water used for manufacture).

² The European EN1568:2018 defines *fluorine free foam concentrates* as follows: "*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 stabilisers.*"

³ PFAS=perfluoro alkyl substances

- Generally, the cleaning and preparation of a vehicle prior to refilling it with F3 should be left to qualified professionals specialised in PFAS cleaning.
- It is also recommended to agree the required level of final cleanliness (i.e. the acceptable residual traces of PFAS - because a return to zero is not possible!) with the cleaning company beforehand.
- This level of final cleanliness should ideally also be agreed with local authorities to avoid later disputes.
- The fire truck needs to be prepared prior to refilling it with F3-foam concentrates: typically, all plastic parts which were exposed to fluorine containing foam agents need to be replaced to avoid a bleed-out of residual trace amounts of PFAS into the new F3.

1.2.1 Complete emptying

If the vehicle is to be cleaned in-house or prepared for external cleaning (the handover condition is to be agreed with the cleaning company), the following should be carried out:

1. The foam tank must be fully emptied, i.e. there should be as little as possible residue of the old foam agent. If necessary use a (plastic) scraper to remove foam concentrate from the tank walls without scratching or else damaging the tank.
2. Pre-clean the tank with a gentle water jet (to avoid foam) and the use of mechanical aids (e.g. brush or similar).
3. Flushing the tank: cleaning water should be forced into the tank through the filling line in order to rinse that as well. Draining through the extraction pipes. The dirty water should be allowed to drain out of the tank permanently.
4. All cleaning and flushing water must be collected and disposed of separately in a professional manner.

1.2.2 Cleaning the foam proportioning system

Switch on the proportioning system and set it to the maximum proportioning rate. Keep the foam tank permanently supplied with water during the process. Flush the system using all available foam solution outlets. Continue flushing until no more foam is visible. Then empty the foam tank and proportioning system.

The last rinse water should be tested for traces of PFAS before refilling in order to document the cleaning success.

1.2.3 Filling with fluorine free firefighting foam concentrate

Before filling with a new foam concentrate, the following questions should be clarified:

1. does the vehicle technology (dimensioning of suction and delivery lines, proportioners and pumps, ...) match the hydrodynamic properties (viscosity type and -level, proportioning rate, ...) of the selected new foam concentrate?
2. is the new foam extinguishing agent suitable for the range of applications intended for the vehicle (fuel suitability, type of application, sufficient foaming, throwing distances, etc.)?
3. are there other aspects to be considered (e.g. level of frost resistance, special requirements for compatibility with materials, shelf life, ...)?

Once these questions have been clarified satisfactorily, the foam tank can be filled with the new product.

Air should not be entrained when filling viscous products, in order not to adversely change (i.e. rise) the viscosity of the foam concentrate and/or avoid admixing errors⁴ caused by air mixed into the foam concentrate.

1.3 Testing of the system

Set the proportioning system to the recommended proportioning rate and carry out a foam discharge test over the entire flow range of the foam system (vent the proportioning pump if necessary).

2 Disclaimer

All information in this data sheet is correct to the best of our knowledge at the time of publication. We reserve the right to adapt the information given to newer findings. Please contact us for the latest version.

⁴ Volumetric proportioning may be rendered inaccurate depending on the amount of air bubbles contained in a foam concentrate and/or the type of proportioning device used