



## VdS Leaflet

# Foam Concentrate in Stationary Extinguishing Systems

## 1 General

In both - stationary extinguishing systems and defensive fire protection - foam compounds are used to protect exposed risks. Foam compounds are used if other extinguishing agents, such as pure water, work insufficiently or not at all regarding their extinguishing effectiveness or if a the extinguishing success to be expected with the use of foam compounds is greater.

Standard fields of applications for foam compounds used particularly in stationary extinguishing systems are:

- hazardous substances;
- flammable liquids;
- synthetic material;
- tyres.

Foam compounds are classified according to their chemical composition into:

- synthetic foam compounds
  - AFFF - aqueous film forming foam;
  - AFFF (AR) - alcohol resistant polymeric film forming foam;
  - AFFF (AR-LV) - alcohol resistant foam of low viscosity;
  - MBS - multi-purpose foam compound.
- protein foam compounds
  - P - protein foam;
  - FP - fluorprotein foam;
  - FFFP - aqueous film forming fluorprotein foam;
  - FFFP (AR) - alcohol resistant polymer film forming fluorprotein foam.

In general, foam proportioning of stationary extinguishing systems shall be designed so as to allow immediate application of the foam solution on the fire once this has started. Normally, this is obtained in sprinkler systems by means of a premix - an already mixed foam solution - being contained in the pipes. In this connection it shall be considered already in the planning stage whether to make the foam compound to be used or the pipes installed ready for use of premix. The pipe system of foam extinguishing systems is normally designed as dry pipe system; the same as the pipe system of water spray systems featuring foam proportioning.

Compared to conventional water extinguishing systems, extinguishing systems featuring foam proportioning require more technical equipment. Here, among other things a proportioning unit to mix the foam solution as well as a foam concentrate storage have to be installed. Moreover, the required regular examination of the foam concentrate quality and of proper functioning of the proportioning unit causes that the expenditure for inspection and maintenance is an essential element to maintain operational availability. If a foam compound due to ageing or other factors does not meet the quality requirements anymore, this has to be replaced.

Detailed requirements for and particularities of extinguishing systems featuring foam proportioning are described in the VdS guidelines VdS CEA 4001, VdS 2109, and VdS 2108. In addition to the requirements for equipment technology these guidelines also specify the relevant measures required to maintain operational readiness.

## 2 Reduction of foam compound load in the environment by adjustment of the equipment technology and taking organisational measures on the occasion of upkeep and repair measures

Foam compounds are to be classified as water-hazardous liquids with an environmental load - depending on their composition - when being released into the environment. In some fields of applications that shall be protected by a foam compound as required in the VdS guidelines, it is presently impossible to replace the foam compound with a suitable alternative of identical effect. Here, equipment technology and processes can be adapted to minimise release of foam compound into the environment as well as consumption of foam compound during maintenance and repair work. The corresponding potential reduction in used foam compound by the measures described below depends on the equipment technology provided in the particular object.

Taking the following technical measures leads to reduction in the release of foam compound into the environment and should be considered by the operating party.

These are e.g.:

- Installation of a slide valve upstream of the alarm valve station for sprinklered areas where the pipes contain premix. Advantage: It is not required to drain the entire pipe system for any maintenance work and, consequently, no unused foam compound will be disposed of.
- Replacement of the hydraulic motor-driven alarm bell by horn and strobe. Advantage: The quantity of foam solution to be used during the alarm test once per week is considerably reduced because the filling time of the feed pipe to the alarm bell and ringing the bell itself are not required anymore.
- Applying test methods to foam proportioning so as to minimise the generation of foam solution.
- Installation of drain valves without permanent leakage.
- To test the proportioning unit: Use of a surrogate liquid the flow and shear properties of which correspond to those of the foam concentrate.

In addition to technical measures, it is also possible to support reduction in the release of foam compound into the environment by organisational measures:

E.g. inspection of foam proportioning should be coordinated with all parties involved so that the required examination of proportioning will take place together with the inspection by an expert. This renders unnecessary double inspection of proportioning.

### Retention of extinguishing water.

Upon actuation of an extinguishing system featuring foam proportioning or of a foam extinguishing system a large quantity of foam solution could be released. This involves the risk that the compound flows e.g. through open doors, gates, and inlets in the bottom to reach the sewerage system or that it infiltrates into the subsoil through unsealed surfaces.

In these cases you should install automatic retention systems for the extinguishing water designed to prevent propagation of foam compound beyond the object boundary. Afterwards, the retained extinguishing water can be disposed of properly. Design of retention of extinguishing water shall be adjusted to the particular object.

## 3 PFC in foam compounds

Foam compounds are composed of a multitude of chemical compounds mostly unknown to the user. However, in the past few years some of these components provided for publicity and came into the focus of experts: polycompounds and perfluorinated chemicals (PFC).

PFC are surface-active substances, which thanks to their chemical properties allow rapid propagation of a water film over burning surfaces. Compared to pure water these considerably improve the extinguishing effect of the foam solution in particular when fighting liquid fires. Moreover, PFC allows extinguishing certain kinds of fire that could not be extinguished without.

At the moment, PFC is used in the foam compounds below:

- AFFF aqueous film forming foam;
- AFFF (AR) alcohol-resistant aqueous film forming foam;
- AFFF (AR-LV) alcohol resistant foam of low viscosity;
- FP fluoroprotein foam;
- FFFP aqueous film forming fluoroprotein foam;
- FFFP (AR) alcohol-resistant aqueous film forming fluoroprotein foam.

Multi-purpose foam compounds are not based on fluorine and, therefore, do not contain PFC.

A multitude of different substances is to be classified into the chemical group PFC. The problematic substances of this group are for instance perfluorooctanoic acid (PFOA) as well as perfluorooctane sulfonic acid (PFOS) - components of foam compounds containing fluorine.

Investigations into this issue have revealed that especially PFOS is long-lasting and toxic and accumulates in nature. PFOA shows the same properties!

### Legal background

For the reasons of environmental and health protection, the directive 2006/122/EC relating to restrictions on the marketing and use of certain dangerous substances and preparations (perfluorooctane sulfonates) was adopted in 2006 and implemented into German law. Accordingly and pursuant to Annex IV No. 32 Paragraph 1 of the GefStoffV [German Hazardous Material Ordinance], the use of foam compounds containing PFOS and preparations proving a mass content of PFOS >0.005 % has been prohibited since 27 June 2008.

Introduction of PFOS into circulation has been prohibited, too, since 27 June 2008, which is laid down in the ChemVerbotsV [German Chemicals Prohibition Ordinance] Annex IV, Paragraph 32.

The limit value laid down in the GefStoffV has been revised by another EU ordinance (No. 757/2010 from 24 August 2010) and reduced to a mass content of 0.001 % PFOS (10 mg/kg). To foam compounds proving a mass content >0.001 % shall apply the restrictions already laid down in the GefStoffV and the ChemVerbotsV.

To foam compounds containing PFOS put into circulation before 27 December 2006 applied a transition period by 27 June 2011. Since this date use of such foam compounds have been prohibited at all.

Contrary to PFOS, PFOA is not subject to any restrictions but is under observation, only.

It is to be emphasised that the ban on PFOS does not apply to all foam compounds containing fluorine. Therefore, any foam compound containing fluorine and no PFOS shall not be subject to the aforementioned rules.

Telomerisation - a procedure used for several years to produce fluorine tensides allows production of PFOS-free foam compounds. Consequently, foam compounds produced after promulgation of the ban on PFOS normally are not subject to it.

PFC-free foam compounds of comparable performance characteristics as today's foam compounds containing fluorine are not known at the moment.

### Handling of foam compounds containing fluorine

The operating party's knowledge of the foam compound kept in reserve in the extinguishing system and of its PFOS content is in parts insufficient. Therefore, the operating parties better ask the installer and the supplier of foam compound for perhaps required measures as to the ban on PFOS should one of the following conditions apply or potentially apply to the foam compound they use in their extinguishing systems:

- foam compounds used in extinguishing systems already before this ban came into force and still held on stock there;
- foam compounds the manufacturers of which declare that they contain PFOS;
- foam compounds the origin / age / contents of which is not clearly documented.

Should you be not sure whether a foam compound is subject to the ban on PFOS - e.g. because the PFOS content is not definitely specified in the documentation - it is possible to analyse the foam compound. The results show the PFOS content in the foam compound and, consequently, you will definitely know whether the foam compound has to be replaced or not. Obligation to prove the PFOS content in a foam compound lies with the operating party of an extinguishing system. Foam compounds containing PFOS shall be disposed of properly. This again the operating party shall arrange for. PFOS is classified as hazardous waste. The operating party shall turn to the enforcement authority competent for waste legislation in the corresponding German Land. In general, the German Land is responsible for the rules and regulations as to disposal.

The foam components allowed after expiry of the period of permitted use are not necessarily free of PFC. Other chemicals containing fluorine are used.

Therefore, the German Federal Environmental Agency (UBA) has published an information portal (<http://www.umweltbundesamt.de/produkte/pfc/>) with up-to-date information on this topic.

The UBA recommends to follow the guidelines below for handling of foam compound and/or extinguishing agents containing PFC:

- 1) Replace extinguishing agents containing PFC with effective alternative agents or technologies without fluorine. Where this is impossible, shall apply:
- 2) Avoid extinguishing agents containing PFC, i.e. delimit the use of extinguishing agents containing fluorine to those fire events for which no effective alternative does exist. In particular in fire practices the foams containing PFC shall be avoided. Where this cannot be avoided, shall apply:
- 3) Retain the extinguishing water of extinguishing agents containing PFC and dispose of properly.

Should you have any questions regarding the use of foam compounds in extinguishing systems, please do not hesitate to contact the Inspection Services of VdS Schadenverhütung. For contact data see: [www.vds.de](http://www.vds.de)

