




# EXTINGUISHING FOAM

BALANCE BETWEEN FIRE SAFETY AND ENVIRONMENTAL IMPACT


 **ARCADIS**

 **KENBRI** The Fire  
Fighting  
Company

# TRANSITION IN EXTINGUISHING FOAM



All over the world, organisations rightly prioritise fire safety and adequate extinguishing agents for calamity abatement. These days, there are a few more things to consider in this area; such as the environmental impact of and requirements for using PFAS in extinguishing foam. These per-and polyfluoroalkyl substances are an artificial group of chemicals that are still present in many extinguishing foam types.



Industrial use of PFAS began around the middle of the last century. Their oil and water-repellent properties, combined with their chemical and heat resistance made these substances an attractive solution for an endless variety of industrial applications and products. Examples of the applications of PFAS include extinguishing foam, textile impregnation, cooking utensils and electronics.

However, using PFAS poses risks for humans and the environment. The discovery of PFAS in our soil, dredging sludge and surface water has resulted in growing awareness of the consequences of using PFAS. The persistence and mobility of these substances pose a serious challenge; they quickly spread to the surface water and hardly degrade, if at all. The growing awareness of their toxicity and the fact that they accumulate in the human body (bioaccumulation) has led to the establishment of very severe standards for the permissible amount in soil, groundwater, surface water, drinking water and food. A number of PFAS have been included in the Persistent Organic Pollutant (POP) regulation. The European Chemicals Agency (ECHA) has stipulated various restrictions regarding the presence of PFAS in products, including extinguishing foam.

As such, PFAS are a leading topic on the agenda of public and private organisations, and extinguishing foam containing PFAS is being phased out. Effective alternatives are being developed rapidly. The transition to this fluorine-free foam (also known as F3 foam) poses significant implications and requires adequate preparations. We can help you with this process. Arcadis and Kenbri Fire Fighting comprehend the chain responsibility you are subject to.



# PFAS IN EXTINGUISHING FOAM

Fluorinated foam contains large amounts of PFAS and is still frequently used to extinguish large liquid fires. Examples of this type of extinguishing foam include Aqueous Film Forming Foam (AFFF), Film Forming Fluoroprotein Foam (FFFP) and Fluoroprotein Foams (FP).

Based on sampling, laboratory analysis and system inspections, Arcadis and Kenbri Fire Fighting can determine whether you are compliant.





## POTENTIAL LOCATIONS WHERE FOAM CONTAINING PFAS IS USED:

01



Airports (hangars, incident locations)

02



Current and former exercise locations, incident and calamity locations

03



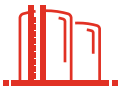
Petrochemical installations and fuel storage terminals

04



Distribution centres, storage of combustible materials

05



Facilities used by the air force, army and navy

06



Railway sector: tunnels and facilities

07



Offshore



Class B extinguishing foam is used in static and mobile extinguishing systems, such as sprinkler installations and firefighting vehicles. This type of foam is used in case of incidents or calamities at airports, in the petrochemical sector, at military bases and in case of hard-to-control fires.

Since extinguishing foam containing PFAS was used at these locations in the past, we now encounter soil, groundwater and waste water (sludge) pollution in these locations. The presence of PFAS outside of the designated systems results in various issues when handling and distributing soil and water streams.

As a result of the ECHA restrictions, companies and organisations are accelerating their transition to fluorine-free extinguishing foam. The aviation sector and the oil and gas industry are already deploying (F3) foam on a large scale. By now, the Ministry of Defence has made the transition to F3 foam for a large number of vehicles and systems.

New F3 foams and modern extinguishing techniques offer sufficient extinguishing capacity for the majority of fire scenarios, and likewise meet the standards set by ICAO, IMO, Lastfire, UL and the NEN-EN 1568. Like current foam containing PFAS, high-quality F3 foam can easily be mixed into water using existing mixing equipment.



# OUR SOLUTIONS



# F3

## QUICK AND SAFE TRANSITION

Transitioning to fluorine-free F3 foam requires proper preparations, as this affects fire safety policy and fire risk analyses. This includes matters like implementing technical modifications and awareness of the environmental aspects of the old and new foam.

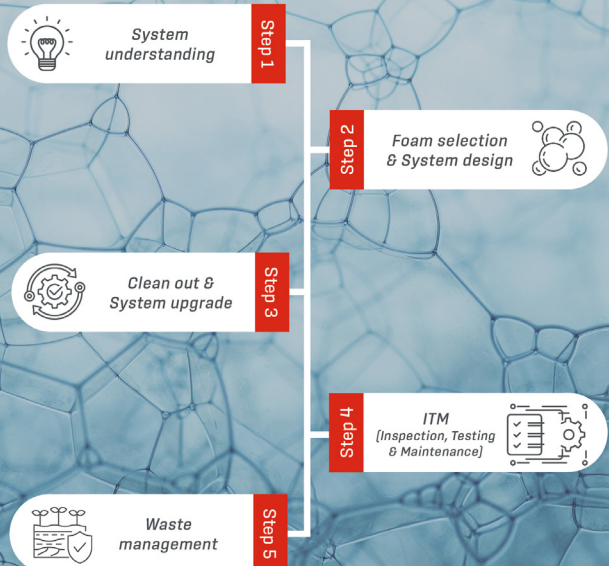
These are the essential steps:

- Analysis of the old foam concentrate using the correct technique.
- Determine whether F3 foam is suitable for the various fire scenarios in question.
- Determine what adjustments to existing extinguishing systems are required for optimal pump, mixing and foam efficiency when it comes to adding the F3 foam to the extinguishing water.
- Use extinguishing trials or manufacturer warranties to determine whether the alternative F3 foam actually delivers the desired performance. Make sure to also test the foam formation, foam strength and the range.
- If the alternative F3 foam proves effective, make the decision to replace the foam containing PFAS.
- Clean the existing extinguishing systems with a proven and certified technique. This is possible thanks to the cleaning procedures based on FluoroFightertm technology by Arcadis and Kenbri Fire Fighting.
- Ensure the waste flows are processed in an environmentally friendly manner.
- Organise supplementary training for firefighting personnel.

## FOAM TRANSITION PROGRAM

Safe transition to fluorine free foam

### Management Of Change







## COMPLIANCE

The guidelines of the European Chemicals Agency stipulate thresholds for the permissible levels of (specific) PFAS in products, including extinguishing foam. Compliance issues may arise if extinguishing foam is used during extinguishing trials or calamities. In such cases, the regulations for disposing of waste water and the Soil Protection Act (WBB) will prevail.

These regulations are far more severe and will result in remediation duties or costs/ consequential damage. As such, it is important to optimally clean the extinguishing system in order to prevent significant consequential damage. On top of that, it is important to perform a thorough cost-benefit and risk analysis.

It is a well-known fact that failing to properly clean an extinguishing system will result in pollution of the new F3 foam concentrate with PFAS. The FluoroFighter™ technology by Arcadis and Kenbri Fire Fighting is a proven technology able to thoroughly clean a system.

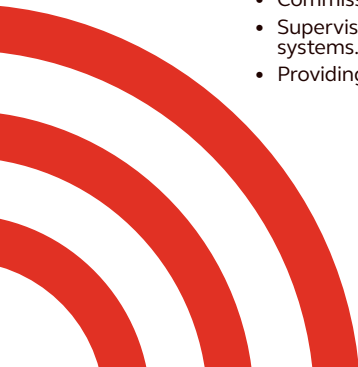


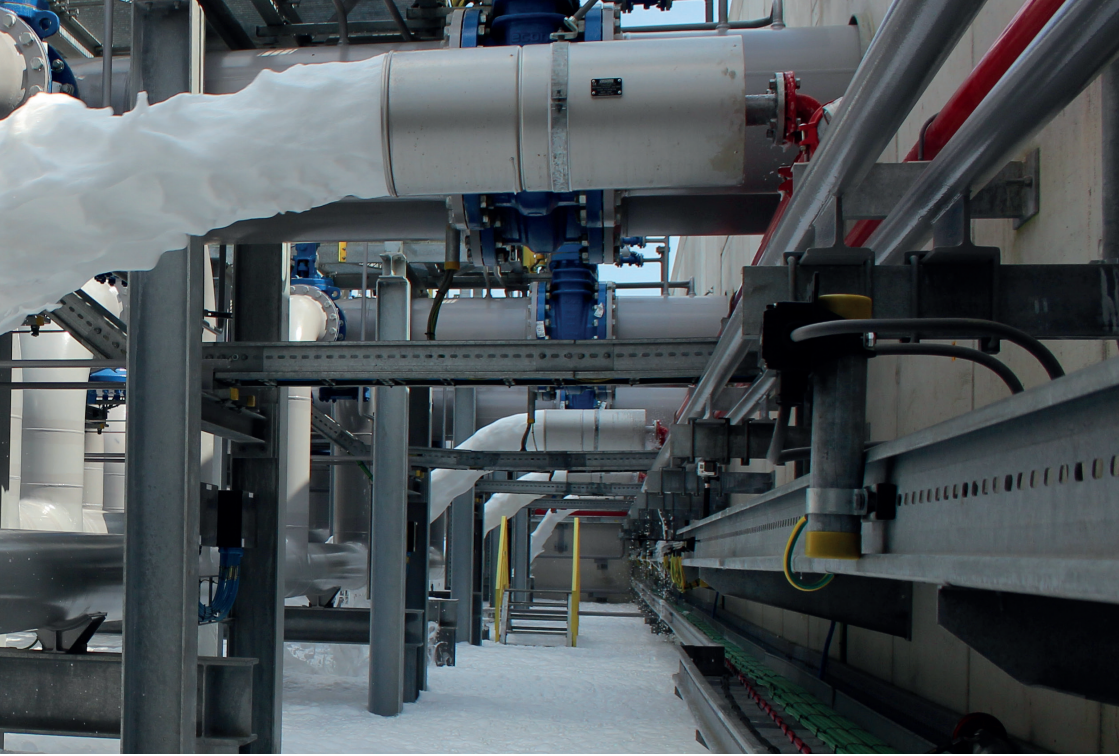
# PFAS TRANSITION PROGRAMME

## TRANSITION IN ALL PHASES

A responsible transition to F3 foam should be preceded by a Management of Change procedure (MOC). This MOC is used to determine whether the modified firefighting systems adequately prevent the risks.

Arcadis and Kenbri Fire Fighting will help your organisation in all stages of the MOC, including:

- Electrical, civil, construction, mechanical and chemical technology.
  - Drafting a document of general principles based on the regional, FM / UL and NFPA guidelines and standards.
  - Assistance with the General Administrative Law Act (AWB) and the General Provisions Act (WABO).
  - Hydraulic calculations based on flow properties of F3 concentrates.
  - Provisional and definitive design of extinguishing systems.
  - Commissioning and operation of fire safety systems.
  - Supervision of the installation of firefighting, detection and alarm systems.
  - Providing all documentation required.
- 



## ENVIRONMENTAL SERVICES

We will also support you through practical environmental services, such as:

- Inventorying installations and foam systems used.
- Performing risk assessment, in consultation with the insurer, if necessary.
- Ranking locations.
- Sampling and analysis of fluorinated or F3 foam, and assessing the data based on applicable laws and regulations.
- Drafting the foam transition plan, including Management of Change (MOC).
- Making all cost calculations for a foam transition (Total Cost of Ownership).
- Controlled processing of the old foam concentrate.
- Cleaning mobile and static extinguishing systems (on and offsite) using the FluoroFighter™ Technology.
- Processing used FluoroFighter™ cleaning liquid.



# A FEW OF OUR PROJECTS AT A GLANCE

## REMEDIATION OF PFAS-CONTAINING EXTINGUISHING WATER AT TERMINAL COMPANY

Due to an incident with a sprinkler system, a limited amount of extinguishing foam containing PFAS ended up in a tank pit at a terminal company in the western port of Amsterdam. The company acted quickly, pumped the 400 cubic metres of polluted water into a storage tank and initially wanted to have this collected by a recognised company.

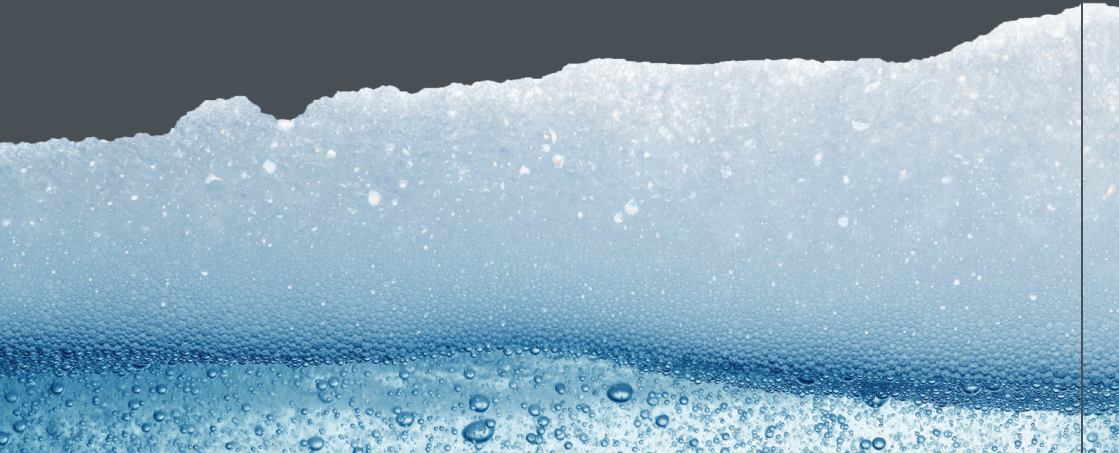
For the sake of effectiveness and sustainability, they opted for on-site cleaning in the end.

Arcadis took care of the preparations and remediation of the tank terminal.

To fully clean the extinguishing water, it was cleaned with active carbon. Based on our own analysis and experience, the amount of active carbon required to fully clean the PFAS was determined. Due to the toxic and persistent properties of PFAS, personal safety and the cleaning of the used materials and pumps were prioritised.

Thanks to this approach, the remediation process was effective and brief.

Moreover, on-site remediation was cheaper and more sustainable than having the polluted water collected.



## **SAFE EXTINGUISHING FOAM FOR SCHIPHOL AIRPORT**

To ensure optimum fire safety, the fire brigade of Schiphol Airport uses large firefighting vehicles, referred to as crash tenders. With the purchase and commissioning of the latest crash tenders, Schiphol Airport aims to transition to a new type of fluorine-free extinguishing foam. This type of F3 foam has a significantly lower environmental impact than the old extinguishing foam types with PFAS.

The properties of this new extinguishing foam did have to meet the firefighting norms and safety requirements, however. Although the foam suppliers provided analysis certificates, Schiphol Airport also wished to have the quality of the foam tested to make sure it was truly fluorine free. Arcadis analysed the

foam concentrate using the TOP analysis.

This analysis method offers insight into the PFAS present in the extinguishing foam and the substances that are converted into PFAS in the environment. This is because extinguishing foam contains many complex, non-detectable PFAS compounds. The TOP analysis allows us to detect these compounds after all.

## **FLUORINE-FREE EXTINGUISHING FOAM FOR LARGE INDUSTRIAL PARTY**

A large client operating in the petrochemical industry made the switch from fluorinated to fluorine-free extinguishing foam. Since fluorine-free extinguishing foam does not contain any PFAS compounds, it is better for the environment. Our client switched to the certified fluorine-free extinguishing foam Respondol, which was released several years ago.

The product was tested for various fire scenarios and approved. The new, fluorine-free extinguishing foam is suitable for

use in the existing firefighting vehicles of the client, without the need for large-scale modifications to the foam extinguishing systems. Transitioning to fluorine-free foam requires removing the foam containing PFAS from the firefighting vehicles and processing this in an environmentally responsible manner. After removing the fluorinated foam, the entire system needs to be cleaned thoroughly to make sure the new foam isn't polluted by PFAS compounds. Industrial cleaning with water has proven insufficient for compliance with the strict environmental standards. In cooperation with Kenbri Fire Fighting in Numansdorp, Arcadis cleans the foam extinguishing systems through a proprietary process and a proprietarily developed solvent. In order to properly manage the process, experts take samples during the various cleaning stages, which they analyse for PFAS.



## Arcadis

Arcadis boasts a long history of researching the impact and effects of PFAS and PFAS remediation. Our first projects in Belgium, Germany and the United Kingdom started early this century. Arcadis is involved in over 500 PFAS projects, which involve over 300 separate locations in 12 countries.

Our team of PFAS experts consists of innovative professionals, including chemists, toxicologists, (hydro) geologists, risk analysts and remediation engineers.

Arcadis is a globally leading design and consultancy firm for the natural and developed environment.

In cooperation with our clients, we develop solutions that are extraordinary and sustainable throughout their lifespan, and we offer design, consultancy, engineering, project and management services, relying on our extensive knowledge of the market and our expertise.

Arcadis has 36.000 employees that generate over three billion in revenue in over 70 countries.

## Kenbri Fire Fighting B.V.

Kenbri Fire Fighting is the leading service provider in the field of fire fighting in the Netherlands, from gloves to fire trucks, and from hydrants to high-quality foam extinguishing systems.

Kenbri Fire Fighting offers consultancy and technical design services, as well as specialist projects with future-proof solutions regarding fire safety and prevention in the (petrochemical) industry, offshore and firefighting services.

Our team consists of 200 enthusiastic and experienced employees that understand what fire safety and prevention are all about. We operate from four locations in the Netherlands.



**We strive  
to deliver  
extraordinary  
— & —  
sustainable  
results.**

# Minimise your impact today

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