To The Point
Aqueous Film Forming Foam (AFFF)

CHUBB®

Aqueous film forming foam (AFFF) is a type of fire protection solution that uses foam to extinguish or control ignitable liquid fires. It has been the go-to firefighting agent for a generation of firefighters tasked with protecting airfields, oil and gas facilities, military installations, and many other ignitable liquid fuel sources. It can quickly snuff out the most challenging liquid fuel fire under a blanket of chemical bubbles.

AFFF has been identified as containing "forever chemicals" known as per- and polyfluoroalkyl substances (PFAS), potentially damaging the environment and human health. AFFF is a commonly used foam because its fluorinated chemicals provide an excellent ability to seal any leaked/burning fuel from the air, which prevents the release of flammable vapors. AFFF could be used effectively against any ignitable liquid fire. PFAS, however, do not break down in the environment; they contaminate soils and water sources and cause significant negative effects on the human body. When AFFF foam is discharged, containment and cleanup are required to prevent negative environmental impacts. AFFF exposure also concerns firefighters' health, who typically discharge the agent on fires.

The Fire Protection Issue

There is now near-universal agreement among health officials, environmental scientists, governments, and even firefighters that AFFF must be retired – sooner rather than later. Growing research shows that high levels of PFAS chemicals may impair the immune system and cause kidney, testicular, and other cancers.[1] Acknowledging that the chemicals within AFFF are damaging, the federal government and many U.S. States have restricted the use of AFFF. According to the National Fire Protection Association (NFPA), they are mandating the removal of existing installations by specific deadlines. At the time of this writing, 15 states have implemented bans or severely limited AFFF use. Legislation is pending in several others.[2] As a result, many companies are looking for alternative extinguishing agents to reduce their environmental impact and protect the occupant's health and safety.

Recognizing the environmental exposure and unintended consequences of AFFF, foam manufacturers have created replacements without fluorine. Fluorine, a PFAS source, is the main ingredient in AFFF. Synthetic Fluorine Free Foams (SFFF) are manufactured without the use of PFAS[3] and can still provide effective fire suppression without the impact to the environment and human health. A 2020 Naval Research Laboratory report showed AFFF extinguishing fires in under 30 seconds while the fluorine free foams took several seconds longer on average. SFFF foams are effective, do not create long-term harm, and are used effectively today at major airports, military installations, and oil and gas facilities worldwide.

SFFF foams are not just PFAS-free versions of AFFF. Instead of the thin aqueous film spreading across the fuel surface, SFFF provides a physical barrier between the fuel and the air with bubbles only, preventing the fire from spreading and providing a cooling effect. SFFF foams may not perform identically to AFFF's – and care must be taken around specifying the specific SFFF to the type and quantity of fuel it is intended to protect.

Changing to a Fluorine free foam is not a direct replacement for AFFF. There are some foams that will perform effectively as an AFFF alternative with the proper design. However, foam replacement must be done with care, and steps must be followed to ensure the adequacy of fire protection to standards, foam equipment compatibility, and environmental impact.

Going Fluorine Free

Account for all the environmental components as you begin the process. Those include disposal of your existing concentrate and equipment, as well as any potential cleanup that is required.

Not all the SFFF foams are created equal – they have different formulations and properties, such as cooling capacity, drainage time, expansion rate, viscosity, etc. It is essential to select a specific Fluorine free foam to the type of fuel (ignitable liquid) being protected.

Review and compare the safety data sheets (SDS) of the liquid(s) being stored against the abilities of the fluorine free foam concentrate. The SFFF product must be listed for the fuel it will be protecting.

SFFF are not plug-and-play replacements for AFFF and are not likely compatible with the existing fire protection piping and equipment that has been installed. Existing tanks, nozzles, piping, and discharge devices must be evaluated and perhaps replaced for SFFF compatibility.

Consideration also should be given to the volume of foam needed for storage. With changing percentages – more foam solution may be required (than AFFF) – do you have enough space in the room to hold an additional or larger tank? Is the water supply adequate to meet the demand for new water/foam concentrate?

Working with your Chubb Risk Consulting team in conjunction with your Fire Protection contractor, all parties can successfully transition from an environmentally damaging product to a cleaner, environmentally friendly product that would be adequate to control the anticipated fire hazard. Combining environmental sustainability and building resilience to create a safe situation for the occupants, environment, and continuity of your business operations is the goal.

Converting AFFF to Fluorine Free Foam Checklist

1. Account for environmental components before starting.
   - ✓ Dispose of existing concentrate and equipment.
   - ✓ Clean remaining equipment.
   - ✓ Check for soil contamination and concrete contamination/leachate.
2. Select the right foam concentrate.
   - ✓ Is it Green Screen Certified?
   - ✓ Is alcohol-resistant foam needed?
   - ✓ Listed for use on the fuel it will be protecting?
3. Determine design density and application rate.
   - ✓ Check NFPA 11 and the manufacturer's density requirements.
   - ✓ Check listing requirements (which may exceed NFPA 11).
   - ✓ Check fuel type.
   - ✓ Check discharge type.
   - ✓ Locate expected fire areas (tank, spill, diked area, etc.).
4. Determine Discharge type.
   - ✓ Learn the required expansion ratio – can discharges meet it? If no, replace.
   - ✓ Check sprinkler heads.
   - ✓ Check foam makers/chambers.
   - ✓ Check directional nozzles.
5. Analyze piping and supporting infrastructure.
   - ✓ Can existing infrastructure meet flow rates? If no, replace.
   - ✓ Did the discharge type change (i.e., went from sprinklers to foam makers)?
   - ✓ Check pipes – "keep and clean" or replace.
6. Analyze foam proportioning.
   - ✓ Is the new concentrate listed with the existing proportioning system? If no, replace the proportioner and then the foam pump, if applicable.
   - ✓ Has the flow rate changed outside of existing capabilities?
7. Analyze foam storage.
   - ✓ Check new flow rate and duration – is existing storage enough?
   - ✓ Is the existing storage system listed with the new concentrate?
   - ✓ Is existing storage contaminated by old foam?
8. Analyze water supply.
   - ✓ Can the existing supply (including the fire pump, if there is one) meet the new demand?
   - ✓ Is a new backflow preventer needed?

References

1. **National Cancer Institute (NCI),** dceg.cancer.gov/research/what-we-study/pfas#:~:text=PFAS%20are%20a%20component%20of,of%20the%20kidney%20and%20testis.
2. **National Fire Protection Association (NFPA),** www.nfpa.org/news-blogs-and-articles/nfpa-journal/2022/07/22/the-new-foam
3. **International Fire & Safety Journal (IFSJ),** internationalfireandsafetyjournal.com/supporting-a-safe-transition-to-fluorine-free-firefighting-foam/

Additional Resources

U.S. Department of Defense, media.defense.gov/2023/Jan/12/2003144157/-1/-1/1/MILITARY-SPECIFICATION-FOR-FIRE-EXTINGUISHING-AGENT-FLUORINE-FREE-FOAM-F3-LIQUID-CONCENTRATE-FOR-LAND-BASED-FRESH-WATER-APPLICATIONS.PDF

U.S. Naval Research Laboratory, apps.dtic.mil/sti/pdfs/AD1100426.pdf

Bryan Cave Leighton Paisner (BCLP) Law, www.bclplaw.com/en-US/events-insights-news/pfas-in-firefighting-foam-afff-and-equipment-state-by-state-regulations.html

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