White Paper

Types of firefighting foam agents

Properties and applications

There are numerous types of firefighting foams that are selected for specific applications according to their properties and performance. Some foams are thick, viscous, and form tough, heat-resistant blankets over burning liquid surfaces. Other foams are thinner and spread more rapidly. Some foams are capable of producing a vapor sealing film on a liquid surface. Others are used in large volumes to flood surfaces and fill cavities. Each of these foams has different chemical and physical properties depending on their intended purpose.

Class-A Foam

Class-A Foam is specifically designed to combat fires involving ordinary combustible materials such as paper, tires, and wooden structures, as well as wildland. The concentrate reduces the surface tension of water providing superior wetting and penetrating characteristics. This allows the solution to penetrate into the char of deep-seated fires, promoting cooling and making the Class-A fuel less combustible. The expanded foam solutions also create a dense foam blanket that clings to vertical surfaces and provides an insulating barrier between the fuel and the air.

PFAS chemicals are not necessary to give Class-A foams these properties in these types of fires and Tyco Fire Products therefore produces Class-A Foam without using any type of PFAS.

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Certain foams are no longer produced by Tyco as they are now obsolete:

Chemical Foam

Chemical Foam has been classified in different ways over the years. The earliest foams were based upon a chemical reaction occurring between aluminum sulfate and sodium bicarbonate. The energy used to create the foam bubbles came from the chemical reaction. This type of Class-B foam is now obsolete and Tyco does not manufacture it.

Chemical Foam was non-fluorinated.

Protein Foam

Protein Foam is derived from naturally-occurring sources of protein such as hoof and horn meal or feather meal. The protein meal is hydrolyzed and converted to a protein hydrolysate which is neutralized and to which other components are added such as foam stabilizers, corrosion inhibitors, antimicrobial agents, and freezing point depressants. Like chemical foams, this Class-B foam is mostly obsolete.

Protein Foam was produced without using PFAS.

High-Expansion Foam

High-Expansion Foam is used in fighting Class-A, Class-B, and LNG fires both indoors and outdoors. Expansion ratios (air-foam) from 50:1 up to 1000:1 make them suitable for a variety of applications including aircraft hangars, flammable liquid storage areas and LNG facilities. When used with high-expansion generators, this foam creates a mass of bubbles that fill large volumes such as aircraft hangars, warehouses, ship cargo holds, mine shafts and various horizontal or vertical applications.

When used with medium-expansion foam equipment, the solution forms a foam blanket that inhibits the release of fuel vapor while providing additional cooling due to the higher water content. Medium-expansion foam has benefits in outdoor applications because the foam is less affected by wind conditions.

Tyco Fire Products produces High Expansion Foam without using PFAS.

Fluoroprotein Foam

Fluoroprotein Foam is derived from a protein foam concentrate to which small amounts of fluorochemical surfactants are added to produce an easier flowing foam. This foam is also oleophobic (oil shedding) which makes it particularly well suited for sub-surface injection near the base of a Class-B flammable liquid storage tank.

Fluoroprotein Foam is produced using PFAS. The PFAS chemicals are not PFOA or PFOS. However, in earlier fluoroprotein foams, PFOA and PFOS may have been present in low levels. Today, Fluoroprotein Foam produced by Tyco Fire Products does not contain PFOS; PFOA may exist at trace levels due to the nature of the chemical process used to make it.

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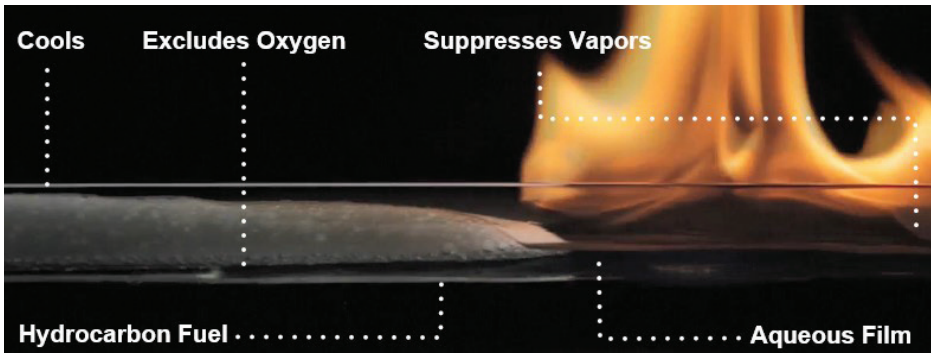
Aqueous Film-Forming Foam (AFFF)

Aqueous Film-Forming Foam (AFFF) suppresses and secures fires involving petroleum-based products such as liquid natural gas and rubber; and flammable and combustible liquids such as diesel fuel, crude oil, and gasoline. It can be applied through a wide variety of delivery systems, both manual and automatic, which provides extreme versatility. Applications include military and civilian ships, military bases and airfields, airport crash-fire-rescue, refineries, tank farms, and other operations involving the transport, processing, or handling of flammable liquids.

Tyco Fire Products blends AFFF firefighting concentrates using short chain, C6 fluorochemicals manufactured using a telomer-based process which produces no PFOS. While C6 materials may contain trace amounts of PFOA due to the chemical processes used to produce them, C6 components do not break down in the environment to yield PFOA.



AFFF combines fluoro- and hydrocarbon-surfactant technologies to provide fire and vapor suppression for Class B hydrocarbon fuel fires. AFFF foam solutions utilize three suppression mechanisms for rapid fire knockdown and burnback resistance:

1. the foam blanket blocks oxygen supply to the fuel;
2. liquid drains from the foam blanket and forms an aqueous film that suppresses fuel vapor and seals the fuel surface, preventing the fire from releasing fumes into the air that are both flammable and toxic to the environment;
3. and the water content of the foam solution produces a cooling effect for additional fire suppression.

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Alcohol-Resistant Aqueous Film-Forming Foam (AR-AFFF)

Alcohol-Resistant Aqueous Film-Forming Foam suppresses and secures fires on hydrocarbon fuels as well as polar solvent fuels such as methanol, ethanol and acetone. It combines a water soluble polymer (polysaccharide) with AFFF surfactant technology to create a foam blanket with cooling and oxygen-blocking fire suppression mechanisms similar to AFFF. In addition, when liquid drains from the foam blanket, it forms either an aqueous film on a hydrocarbon fire, or a polymeric membrane on a polar solvent fire that prevents the barrier from being dissolved by the alcohols in the fire, both of which suppress the vapor and seal the fuel surface.

Tyco Fire Products blends AR-AFFF firefighting concentrates using short chain, C6 fluorochemicals manufactured using a telomer-based process which produces no PFOS. While C6 materials may contain trace amounts of PFOA due to the chemical processes used to produce them, C6 components do not break down in the environment to yield PFOA.

Training Foam

Training Foam Concentrate is intended to simulate AFFF for training purposes. It is not intended for live fire training or for actual firefighting operations. Training Foam is functional in any proportioning and generating equipment with expansion and drainage characteristics similar to conventional 3% and 6% AFFF products. In addition, the low cost of training foam over regular foam provides a cost effective alternative for training purposes.

Tyco Fire Products produces Training Foam without using PFAS.

Vapor Mitigation and Neutralizing Agent

Vapor Mitigation and Neutralizing Agent provides for a single application to suppress dangerous vapor release from a chemical spill while also pH neutralizing the spilled material. When mixed with the appropriate neutralizing agent, the concentrate may be used for chlorine dioxide, oleum, chlorosulfonic acids, sulfur trioxide, liquid ammonia, and other fuming acid spills. This is critical when time is of the essence after a dangerous spill of fuming acid or other hazardous chemicals.

Tyco Fire Products produces this agent without using PFAS.

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