FOAM

Standard: NFPA 298 (Standard on Fire Fighting Foam Chemicals for Class A Fuels in Rural, Suburban, and Vegetated Areas)

Indication: Firefighters must be knowledgeable and demonstrate competence on the types of foam, foam equipment and foam application is essential at emergency incidents.

How Foam Works:

The water and foam mixture is referred to as a "foam-solution". After air is introduced to the solution via an aerating nozzle, the final product is known as finished foam.

- Smothers the fire and prevents air from mixing with flammable vapors
- Suppresses flammable vapors and prevents their release (helps prevent fire in no-fire or spill situations)
- Separates the flames from the fuel surface
- Cools the fuel and sources of re-ignition (hot metal surfaces). Cooling the fuel is a secondary effect on low flash point flammable liquids, such as gasoline with flash point of -45 degrees. Combustible liquids with higher flash points may be cooled below their flash points.

Types of Foam:

- Class A Foam (Wildland Foam)
- Class A/B Foam (Pyrocool)
- Aqueous Film Forming (AFFF)

<u>Class A Foam (Wildland Foam)</u>

The foam is a non-corrosive, non-toxic, biodegradable concentrate. When mixed with water in the correct proportion, it changes the properties of water. It reduces the surface tension of the water, and produces foam which allows the water to cling to vertical or horizontal surfaces without run off. This allows the water to absorb more heat and provides greater penetration into Class A fuels.

The application rate for Class A foam is 0.01%. Class A foam is primarily utilized for wildland fire application in the batch mixing mode. Therefore the following rough rule should be utilized:

- For batch mixing Class A foam in wildland fire apparatus, add approximately ¾ of a gallon (out of a 5 gallon can) to a 750 gallon water tank to achieve a 0.01% foam solution.

Class A/B Foam

It extinguishes highly volatile hydrocarbon fires (e.g. military jet fuel) and three-dimensional and pressurized fires, as well as deep seated fires and combustible metal fires. Structures located in or adjacent to fire sites are cool to the touch following extinguishment and the temperature of residual fuel sources (normally a point of re-ignition concern) is drastically lowered. The beneficial effects of the PYROCOOL cooling phenomenon cannot be underestimated.

The application rate for Class A/B foam is 0.1 to 0.5% for hydrocarbon fires and 1.0% for polar solvent fires or spills. Therefore the following rough rule should be utilized:

- For batch mixing in a fire apparatus add 5 gallons (0.5 %) for every 1000 gallons of water.
- On board foam system (Hale Foam Master) defaults to 0 .5%. Press the arrow up/down button dependant on fuel type.
- Akron foam in-line eductors should be set to 0.5 % or 1.0% dependant on fuel type.

Class B Flammable Liquid Foam

The foam works by forming a vapor suppressing aqueous film on hydrocarbon type fuels (gasoline, kerosene, diesel, etc). The AFF/ATC foam works on a polymeric membrane on polar solvent/water miscible type fuels.

The application rate for AR-AFFF foam is 3% - 6%. Therefore the following rough rule should be utilized:

- Akron in-line eductors should set at 3% (3 parts AR-AFFF concentrate to 97% parts water) for hydrocarbon fires.
- Akron in-line eductors should be set at 6% (6 parts AR-AFFF concentrate to 94% parts water) for polar solvent fires.

Foam Application Systems

- In-Line Eductors

Pre-engineered systems that require specific inlet pressures for operation, usually 150-180 PSI inlet pressure. A large amount of that inlet pressure is lost in creating the vacuum necessary to pull foam concentrate into the water. The pressure at the exit of the eductor is called back pressure. If the back pressure is more than 65-70% of the inlet pressure, then the eductor stops producing a vacuum, and foam cannot be made. The actual back pressure at the eductor is the combination of nozzle pressure plus friction loss in the hose and elevation loss.

Steps:

1. When using an automatic nozzle with an eductor, the nozzle must be fully open to prevent excessive back pressure which will prevent foam pickup. When selectable gallonage nozzles are used nozzle flow must be matched to the flow of the eductor, typically 60 GPM, 95 GPM, or 125 GPM, and 240 GPM with 2 ½" hose.
2. Set metering dial to desired percentage. (Percentage number aligns with pickup tube).
3. Set eductor inlet pressure to 150-180 psi, occasionally the setting may have to be increased to 200 psi.
4. Place pick up tube in foam container, Make sure tube inlet is not restricted or touching bottom of foam container.
5. Nozzle shutoff must be completely open. Throttling shutoff may cause eductor to shut down.
6. Do not use more than 200 feet of 1½" hose or 350 feet of 1¾" hose between the proportioner and the nozzle.
7. The nozzle should not be elevated more than five feet above the proportioner.
8. Flush system at least three (3) minutes with clean water after each use. This will assure metering dial and eductor check ball are clear. Rotate metering dial when flushing.

✍✍ Foam Tube

To increase the expansion ratio, Task Force Tips "Foamjet" (foam tube) may be attached to the nozzle. The foam tube allows for expansion ratios of 8:1. This thick foam blanket has better extinguishing ability and is longer lasting than foam from non-aspirated nozzles.

As the nozzle shaper is rotated to the wide fog position (counterclockwise), higher expansion ratios will be produced, but with reduced stream reach. Rotating the nozzle shaper forward to straight stream (clockwise) will produce lower expansion ratios, but with increased stream reach. It can be easily removed in seconds for a water-only or non-aspirated stream.

Note: As expansion ratio is increased, the reach of the nozzle will be decreased due to the greater amount of bubbles in the stream and their inability to penetrate the air. Generally the reach with foam is approximately 10% less than with water only. Actual results will vary based on brand of foam, hardness of water, temperature, etc.

✍✍ Electronic Foam Proportioning System

Engines purchased after 2001 are equipped with a Hale Foam Master Foam Proportioning System so that all pre-connected pump discharges (pre-connects, trashline, booster reel, etc.) are capable of flowing foam solution that is set to automatically default to 0.5% application rate. The foam cell holds 15 gallons and the engine can be set at a minimum of 0.1% and a maximum of 6%.

Steps:

Upon initial power up of the apparatus, the Hale Foam Master system will go to the standby mode upon completion of a self- diagnostic routine.

1. When the % FOAM LED is lit, or in any other function mode, the foam concentrate injection rate can be set to the desired value, if different from the default value of 0.5%, prior to or during foam operations by pressing the up arrow and down arrow buttons.
2. When the red ON button is pressed, the button will illuminate indicating that the system is ready. If water flow is present the foam pump will start and inject foam concentrate into the discharge stream.
3. The bargraph will light when foam is being injected and indicate system capacity. The Hale Foam Master system constantly monitors water and foam concentrate flow values maintaining foam injection at the specified concentrate injection rate. The system responds to variations in water flow by increasing or decreasing the speed of the foam pump.
4. When the ON button is again pressed, the button will extinguish, indicating that the system is in Stand-By mode and the foam pump will stop, but other system monitoring functions will continue.

Batch Mixing

Batch mixing is when foam concentrate is added directly to a water tank on an apparatus. Typically, batch mixing is used in wildland firefighting however may be useful in the event of a failure of foam generating equipment.

Steps:

1. For 0.01% foam solutions of Class A foam in wildland fire apparatus, add approximately ¾ gallon (out of a 5 gallon can) to a 750 gallon water tank.

2. For 0.5% foam solution of Class A/B foam in a fire apparatus, add 3.75 gallons (out of a 5 gallon can) for every 750 gallons.

3. For 1.0% foam solution of Class A/B foam in a fire apparatus add 7.5 gallons for every 750 gallons of water.

4. Remember, when batch mixing always add the foam concentrate to a full tank of water thereby reducing the amount of sudsing. Also do not rely on the water level gauge to indicate when the tank is full as the sudsing may cause inaccurate readings. Fill tank until water discharges onto the ground, then add the foam concentrate.