National Foam

Foam Lines® - February 2010

Frequent Questions On Firefighting Foam & F. D. Equipment

Question 1. What is the downside of carrying two kinds of foam in two tanks? Reply: Carrying two kinds of foam concentrate for two completely different missions is, in my experience, asking for trouble in terms of concentrate storage, use, and system maintenance. As you already know, Class A foam solution can be used as an effective wetting and soaking agent where structure and ground cover fires are encountered. As such, the class A side of a dual agent system generally gets enough exercise. The class B-side of the system will see little if any use except for training or the odd spill event where class B foam is indicated for scene security. You really need two types of foam. One for general purpose, class A use and the other for occasional haz-mat applications. The problem is that the B system will rarely see use - and then there's the possibility of mixing A&B foams by accident which can be system fatal.

Question 2. What are your recommendations on storing foam, and are there any special plumbing requirements for onboard foam systems? Reply: NFPA 11 now requires alcohol resistant AFFF where the fuel risk is blended or reformulated gasoline (more than 10% oxygen or ethanol additive). AFFF, and more importantly, alcohol resistant aqueous film forming foams (AR-AFFF's) do not store well in mobile fire apparatus tanks unless you keep foam tanks topped-off, sealed and the concentrate supply lines well flushed. Foams that carry Underwriters Listings require foam concentrate not be stored at temperatures in excess of 120 degrees F. The reason is simple: Class A & B foam concentrates are comprised mostly of water and dispersing solvents. If exposed to heat, the water and solvents will evaporate, leaving dried debris glued to concentrate plumbing or on the walls of tanks.

Both Class A and AR-AFFF foam concentrates are perhaps more susceptible to dry out problems than regular AFFF concentrates. In fact, many class A foam concentrates start-out as a dry powder and are mixed with water and alcohol.

Too much heat
On mobile apparatus, foam concentrate supply lines and filters are usually exposed to very high engine/pump space temperatures for hours on end, especially in summer months. Lines and filters will dry a little every time you make a run. That's why it's important to operate both A & B foam system for at least a half a minute a month. The reason is that most apparatus foam system flush lines do not begin at the foam concentrate tank. NFPA 1901 is not clear on where the flush line must start, nor are most foam system manufacturers. If yours is one of those jobs where you only use foam when there's an "emergency", odds are your hidden (behind the pump panel) foam system is proportioning lean, or not at all.

TIP: Do not use mild steel, galvanized pipe or aluminum for foam concentrate storage tanks, valves or plumbing. Poly, PVC, stainless steel or fiberglass are materials choices. Gaskets should be buna-n (nytrile).

Question 3. How critical is proportioning accuracy? Reply: Foam system proportioning accuracy is something that should be tested at least once a year, particularly where class B foams are relied upon for crash scene security. It's important to keep in mind that proportioning accuracy is not likely to be life threatening when dealing with class "A" foam. On the other hand, operations using miss-proportioned (lean) class B foam may end in catastrophe. Just because bubbles come out of the nozzle doesn't mean you have foam that will stand up to vapor pressure associated with a hot road spill. For pointers on how to test your system's proportioning accuracy, contact me at: info@combatsupportproducts.com

Question 4. What do we do with jelled-up foam? Reply: Your foam has not "jelled up". Odds are you bought it that way. All Alcohol Resistant foams are thick and gooey. Next time someone blames the foam for being too viscous to proportion use an eyedropper to gain the

confidence of your pump operators or procurement staff. Alcohol resistant foams (AR-AFFFs) are thick and gooey to begin with. Contrary to how it may appear, an eyedropper will lift AR-AFFF - and so will a foam eductor and most onboard foam systems, with few exceptions.

Question 5. Why is AR-AFFF so viscous? Reply. A powdered sugar-type material, xanthan thickens AFFF and is what makes it alcohol resistant. Xanthan is widely used in the food processing industry. It adds texture and thickness to what would otherwise be thin and soppy. When AR-AFFF solution contacts a solvent like alcohol, the xanthan helps create a Saran Wrap-like raft that allows foam to ride on it. This prevents water-laden foam from becoming absorbed by solvent fuels (alcohols, acetone, esters and ethers). Today, these water thirsty solvents are found in gasoline blends. Some blends are more potent than others. Xanthan also helps finished foam last longer than regular AFFF on hot spills.

Xanthan's down side: Because of their viscosity, alcohol resistant foam concentrates (AR-AFFF's) do not gravity feed well without energy. They behave exactly like latex paint in an airless sprayer. They tend to be self-thinning when moving through a pick up tube; the faster they move the thinner they get. When they stop, they get thick again; sort of like catsup coming from a squeeze bottle. For this reason, a simple foam eductor works flawlessly with AR foams. It does so simply because it possess more than enough suction energy to thin (shear) the foam concentrate as it moves through a pick up tube. All National Foam's AR-AFFF concentrates are UL listed with foam eductors.

Question 6. What's the downside of accidental mixing of unlike foams in our tanks. Reply: Class A foams and regular AFFF's rely on solvents for water dispersion, wetting and foaming. Therefore, if class A or regular AFFF foams are accidentally mixed in a tank that contains AR-AFFF, the polymer (xanthan) in the alcohol resistant foam concentrate will do its thing as it reacts with (polymerizes) the solvents in your class A, or AFFF foam. A cup of AR-AFFF in a tank of class A, or regular AFFF concentrate can be system fatal. Same goes for Class A in a tank full of AR-AFFF.

The photo on the right shows what happens to AR-AFFF when mixed with class A concentrate. About 50 ml. of AR-AFFF was mixed with 250 ml. of class A foam concentrate. It took about fifteen minutes to polymerize. So, if you think no harm done because you only put a little class A foam in the AR-AFFF tank, you're wrong. Drain it all and start over. Perhaps you can screen out the random masses of pizza dough-like material caused by solvent contamination. If so, class A foam should again be fit again for use. Your class B foam will be ruined. Further, be advised that AR-AFFF's don't drain very well from tank drains. You might need a foam transfer pump to empty your tank from the fill tower.

By the way, the more alcohol resistant polymer the thicker the foam concentrate. The thicker the foam concentrate, the more stable and longer lasting the finished foam is likely to be. Be suspicious of "ours" is thinner sales pitches. Odds are they also have thin UL Fire Test Listings as well.

Question 7. FoamPro® says they do not guarantee proper system performance with the use of foam concentrates like National Foam's Universal Gold, 1x3% AR-AFFF due to its viscosity. Have you heard of this limitation using Universal Gold or foams like it with the FoamPro system? Reply: Yes, the FoamPro®-1600, 2000 and 2001 series systems have difficulty with AR-AFFF (Alcohol Resistant- Aqueous Film Forming Foam). The reason is that FoamPro® use a chemical pump to proportion fire fighting foam concentrates and water which are of the self-priming variety and are designed to move fluids having the viscosity of water or slightly thicker. Class A foam concentrate and simple AFFF's are water-like in viscosity and therefore are not a proportioning problem for FoamPro® systems, as Class A and AFFF foam concentrates tend to gravity feed quite well. The Pierce, Husky® foam system, Hale Products, FoamMaster® system and Foam-Pro's® series 3000 foam systems do a fine job of proportioning AR-AFFF foams because they use foam concentrate pumps that are designed for use with the more viscous, AR-AFFF foams. The down

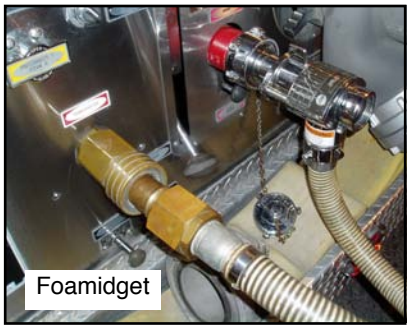
side is that these systems are at the higher end of the food chain in terms of price.

Question 8. What foam is your recommendation for ethanol/gasoline blends? Reply: As you know, the EPA now requires an oxygen compound be added to gasoline. Oxygen compounds found in gasoline can have a negative effect on AFFF's ability to form a film. This is at the root of NFPA 11's requirement for gasoline blended with oxygen compounds to be dealt with using properly listed (UL) AR-AFFF or fluoroprotien foam. Another thing that interferes with AFFF's ability to film form is fuel temperature. A hot (unignited) road spill is not likely to allow AFFF to properly form a film. Film-forming characteristics are inhibited to a large extent when fuel temperature exceeds140 degrees F, (60c) which is another reason for my recommending the heartier AR-AFFFs.

Question 9. Should we consider a simple foam eductor and onboard foam tank for class B foams? Reply: Yes, a simple foam eductor screwed to a pump panel discharge is the ticket when you want reliable, accurate class B foam proportioning. Foam eductors are the foam industry's default proportioning devices. All National Foam's products are UL listed with foam eductors. A 100-gallon per minute foam eductor will send solution two hundred feet to a 100-psi nozzle, using 1.75" hose. If you have a 75-psi nozzle you can get 350 feet. If you put your TFT 's pressure switch in the low-pressure setting you get a great foam stream. 450-feet away from the eductor using 1.75" hose, and 800-feet using two-inch hos Be advised that older foam eductors may not proportion AR-AFFF accurately. Many were designed before the more viscous AR-AFFF foams were in wide spread use. They will proportion a little lean with AR-AFFFs. I'd bump the meter from 3% to 6% when using 3/6 foams, or to 3% when using 1-3% foam.

Tip: Remove the filter from your foam pick-up tube if you are using AR-AFFF's with older eductors. This will eliminate one of a couple restrictions in the older designed eductors.

I would put a foam concentrate tank on-board. Have the tank's (1"+ I.D.) foam concentrate hose terminate at a stainless steel or brass shut-off valve somewhere on the pump panel. Put a check valve and tee at the tank's outlet with a fresh water flush line that back-flushes the foam tube from tank outlet to the shut-off valve. Use a brass, poly or stainless cam-lock connector on your foam eductor pick-up tube. When you need class B foam, put the eductor on any discharge and connect the pick-up tube to the foam tank line. When the tank is empty, disconnect the tube from the tank outlet and use foam pails or a drum to keep the system going. Flush it by sucking up five gallons of fresh water. If you are using TFT's new self-flushing foam eductor, simply push the flush button, which cleans interior works of the eductor and pickup tube. There is no need to disassemble or bucket flush this one.


Foamidget

Tip: Foam eductors do not need nozzles to make foam/water solution. Using a 100 gpm eductor, without a nozzle at the end of the hose, you can fill a folding tank or truck's booster tank with foam solution in minutes - Use 800 ft. of 1.75" hose, 1600 ft. of 2" or 2600 ft. with 2.5" hose.

Question 10: How big an eductor do we need; at what pressure, and how far will the stream reach? Reply: In terms of fire-fighting power, a 60-gpm-foam eductor will handle a 600 square foot, gasoline spill fire, or a 300 square foot ethanol or E-85 spill fire. Provided you have foam that's UL fire tested and listed for an ethanol or E-85 application. Yes, bigger is better. A 100-gpm eductor will handle a thousand square foot fuel oil spill fire, or a 500 square foot ethanol fire. Again, providing you have the right foam. A 250-gpm eductor will handle a 2500 sq. ft. spill fire, and a 350-gpm eductor will handle 3500 sq. ft. Multiply the eductor flow rate by ten to determine firefighting power on simple hydrocarbons (diesel) and by five for solvents like ethanol E-85 or acetone.

The rules of operation are the same for most foam eductors: two hundred psi at the inlet of the

eductor. Don't exceed 130 psi combined hose and nozzle back pressure. For example: one-hundred psi for nozzle pressure, thirty psi for hose or elevation loss. Just don't exceed 130-psi on the outlet of the eductor, or 65% of the eductor's inlet pressure. For this reason, it's a good idea to fit your eductors with Go-Gauges® - outlet pressure gauges.

Remember, stream reach is important in terms of firefighter safety. The higher the flow rate the greater the stream reach. A 100 gpm foam stream at 100 psi will reach 60 - 70 ft. A 250 stream will go 100 - 110 ft. and 500 gpm will throw +/- 150 ft. Go to 1000 gpm and you will reach about 190 - 200 ft.

A word on portable, suction side foam eductor kits: Foamidget®
Otherwise known as portable around the pump foam systems. A Foamidget® can turn any pumper in your fleet into a crash truck. SSE's have one moving part. (no pumps or flow meters.) These devices use the fire pump energy you already bought to drive them. The difference between one of these and a discharge side foam eductor is that it's screwed into the suction inlet of your pump, can flow up to 1500 gpm of solution and there are no distance limitation between pump and nozzle(s).

Regional haz-mat folks can carry a couple SSE's on a specialty foam trailer that shows up with enough foam and proportioning capabilities to run a major incident for a couple hours. Either way, it's simple. The best part is, they're transferable from rig to rig. Contact me at jimcott@mac.com for more information on SSE's and foam trailers.

Question 11: How much foam should we have on hand? Reply: NFPA 11 says one should have a fifteen-minute supply of properly listed foam concentrate on hand to handle an ignited spill (one inch or less in depth). Therefore, fifteen minutes of operation at 1% uses, at minimum, fifteen gallons; at 3% you use forty-five gallons; and at 6% you use ninety gallons of foam concentrate. Now you know why National Foam developed 1-3% AR-AFFF for fire department use.

Question 12: What's the story on those yellow foam boxes? Reply: You are no doubt referring to the TFT, PRO/pak®. This is an item that is, strictly speaking, for first-aid use. The total solution throughput is on the order of twelve gpm. You can cover a 120 sq. ft. fire or a parking lot if the spill is unignited. Its great for a spill flowing into a storm drain. Set it up at the storm drain and safely turn it on and off up-wind at the engine.The pro/PAK and Universal Gold combination is, in my opinion, the best foam and application inventions to come down the pike for the department that needs small quantities of accurately proportioned foam.

Question 13: A neighboring Department just started using something called, Emus-A-Flame. They claim it to be better than AFFF. Have you heard of it, or products like it? Are the claims true?

Reply: Yes, I've heard of many: Knockdown, F-500®, Pyro-Cool®, Cold-Fire®, FireAde®, FlameTamer®, EmulsaFlame® and FireOut®, to name a few. And yes, the claims are almost true. NFPA 18 deals with wetting agents and emulsifiers, ionic and anionic detergent surfactants. Historically the NFPA 18 committee has dealt with issues that are slightly less than main stream in terms of Fire Department application of water additives used as flammable liquid extinguishing agents. NFPA 11 deals with issues that revolve around flammable / combustible liquids and fire fighting foams. I would say wetting agents are more in the realm of class A foams (NFPA 18, 1145 &1150) than anything else. My best advice is to ask Exxon/ Mobile or your nearest FAA airport Fire Chief if such products are approved for use in fuel rack systems or ARFF vehicles. Check the DOT Haz-Mat Response guide and or gasoline MSDS neither authority says anything about wetting agents.

That said - The chemistry that enables water to do a better job of soaking is pretty much the same chemistry that allows water and oil to mix as seen on TV dish detergent advertising. The detergent science driving this technology is not new to the fire protection industry. Products like these have been commercially available for more than forty years under at least a dozen trade names. Recently, several detergent suppliers have gotten in the game with chem-bio speak literature and “scientific break-through” news releases that advertise what we have always known about detergents, water and oil.

If you’re a user of such water additives, be advised they may not secure a fire or a hydrocarbon fuel spill that has soaked into the earth, as agitation of the fuel and the fire fighting solution is very important to its successful use. Polar solvents will be diluted with the water that make-up ninety-four parts of these fire fighting solutions. Nothing in our super soaps will allow water and alcohol to mix any better than they already do. Alcohols have a magnetic attraction for water. Water and oil have opposing magnetic properties and is why they don’t mix. Emulsifiers (ionic and anionic surfactants) cause water and oil to temporally bond. Use these products on high flash point, oil based fuels only.

I suppose It can be said that these agents are OK for small hydrocarbon fuel spills that have a depth (unto themselves) of one inch or less. Sort of like oil in a training pit. Keep in mind that detergent solutions must be forcefully mixed or blended with oil base fuels in order to lock up the hydrocarbons. Have you ever seen a sales demonstration where these agents are gently applied to the surface of a gasoline fire with no water bottom? Not likely.

Applying a mist over a pooled gasoline spill fire with these products can take several long minutes to create a safe emulsion, if a t all. In the end, there is nothing faster and cheaper than a properly listed, AR-AFFF when it comes to dealing with fires in high performance, unleaded, oxygenated gasoline. Ask Exxon/Mobil, Chevron or Sun or Hess what they use in systems that protect tank truck loading racks or what’s in stock at tank farm fire stations. Ask the Fire Chief on a modern aircraft carrier what they use should the Forestall monster get out of the cage again. I can tell you it isn’t detergent based wetting agents. When it comes to spill fire extinguishing and scene security, a visible foam blanket is better assurance the ground you are walking on is safe. Although emulsifier technology is based on sound science, it’s my opinion that these products are better left to the tow truck guys and clean up folks at NASCAR tracks.

Since 1988, Jim Cottrell has been National Foam and TFT’s eastern regional factory agent and product development consultant. He chairs the IFSTA Foam Technical Committee and is a member of the Underwriters Laboratories, Foam Standards Panel. Jim is an accomplished investigator, speaker and a nationally recognized instructor /lecturer. Jim’s Combat Support Products Division manufactures specialty firefighting appliances.

See training video postings from arafff136 on YouTube, or www.combatsupportproducts.com/Video_Library/Archive.html