MISCELLANEOUS

FOAM CONCENTRATE COMPATIBILITY

There is no doubt that the subject of compatibility between different foam concentrates is a complicated and complex issue. However, it can be broken down into several different areas and the various concerns explored. To make this a straightforward subject, consider the following:

What is compatibility? In other words, compatibility must first be defined.

Compatibility of foam concentrates, for the purpose of this bulletin, means that two or more foam concentrates of the same type, but from different manufacturers have the ability to exist together in the same storage vessel for extended periods of time without degradation and/or loss in fire fighting performance.

Is this possible?

Yes it is possible and moreover, it is a requirement of the U.S. Military Specification MIL-F-24385 (Latest amendment).

The U.S. Military specification sets forth compatibility requirements for any and all A.F.F.F. concentrates that appear on the Q.P.L. (Qualified Products List). This is not only a requirement; but a detailed procedure is defined for proving proper compatibility.

The U.S. Military Specification states:

The concentrate of one manufacturer shall be compatible in all proportions with the concentrates furnished by other manufacturers listed on the qualified products list (QPL).

This requirement ensures that the resulting ad-mixtures meet the following minimum requirements after elevated temperature storage for 10 days at 65ºC ± 2º (150ºF).

- Foamability
- Film Formation & Sealability
- Fire Performance 28 sq. ft. (2.6 sq. m.) Fire Using Fresh & Salt Water Pre-Mix Solutions
- Stratification
- Precipitation

Now that we have established that some form of compatibility is really possible and can be proven by independent means, we can go further into this issue with a degree of comfort. Since we now know that the largest single user of A.F.F.F. concentrates in the world produces admixtures of A.F.F.F. concentrates for ready use, almost every day and experiences no problem with this practice.

It should also be pointed out that not all A.F.F.F. concentrates (i.e. freeze protected versions, AR-A.F.F.F. (Alcohol Resistant) A.F.F.F. or 1% A.F.F.F. concentrates) conform to the exacting standards of the U.S. Military Specification and as such a simple statement of compatibility under all circumstances cannot be offered or made.

Always remember that the basic raw material packages are similar and as such compatibility between various manufacturers LIKE products can be expected without experiencing a problem.

There are perhaps three issues to review when considering the mixing of foam concentrates from different manufacturers and these issues are:

- Regulatory
- U. L. Listings/F. M. Approvals
- Physiochemical/chemical compatibility

REGULATORY

If we accept NFPA 11 as the regulatory “body”, that pamphlet currently (2001) states:

2-4 Concentrate Compatibility.
2-4.1 Compatibility of Foam Concentrates.

Different types and brands of concentrates and solutions might be incompatible and shall not be mixed in storage.

Foams generated separately from protein, fluoroprotein, FFFP, and AFFF concentrates can be applied to a fire in sequence or simultaneously.

This statement might be read as prohibiting the mixing of different brands of foam concentrates and/or it can be read as prohibiting the mixing of different types of foam concentrates. Indeed this statement could be read that neither option is possible and no foam concentrates of different brands and/or types can be mixed. The two issues are quite different, since hopefully nobody would deliberately mix two different TYPES of foam concentrate and expect no detrimental result. One could speculate on what changes may occur, or be required in future revisions of NFPA 11, but that would be just that; pure speculation. We have to provide accurate information on what is available today.

One could argue inconsistency between NFPA 11 and the U.S. Military Specification, however, these two documents do not relate to one another and the purpose of each individual document is specific and defined. The Military must, in time of war eliminate any problem with compatibility of fire fighting foam concentrates. However, since U.S. Military Specification foam concentrates are provided to the commercial sector, NFPA 11 might apply. It seems difficult then to understand or put into perspective what action is justified. Something is amiss, if we state that when Military Specification foam concentrates from different manufacturers are used by the Military, they are compatible, but those same foam concentrates when used by a commercial user are not compatible.

The NFPA Standards do not provide a method of determining compatibility. Only the Federal Government, as part of MIL-F-24385 requires compatibility and provides a formalized method of determining this compatibility.

U. L. LISTINGS & F. M. APPROVALS

To obtain a U. L. Listing or F. M. Approval the foam concentrate, proportioning device(s) and discharge device must ALL be U.L. Listed or Approved in combination with one-another. Change one item and the Listing might be void, unless a “cross-Listing” using another component exists. The issue of U. L. Listings & F. M. Approvals typically applies to fixed foam system installations, where the performance of a sprinkler head may be critical to the overall performance of the system on a given fuel, particularly if polar solvent or water miscible fuels are involved.

U.L. LISTED COMBINATIONS

A U.L. Listed combination might be an Arrow Bladder Tank, Arrow Ratio Controller, 3M A.F.F.F. Concentrate and a Reliable Model “G” sprinkler head. In the event of a system discharge, could the foam concentrate be replaced with Buckeye A.F.F.F. concentrate? The answer, in this case is YES, but it does depend upon the amount of cross-listing available. In other words, how much money is Buckeye willing to spend in achieving the cross-listing? In this particular case, Buckeye has it’s A.F.F.F. concentrate U.L. Listed with the Reliable Model “G” sprinkler head, furthermore, Buckeye has also conducted testing for U.L. and obtained a cross-listing for the Buckeye A.F.F.F. concentrate in an Arrow Bladder Tank with an Arrow Ratio Controller. Thus substituting the Buckeye A.F.F.F. Concentrate in this particular system will still maintain a U.L. Listing. It is fair to say that this is a manufactured example, but nevertheless, it is a typical but yet real example. Whenever a substitution of a component is required, the overall system performance must be reviewed to ensure NO degradation in fire protection engineering. Based on physical testing it can be determined that not all sprinkler heads are created equal. In some cases, the design of the sprinkler head deflector, while they may all look-a-like, do not always produce the same quality of finished foam and after all, finished foam quality has a lot to do with good fire fighting performance. There are also differences in foam quality when comparing the upright sprinkler to the pendant sprinkler of the same type & brand. Thus, we cannot say that simply changing the sprinkler head would not affect the fire fighting performance of the system, since it just might be the key to the difference in extinguishment or conflagration.

When evaluating a fixed foam system for a change, look at the following points:

- Is the sprinkler head U.L. Listed with the foam concentrate?
- Is the sprinkler head U.L. Listed at the same pressure & flow rate?
- Is the proportioning device U.L. Listed with the foam concentrate? (This involves proper ratio controller orifice plate sizing).
- Is the sprinkler head and foam concentrate U.L. Listed for the fuel type(s) involved?

In the event that a partial refill of a foam concentrate storage tank is required, it would be wise to take a sample of the existing foam concentrate and test it for continued use. A sample of the existing foam concentrate can be sent to Buckeye Fire Equipment Company, along with The Request For Foam Analysis Form for testing, just to make sure the product is suitable for continued use. This move

is prudent, just in case the foam concentrate in the storage tank has degraded or become diluted by other means. After all, compatibility only means something if both foam concentrates being mixed together are in good working order. The resulting ad-mixture must be equal to or better than the performance expected from the individual foam concentrates in the mixture.

One or two manufacturers offer "standard-grade" foam concentrates. These products are low cost foam concentrates that generally end up in the export market place. Their performance is well below (>50%) that of a normal U.L. Listed foam concentrate and as such mixing a U.L. Listed foam concentrate with a "standard-grade" foam concentrate will bring down the overall performance of the U.L. Listed product and the resulting ad-mixture. It is for this reason that familiarity of both products forming the ad-mixture is required before the two are mixed together.

WHAT ABOUT THE AVERAGE FIRE DEPARTMENT USING U.L. LISTED FOAM CONCENTRATES?

In most cases, Fire Departments use a variety of handline nozzles and some high output monitor nozzles up to about 1,250 gpm. (4,740 lpm). It would also be fair to say that most Fire Departments apply foam with a non-air aspirating nozzle, which more than likely is NOT a U.L. Listed foam nozzle. Thus any stated or implied "Approval" would automatically be void, since at least one part of the equation is not approved, the rest of the equation falls apart. This does not mean that the foam does not work, as can be seen from successful extinguishments, using a variety of non-air aspirating nozzles, this practice works every day. The Average Fire Department buying a U.L. Listed foam concentrate gets an independent third-party verification that the foam will work in a variety of hardware, generally in accordance with the devices used in that Average Fire Department.

There are also emergency operational circumstances to consider. In the event of a large fire for example, one manufacturer may not be able to supply the total quantity of foam concentrate required for total extinguishment. In this case, it would be necessary to mix the available foam concentrates together in a common container on site - PROVIDING THEY ARE OF THE SAME TYPE to achieve the desired result; which is an uninterrupted supply of foam solution to the fire area. In the event it is decided that mixing of one or more different manufacturers similar foam concentrates in the same container is required, it would be prudent to place an individual in-charge of this operation. This one individual would then be responsible to ensure that in fact similar foam concentrates were mixed together and that no obviously different foam concentrate were shipped to site, that may affect the performance of the ad-mixture. This individual would also ensure that no "expired" or "watered-down" foam concentrate was shipped to the scene. This individual would be designated as "The Foam Concentrate Logistics Officer" and should NOT be a manufacturers representative!

Under normal circumstances, there is no chemical or physical reason why the same type and percentage of foam concentrate manufactured by one manufacturer should not be compatible with the same type and percentage of foam concentrate manufactured by another manufacturer. This applies to both standard foam concentrates and to alcohol resistant foam concentrates.

PHYSIOCHEMICAL/CHEMICAL COMPATIBILITY

Alcohol Resistant A.F.F.F. concentrates:

The alcohol resistant or AR-A.F.F.F. concentrates are chemically and visually dissimilar when compared to the standard A.F.F.F. concentrates and must be treated as such. The special additive that gives these products their high performance on polar solvent fuels can make them vulnerable if they were to be mixed with a standard A.F.F.F. concentrate. In other words, both standard A.F.F.F. concentrates and AR-A.F.F.F. concentrate contain a proprietary mixture of solvents in a carefully developed blend. In the event an ad-mixture of standard A.F.F.F. and AR-A.F.F.F. were produced, the percentage of solvents in the admixture could cause the polysaccharide to be out of balance with the mixture and precipitate, thus destroying the resulting ad-mixture.

WHY DOES COMPATIBILITY BECOME AN ISSUE?

In some cases compatibility becomes an issue when an incumbent supplier tries to exert the Fear Factor! In other words, the incumbent supplier will put enough doubt in the mind of the purchaser, to where that purchaser will be so fearful of mixing two different brands, that simply to avoid the issue, they will continue with the incumbent - even if it means paying a higher price.

Various statements have been made, particularly when the AR-A.F.F.F. concentrates were in question. One particular manufacturer would state that due to the higher apparent viscosity, the AR-A.F.F.F. concentrates would layer; i.e. sit on top of each other. This is true, they do, but it is interesting to note that the same product, when mixed together, will also layer, simply due to the apparent static viscosity. This can be easily demonstrated as shown in the following picture:

You will note that the sample of foam concentrate in the glass beaker shows two distinct colors. This sample is in fact the same foam concentrate, but the upper level of foam concentrate was premixed with a vegetable dye, before it was placed on the lower layer, to show that while layering does occur, it occurs even with the same product. It does not simply require that the two products are from different manufacturers. The fact that the two products do not initially intermix should not be a cause for alarm. During fire fighting operations, it would not be noticeable when one product has been consumed and the other is being used.

DISSIMILAR FOAM STREAMS APPLIED TO THE SAME FIRE

If two foam streams are being applied to a fire simultaneously and one is an A.F.F.F. and the other an AR-A.F.F.F. or a fluoroprotein, (or any similar combination) there should be no problem with fire fighting performance of the foam when it either lands on the fuel surface or butts up against the other foam blanket. The finished foam blankets will neither react with one another, nor will they repel one another. They will simply mesh together and effectively extinguish the fire.

CLASS A FOAM CONCENTRATES

Class A foam concentrates are formulated with a unique blend of hydrocarbon surfactants and water and are typically used for wild-land applications in forested areas. Since these products are used in remote areas, compatibility with other brands is fairly important since resources could be limited. Buckeye Fire Equipment Company has conducted a compatibility study with products such as Ansul Silv-Ex, Astaris Phos-Check and some formulations of Chemguard Class A Foam Concentrates. This testing has shown no degradation of any kind in performance of the resulting admixtures. Since formulations of Class A foam concentrates can change more frequently than other types of foam concentrates. Our Research & Development Department is continually evaluating new formulations from other manufacturers, so please contact your local Buckeye Representative for the most up-to-date information concerning the compatibility of Class A foam concentrates.

LATEST NEWS

The issue of compatibility came into prominence in the middle of FY-2000, when 3M announced that it would withdraw their Class “B” fire fighting foam concentrates which included all of the A.F.F.F. concentrates. This move would leave a number of 3M foam concentrate users, including the 3M Chemical Plants without a true substitute for the foam concentrate currently in their storage tanks. As a result of this potential void, Buckeye Fire Equipment Company conducted a full-scale compatibility study to evaluate ad-mixtures of various foam concentrates under long-term accelerated ageing storage conditions. By conducing this study, Buckeye can categorically state that there are no problems when Buckeye Foam Concentrates are mixed with 3M foam concentrates in any proportion, in the same storage vessel. We can go further and state that additional testing for compatibility with Ansul, (Standard Viscosity Products*), National Foam, (Kidde), Chemguard and Angus has shown no signs of foam concentrate separation, no loss in foamability and no reduction in film-formation or sealability, when compared to base line samples on a standard array of test protocols. These tests detected no physical or chemical incompatibility or decrease in performance when compared to the stand-alone product samples.

In the event a supplier, whether manufacturer or distributor is adamant that the two products cannot be mixed together, ask for a letter that addresses the following two points:

- The chemical reason why the two foam concentrates are not compatible
- The performance reason why they are not compatible.

In some cases, perhaps on very special fuels, specific test data may not be available and as such replacement of the foam concentrate might not be practical. But this is not a compatibility issue; this is a fire performance issue.

* Ansul has a Low Viscosity AR-A.F.F.F. concentrate which when manufactured uses partially hydrated polysaccharide and as such this product may not be compatible with any other AR-A.F.F.F. concentrate. Over time this product shows a tendency to increase in viscosity as the polysaccharide becomes more hydrated.