

TI-033 – Mixing Foam Concentrates

One of the most burning questions related to the use of firefighting foam in big events is the question for miscibility of concentrates:

If the going gets rough, firefighters need to ensure a continuous flow of foam onto large fires to avoid an unacceptable loss of push of the foam blanket or footprint established to that point in time. With the risk to put any success gained to that moment at risk.

Continuous foam application also means continuous foam agent supply which results in the need to switch between foam concentrates if the supply of a particular one isn't granted throughout the entire duration of engagement.

But even beyond that mixing foam agents for the purpose of backfilling storage capacities after a test, or an event or during a transition between different agents are reasons to ask the question: *Can the foam concentrate A be mixed with B?* The answer to this question needs to consider the two areas of key aspects:

- The technical aspects: Are the foam concentrates that are supposed to be mixed compatible to each other?
- The legal aspect: Is there any legal requirements to be considered before mixing foam concentrates?

Technical Aspects of Mixing Foam Concentrates

Firefighting foam concentrates are balanced mixtures of chemicals in an aqueous solution. The chemicals contained have different functions – some are in to provide certain properties of the concentrate (e.g. freeze protection agents), others contribute to the performance and properties of the foam made from it.

All ingredients are present in a solution, meaning the individual chemicals have the closest possible contact with each other. Consequently, the mixing of two or more solutions (=concentrates or premixes) also leads to a very intense contact between the ingredients contained in either one of them.

Mixing solutions therefore results in the maximum potential for interactions such as:

- ❑ Chemical reactions leading to new chemical substances (e.g. ion exchange between surfactants)
- ❑ Physico-chemical interactions pushing one or more ingredients out of solution (absorption of solvents, evaporation, ...)

- ❑ Aggregation of ingredients leading to formation of lumps or gels (e.g. interaction of polymers with non-compatible substances)



Figure 1: coagulation – formation of lumps by mixing two incompatible foam concentrates

Any of the aforementioned interactions has its timing, meaning: depending on the type and amount of chemicals involved and the reaction conditions (temperature, agitation, ...), the reaction may happen very quickly (such as turbidity or precipitations) or take some time (like crystallization, drop-out of polymers etc.).

Therefore, it does make a difference if the mixture is supposed to be used immediately or to be stored: the longer a mixture of foam concentrates is being stored, the more likely the occurrence of adverse interactions will become if any at all.

Storage of Mixtures

Generally spoken: **Mixtures of firefighting foam concentrates of either different types or same type but different manufacturers shall not be stored.**

In opposite hereto, storing mixtures of different batches of *the same product* typically is not an issue. Still some precautionary measures need to be considered:

- Run a performance-/quality-check on the older of the two batches: degradation products may have the potential to self-accelerate further degradation which makes the mixture adopt the age of the oldest mixing component.
- Beware of critical ingredients such as PFAS: legal limits may have been sharpened, hence mixing an old non-compliant stock with new compliant product may render the mixture non-compliant.
- The mixture should be checked annually to capture changes in quality or performance.

Mixtures of different foam concentrates¹ should never be stored as adverse interactions and changes may occur long time after the mixing and lower or terminate the fire-performance.

Legal Aspects of Mixing

Chemical products such as firefighting foam concentrates are subject to chemical legislation hence producers of such mixtures must meet certain requirements for the provision of mixtures to professional users (such as fire departments):

- The mixtures must be classified and labeled according to the legal requirements.
- The producer must provide the professional user with an EU safety data sheet.

Providing a chemical mixture that has hazardous properties according to EU laws to professional users without a prior proper classification labelling and information (safety data sheet) is a criminal offense and is punishable by severe penalties.

The Golden Rules

The following golden rule should be the starting point for any case mixing of agents is considered:

Do not mix – unless you ultimately have to!

This rule even gains more weight considering the more complex and sensitive composition of many fluorine free foam concentrates.

However, as stated above in reality mixing foam concentrates is occasionally unavoidable. To stay as safe as under this condition possible, the following rules should be considered.

Mixing for immediate use:

- Never mix foam concentrates of different types

or -manufacturers!

- Never mix more than two concentrates!
- Beware: the mixture is not performance tested! Its performance (foaming and extinguishing!) may differ drastically from the one of any component.

If it is for storage (even short term):

- Always test the concentrates prior to mixing for compatibility
- Positive testing does not guarantee long term stability or performance
- The mixture adopts the age of the oldest component, therefore test the older component for performance prior to mixing it!
- Beware: the mixture is not classified and labelled according EU chemical laws. Use of such mixtures in work environment is not allowed!

Ready expanded foam can be applied together with other foams in any ratio with no adverse interaction. However, depending on the type of foam (low-, medium-, high-expansion) foams having a higher specific gravity may flow under those having a lower specific gravity.

Hence, topping up a medium-expansion foam blanket with low-expansion foam may not work.

Disclaimer

All information given in this technical information are based on our best knowledge at the time of this revision. This Technical Information remains subject to alterations and revisions. Please do not hesitate to contact us for the most recent edition.

¹ of the same manufacturer or different manufacturers

				
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