

Fire Fighting Foam Storage Recommendations

This data sheet applies to the following Angus Fire foam concentrate products:

- Natural protein-based products: Niagara, Alcoseal, Petroseal, FP70 Plus, FP70, FP350, FP570, FP600, Nicerol, Nicerol HC.
- Synthetic detergent based products: Tridol ATF, Tridol S, and Tridol C.

SHELF-LIFE

Angus Fire offers a range of superior quality foam concentrates that are specially formulated to ensure exceptional storage stability as well as fire fighting performance.

A shelf-life of at least ten years can be expected if stored properly according to these recommendations. This figure is based on laboratory-based accelerated ageing tests.

However, to ensure satisfactory performance they should be sampled at least annually as recommended in NFPA 11, (1998) Section 8-2, "At least annually, an inspection shall be made of foam concentrates and their tanks or storage containers for evidence of excessive sludging or deterioration. Samples of concentrates shall be sent to the manufacturer or qualified laboratory for quality condition testing." The Angus Fire Foam Testing Service will perform such tests on foam concentrates or foam premix solutions.

SHIPPING CONTAINERS

Foam concentrates may be stored in its original shipping containers. It is available in 25 litre black plastic drums, 210 litre (55 US gal) blue plastic drums, and 1000 litre IBCs. All containers comply with UL 162 (7th Edition) and UN recommendations. The maximum safe stacking height for 25 litres plastic drums is two high without pallets or 4 high with pallets (2 high per pallet); for 210 litre plastic drums is 2 high (with or without pallets); and for IBCs is 2 high. Plastic drums should not be stored in direct sunlight.

STORAGE TANKS

Foam concentrates are suitable for transferring into bulk storage tanks for long-term storage.

Materials of Construction

Foam concentrates have a neutral pH and generally no corrosion problems will occur with metals or plastics (except where noted below). Storage tanks should be fabricated from or be lined with the following materials:

- Mild Steel (uncoated): Not recommended for synthetic detergent based foam concentrates. Ferrous metal ions can poison the foam concentrate leading to reduced fire fighting performance. Suitable for use with natural protein-based foam concentrates, although there may be some slight initial etching which will not affect the tank or contents. Natural protein based foam concentrates quickly inhibit this process by forming a thin protective layer of calcium sulphate on the surface of the mild steel.
- Mild Steel (coated): Surface preparation and coating should be performed by qualified personnel in accordance with Angus Fire recommended guidelines.
- Stainless Steel: 316L and Duplex 2205 grades. Tanks with welded construction should have all joints treated to ensure consistent properties close to welds. There may be very slight pitting which will not affect tank or contents.
- Aluminium (coated): Surface preparation and coating should be performed by qualified personnel in accordance with Angus Fire recommended guidelines.
- Glass Reinforced Plastic (GRP): Fibreglass with epoxy resin. Not recommended for foam systems involving pressure displacement.
- High Density Polyethylene (HDPE).
- Polypropylene.

The use of zinc, galvanised materials, and aluminium in storage tanks, pipework, and machinery handling foam

concentrates should be avoided. In the event that foam is being replenished into an existing system where zinc or galvanised materials were used in original construction, it is advised that some means are provided by which the system can be flushed through with water and drained after use.

Gaskets, seals, and bladders may be fabricated from all commonly-used elastomers:

- Ethylene Propylene Diene Monomer (EPDM) or Ethylene Propylene Rubber (EPR) (eg. AP Rubber).
- Butyl rubber (modified iso-butylene) (eg. Bucar, Polysarbutyl, MD551, Buna N, Nitrophenyl).
- Silicone (eg. GE Silicone, Rhodorsil).
- Fluoroelastomer (eg. Viton).
- Neoprene (eg. Perbunan C, Butador).
- Nitrile Rubber (butadiene acrylonitrile copolymer).
- Natural rubber (or Latex).

Fittings in foam concentrate pumps and valves may be made from brass, bronze, and gunmetal. Dissimilar metals in contact with one another (eg. a stainless steel tank and a brass valve) will lead to electrolytic action. This will cause galvanic corrosion of the metals. Dissimilar metals should either be avoided or a non-conducting gasketing material should be used in the joint.

Pipework

The choice of pipework materials depends on the anticipated contact time with the foam concentrate. For continuous contact the same materials of construction apply as for storage tanks (see above). PVC, copper, brass, and bronze pipes are also acceptable for continuous contact. For intermittent contact normal pipework materials are satisfactory subject to normal engineering criteria.

Inlet pipework should be located at the base of the tank to avoid excessive foaming during filling. Outlet pipework should be located above the base of the tank to prevent clogging in the event of any minor sediment that might have formed or other foreign materials in the tank.

Pipework systems should be designed to prevent water and other liquids accidentally entering the tank and foam concentrate accidentally escaping from the tank.

Foam concentrates are suitable for decanting into small containers. Agitation and air intrusion should be kept to a minimum if foam concentrate pumps are used.

Evaporation

If foam concentrate is allowed to evaporate freely, the water and solvent in the concentrate will evaporate. With Alcolseal or Tridol ATF foam concentrates this may cause a skin of polymer to form on the surface of the concentrate which could plug proportioning orifices.

To minimise evaporation losses, the concentrate tank should be sealed and a pressure vacuum vent installed to

break the seal when the concentrate is required.

Evaporation will also be reduced by keeping the concentrate tank full. However, an ullage of 5-10% of the tank volume (eg. expansion dome) should be maintained to allow for differences in thermal expansion coefficients between the tank materials of construction and the foam concentrate.

If it is not possible to seal the tank, air ventilation may be provided by breathers fitted with cowls. Alternatively a nitrogen inerting system comprising a nitrogen layer maintained above the concentrate at a pressure fractionally above atmospheric pressure will reduce evaporation and ensure that leaks are nitrogen less rather than oxygen gain. A layer of hollow plastic spheres, either polypropylene or polyethylene, or a 3-6 mm layer of hydraulic mineral oil may be floated on the surface of the concentrate to reduce evaporation.

Flushing

Storage tanks, pipework, and pumps that have been filled with foam concentrate or solution should be flushed with clean water and drained after use. The need for flushing storage tanks falls into two areas:

- When changing foam concentrate stored in an existing tank, or after commissioning: The foam system should be emptied of any foam concentrate previously contained in it (or water used for hydrostatic tests), cleaned, and dried prior to filling it with the final charge of foam concentrate. Particular care should be taken when changing from synthetic foam types. Drain down system - open all valves. Fill foam tank with water and allow to drain. Repeat. Backflush through outlet using sufficient water as calculated to completely fill and overflow the tank twice. Allow to drain. Purge out all water, check to see foaming has ceased. If not continue to cycle through process until foaming has diminished. Set valves correctly. Fill slowly with foam concentrate to minimise frothing and formation of air pockets. Charge foam line to furthest designated valve so that foam concentrate is present in all pipes where it is required. Drain foam concentrate from any pipes where drying out could occur and rinse through with pressure hose reel or similar.
- In normal usage of system: This presumes it has been designed to avoid "dead-legs" in the system and drainage/flushing points are included to facilitate preventative maintenance. Judicious use of high pressure water regularly will enable pipework to be flushed and drained to dry so preventing any drying out of foam concentrate which would lead to the deposition of any solid material. Drain and flush until foaming diminishes.

Avoid ullages greater than 10%. Use of a transparent bottle filled to half level and shaken regularly will assist in judging the cessation of frothing.

When using natural protein-based foam concentrates or Tridol ATF in locations where drained areas may be heated

(pipework, recently operated pumps), flushing should be carried out immediately after use to prevent localised drying-out of foam concentrate which could result in the deposition of solid material.

Bunding

In some instances there may be a need for bulk foam concentrate stocks to be banded. This will depend on the circumstances of a particular site, and the relevant enforcing authority should be consulted.

COMPATIBILITY

Foam concentrates must not be diluted or contaminated by foreign materials or other types or brands of foam concentrate. Such mixing may lead to physico-chemical changes in the product and a reduction in or loss of fire fighting capability. This is recognised by NFPA 11 (1998), Section 2-4.1, "Different types and brands of concentrates and solutions might be incompatible and shall not be mixed in storage".

TEMPERATURE

The maximum storage temperature is 49°C (120°F) although temperatures up to 60°C (140°F) are acceptable for short periods. If ambient temperatures exceed 35°C (95°F) then storage vessels should be shaded or located indoors.

The Freezing Point and Lowest Use Temperatures (LUT) at which foam concentrates will proportion correctly are

available on the product data sheets. If ambient temperature is below the LUT or freezing point then storage vessels should be fitted with insulation lagging. Do not add freezing point depressants such as ethylene glycol or any proprietary brands of antifreeze. Repeated freezing and thawing have no adverse effect on the performance of foam concentrates. However, it should be noted that foam concentrates expand on solidification and, like water turning into ice, may damage a completely rigid container.

In accordance with UL 162 (7th Edition) foam concentrate shipping containers are marked with the minimum and maximum storage temperatures. Details of UL Listings are available on the product data sheets.

PREMIX

The following foam concentrates are suitable for storage as a premixed solution: Alcolac 3-6, Petrosol 6, FP570, FP600, Tridol S (all grades), Tridol C (all grades). Storage of premixes is generally not recommended for periods longer than one year.

The following foam concentrates are unsuitable for storage as a premixed solution: Niagara 3-3, Alcolac 3-3 (premix grade available on request), Petrosol 3, FP70 Plus, FP70, FP350, Nicerol, Nicerol HC, Tridol ATF 3-3 LT, Tridol ATF 3-6.

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