

# Fire Fighting Foam - "Jargonbuster"



## A

**Aeration:** The introduction (or entraining) of air into a foam solution to create bubbles that result in finished foam.

**AFE:** See Angus Fire Engineering.

**AFFF:** See Aqueous Film-Forming Foam.

**Alcohol Resistant (AR):** A foam concentrate for use on polar solvents in addition to hydrocarbons. Also called Multipurpose.

**Alcohol Resistant Aqueous Film-Forming Foam (AR-AFFF):** Pronounced AR-A-triple-F. eg. Tridol<sup>®</sup> ATF. AFFF that is suitable for use on polar solvents in addition to hydrocarbons.

**Alcohol Resistant Film-Forming FluoroProtein (AR-FFFP):** Pronounced AR-triple-FP. eg. Niagara<sup>®</sup> and Alcoseal<sup>®</sup>. FFFP that is suitable for use on polar solvents in addition to hydrocarbons.

**American Bureau of Shipping (ABS):** US classification society which establishes and administers standards known as "Rules" for the design, construction, and periodic survey of ships and other marine structures. Approves foam concentrates and foam equipment.

**Angus Fire Engineering:** Leading fire engineering contractor. Division of Angus Fire that combines the company's three core technologies to offer a unique total capability approach to fire suppression systems from initial design, through equipment supply, to full-scale commissioning.

**APE:** Alkyl phenol ethoxylate. Ingredient in some AFFFs and AR-AFFFs. Causing concern among environmental authorities because it is an oestrogen mimicker and suffers poor biodegradability. Not present in any Angus Fire formulation.

**Application Rate:** The rate at which foam solution is applied to a fire. Expressed as litres of foam solution per square metre of fire area per minute (L/m<sup>2</sup>/min). Typically between 4 and 10 L/m<sup>2</sup>/min.

**Application Time:** The duration of time over which foam is applied. This can be broken down into three definitions, Critical Application Rate, Optimum Application Rate and Overkill Application Rate.

**Approval:** Certificate that ensures a foam concentrate meets the minimum requirements of a particular test Standard. Standards range from UL162, Mil-F, EN1568 parts 1, 2, 3 and 4, etc.

**Aquatic Toxicity:** A measure of how poisonous foam is to creatures living in the water environment. See LC50.

**Aqueous Film-Forming Foam (AFFF):** Pronounced A-triple-F. eg. Tridol<sup>®</sup>. A synthetic foam concentrate containing detergent and fluorocarbon surfactant that forms a foam capable of producing a vapour-suppressing aqueous film on the surface of some hydrocarbon fuels. Provides rapid flame knockdown on short preburn, shallow spill fires (eg. aircraft crash fires), but not suited for use on long preburn, deep-seated fires (eg. storage tank fires). Developed in the 1960s,

AFFF is today largely replaced by the more sophisticated FFFP.

**AR:** See Alcohol Resistant.

**AR-AFFF:** See Alcohol Resistant Aqueous Film-Forming Foam.

**ARFF:** Aircraft Rescue and Fire Fighting.

**AR-FFFP:** See Alcohol Resistant Film-Forming FluoroProtein.

**Aspirated Foam:** Foam blanket obtained by mixing water, foam concentrate, and air. Expansion ratio typically 2:1 or more. Also called Finished or Expanded Foam.

**AVGAS:** Aviation gasoline. Similar to gasoline used in cars except that AVGAS has a higher octane rating.

**Avtur:** Aviation kerosene. This can also be referred to as Jet-A1 or Jet-A. Each name has a slightly different chemical make-up and certain impurities may be present in one brand when compared to the next

## B

**Backboard:** Metal sheet attached to back of test fire tray that enables foam to be applied gently on to a fire. Particularly important for Alcohol Resistant foams.

**Back Pressure:** Pressure loss or gain created by changes in elevation between nozzles and pumps.

**Bag Tank:** eg. Angus Fire Bag Tank Module. A device that controls the flow of foam concentrate into a BPP at a pressure that is balanced to water line pressure. Also called Diaphragm Tank.

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**Balanced Pressure Proportioner**

**(BPP):** eg. Angus Fire BPP. A foam concentrate proportioning system designed to inject automatically the correct quantity of foam concentrate into a water stream over wide flow and pressure ranges by balancing the pressure of a foam concentrate with that of the water supply. Used in combination with a bladder tank or balance valve.

**Balance Valve:** eg. Angus Fire Balance Valve. A device that controls the flow of foam concentrate into a BPP at a pressure that is balanced to water line pressure.

**Base Injection:** A technique used for the protection of fixed roof hydrocarbon fuel storage tanks where fuel-resistant aspirated foam is injected into the base of the tank and rises through the fuel to the surface to effect extinguishment. Expansion ratios typically between 2 and 4:1. Also called Sub-Surface Injection.

**Biochemical Oxygen Demand (BOD):**

The amount of oxygen consumed by aquatic micro-organisms in a specified number of days (usually 5 or 28) when metabolising an organic material such as foam concentrate.

**Biodegradable:** Capable of being broken down into innocuous products by the action of living creatures such as micro-organisms.

**BLEVE:** Acronym for Boiling Liquid Expanding Vapour Explosion. Explosive fire ball caused by the rapid escape of flammable gas discharging from sealed pressurised containers which have ruptured due to adverse heat exposure.

**Boilover:** Violent ejection of flammable liquid from its container caused by vapourisation of a water layer beneath the body of a liquid. It will generally only occur after a lengthy burning period in wide flash point range products such as crude oil.

**BPP:** See Balanced Pressure Proportioner.

**British Standards Institute (BSI):**

An independent national organisation that facilitates the production of standards, tests products, and assesses organisations against the national standard for quality management systems BS EN ISO 9001 : 2000. A member of ISO. Publishes BS5306: Section 6.1:1988 Specification for Low Expansion Foam Systems.

**Bund:** An area surrounding a storage tank which is designed to contain the liquid product in the event of a tank rupture. Also referred to as Dike.

**Burnback Resistance:** The ability of a foam blanket to resist direct flame and heat impingement such as would be evident in a partially extinguished fire.

**Bag Tank Module:** eg. Angus Fire Bag Tank Module. A device that controls the flow of foam concentrate into a BPP at a pressure that is balanced to water line pressure.

## C

**C6:** This is a name for any chemical with a carbon backbone consisting of 6 atoms. This commonly refers to a fluorinated foam utilising C6 chemistry. Angus Fire's C6 foam can be identified by the C6 superscript following the name, such as Niagara<sup>C6</sup>, Tankmaster<sup>C6</sup> and Tridol<sup>C6</sup> Ultra.

**C8:** This is a notation for any chemical with a carbon backbone consisting of 8 carbon atoms. This commonly refers to a fluorinated foam utilising C8 chemistry.

**CAFS:** Compressed-Air Foam System.

**CFR:** Crash, Fire and Rescue. In Australia, this may also mean County Fire and Rescue.

**Chemical Oxygen Demand (COD):**

The amount of oxygen required for the complete oxidation of a known quantity of an organic material such as a foam concentrate.

**Civil Aviation Authority (CAA):**

Organisation responsible for civil aviation.

**Class A Fire:** A fire in materials such as wood and paper where the cooling effect of water is of paramount importance in extinguishing the risk (CEN definition). Fires which occur in ordinary combustible materials, ie. wood, paper, rubber, and certain plastics, etc. (NFPA 10 definition).

**Class A Foam:** eg. Forexpan. Foam specially formulated for use on Class A fires. Essentially wetting agents that reduce the surface tension of water and allow it to soak into combustible materials easier than plain water.

**Class B Fire:** A fire involving a flammable liquid where a blanket or smothering effect is of first importance in extinguishment (CEN definition). Fires which occur in flammable liquids, oils, tars, lacquers, etc. and flammable gases (NFPA 10 definition). Fires in flammable and combustible liquids, gases, and greases (UL 162 definition).

**Class B Foam:** Foam formulated to be used on fires or spills of flammable and combustible liquids.

**Class C Fire:** Class C Fire: Fires involving gases or liquified gases in the form of a liquid spillage, or a liquid or gas leak (CEN definition). Fires involving energised electrical equipment (see Class E fire) where the electrical nonconductivity of the extinguishing agent is particularly important (NFPA 10 definition).

**Class D Fire:** A fire involving a metal such as magnesium, sodium, lithium, and potassium, etc (CEN definition). Fires which occur in metals such as magnesium, zirconium, lithium and potassium, etc. (NFPA 10 definition).

**Class E Fire:** These are fires involving electrical equipment such as heaters, computers, air conditioning units, etc. Although the fire will involve another class of fire (A, B, C, D, etc) special precautions should be taken due to the presence of high voltages. Hence a dedicated classification.

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**Class F Fire:** Fires involving cooking oils. These fires are generally controlled and extinguished by the use of an emulsification agent. Sometimes these fires are also referred to as Class K fires.

**Class K Fire:** See Class F.

**Cloud Point:** The lowest temperature at which foam concentrate remains clear. Applies only to synthetic foams.

**Control:** A reduction in fire intensity of approximately 90 percent.

**Critical Application Rate (CAR):** The minimum rate at which foam solution needs to be applied to a fire in order to achieve extinguishment.

**CEN:** Comite Europeen de Normalisation (French) or European Committee for Standardization (English). Brussels-based association of national standards bodies from the eighteen member countries of the European Union (EU) and the European Free Trade Association (EFTA). Currently drafting four new foam standards for low expansion foam on hydrocarbons, low expansion foam on polar solvents, medium expansion foam, and high expansion foam.

**Colossus:** Large-capacity mobile monitor for applying high quality aspirated foam on to large-diameter storage tank fires.

**Combustible Liquid:** Liquid having a flash point at or above 37.8°C (100°F).

## D

**Det Norske Veritas (DNV):** The Norwegian Testing House. An independent Foundation with the object of safeguarding life and property at sea and ashore. Approves foam concentrates and foam equipment.

**Dike:** See Bund.

**Discharge Device:** A fixed, semi-fixed, mobile, or portable device that directs the flow of foam on to a fire.

**DIN:** Deutsches Institut für Normung. The German national standards body.

Coordinates and publishes standards governing foam concentrate performance.

**DNV:** See Det Norske Veritas.

**Drainage Time (DT):** The time required in minutes for 25% (usually) or 50% of the total foam solution to drain from aspirated foam. A measure of foam stability. Also referred to as Drainage Rate.

## E

**EC<sub>50</sub>:** The Effective Concentration in water of a material such as foam concentrate that would produce a particular response in 50% of a test batch of animals (eg. Immobilisation of Daphnia) or a 50% reduction in a particular response (eg. inhibition of the growth of algae).

**ECHA:** The European Chemicals Agency is an agency of the European Union which manages the technical, scientific and administrative aspects of the implementation of the European Union regulation called Registration, Evaluation, Authorisation and Restriction of Chemicals (See REACH). ECHA is the driving force among regulatory authorities in implementing the EU's chemicals legislation.

**Eductor:** A device that introduces foam concentrate. Also referred to as Inductor or Proportioner.

**Eduction Rate:** The percentage of foam concentrate mixed or introduced into the water supply line to produce foam solution. Also called Induction Rate or Proportioning Rate or Pick-Up Rate.

**Expanded Foam:** Foam blanket obtained by mixing water, foam concentrate, and air. Expansion ratio typically 2:1 or more. Also referred to as Aspirated Foam or Finished Foam.

**Expansion Ratio (ER):** The ratio of final foam volume to original foam solution volume before adding air.

**Explosive Limit:** See Flammable Limit.

**Explosive Range:** See Flammable Range.

**Extinction Time (ET):** The time taken by foam to extinguish a fire.

## F

**F3:** See Fluorine Free foam.

**Factory Mutual International (FMI):** The US industrial and commercial property insurer specialising in loss prevention engineering and risk management services. Internationally recognised as an approved testing body for loss prevention, equipment, materials, and services. Approves foam concentrates and foam equipment.

**FDA:** See Foam Destroying Action.

**Federal Aviation Administration (FAA):** The US authority responsible for civil aviation.

**FF:** See Fluorine Free foam.

**FFF:** See Fluorine Free Foam.

**FFFP:** See Film-Forming FluoroProtein.

**Film-Forming:** A foam concentrate containing fluorocarbon surfactants that has a spreading coefficient greater than zero and so forms a foam capable of producing a vapour-suppressing aqueous film on the surface of some hydrocarbon fuels (eg. Niagara<sup>®</sup>, Petroseal<sup>®</sup>, Tridol<sup>®</sup>).

**Film-Forming FluoroProtein (FFFP):** Pronounced Triple-FP. eg. Petroseal<sup>®</sup>. A natural protein-based foam concentrate containing fluorocarbon surfactants that forms a foam capable of producing a vapour-suppressing aqueous film on the surface of hydrocarbon fuels. Developed in the 1980s. Combines rapid knockdown of top quality AFFF with high post-fire security and low environmental impact of top quality FP.

**Finished Foam:** Foam blanket obtained by mixing water, foam concentrate, and air. Expansion ratio typically 2:1 or more. Also referred to as Aspirated Foam or Expanded Foam.

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**Fire Triangle:** This is the method of describing how a fire can be started and extinguished. Each side is represented by Heat, Fuel and Oxygen. If all three are present then combustion may occur. Once a fire has been lit (and combustion is taking place) then it can be extinguished by removing one side of the fire triangle.

**Fixed System:** Complete installation that generates aspirated foam and discharges it on to the risk to be protected.

**Flame Transmission:** Faint flames that flicker over the surface of an AFFF foam blanket. If the foam blanket does not completely cover the fuel, the flames may ignite exposed fuel. Also referred to as AFFF Ghosting Effect.

**Flammable Liquid:** Any liquid having a flash point below 37.8°C (100F).

**Flammable Limit:** Percentage of a substance in air that will burn once it is ignited. Most substances have an upper (too rich) and lower (too lean) flammable limit. Also called Explosive Limit.

**Flammable Range:** The range between the upper flammable limit and lower flammable limit in which a substance can be ignited. Also called Explosive Range.

**Flashback:** Reignition of flammable liquid caused by exposure of its vapours to a source of ignition such as a hot metal surface or a spark.

**Flash Point:** The lowest temperature at which a flame can propagate in the vapours above a liquid.

**Fluorocarbon Surfactant:** Fluorocarbon surface active agent component in some foam concentrates to improve fuel tolerance and fluidity.

**FluoroProtein (FP):** eg. Tankmaster<sup>6</sup>. A natural protein-based foam concentrate containing fluorocarbon surfactants. Extensively used in oil and petrochemical industries.

**Fluorine Free Foam:** eg. Syndura, JetFoam or Respondol. (May also be referred to as FFF or 3F, or F3 although beware of confusion with other foam types).. Fluorine Free foams are manufactured not using any added fluoro-surfactants. Each risk must be looked into when comparing FF as some are specifically for Class A fires, whilst some foams are specifically designed for Class B fires. Always check approvals as to what ratings these foams claim.

**Foam Chamber:** See Top Pourer Set.

**Foam Concentrate:** A concentrated liquid foaming agent supplied by a manufacturer for mixing with the appropriate amount of water and air to produce finished foam. Also called Foam Compound.

**Foam Destroying Action:** The ability of polar solvents to collapse standard foam blankets.

**Foam Generator:** A device designed to introduce air into a pressurised foam solution flow. Also called Foam Maker.

**Foaming Agent:** A component in foam concentrate responsible for foaming properties. Usually natural protein or synthetic detergent.

**Foam Maker:** A device designed to introduce air into a pressurised foam solution flow. Also called Foam Generator.

**Foam Pourer:** A device designed to deliver aspirated foam gently on to a burning liquid.

**Foam Quality:** A measure of a foam's physical characteristics expressed in terms of its 25% drainage time and expansion ratio.

**Foam Solution:** A homogeneous mixture of water and foam concentrate in the correct proportions. Called Premix Solution when in storage.

**FOAMSPEX:** Large Scale Foam Application Modelling of Foam Spread and Extinguishment. The most comprehensive independent research project ever undertaken into extinguishing major storage tank fires.

**Foam Spray:** Discharge outlet which delivers aerated foam of typical expansion ratio 6-10:1 in a spray pattern.

**Forestry Foam:** eg. Forexpan or Hi-Combat A. Foam concentrate for use on Class A fuels in vegetation and structural fires. These foams also carry the relevant USDA approval for aerial forestry firefighting.

**Freezing Point:** The temperature at which foam concentrate solidifies and cannot be used.

**Freeze/Thaw Cycle:** The process of freezing and thawing out a foam concentrate to assess its storage stability.

**Fuel Tolerance:** The ability of aspirated foam to withstand contamination by hydrocarbon fuels.

**Foam-Water Sprinkler System (FWSS):** A system that is designed to discharge either finished foam through aspirating open sprinkler heads, or non-aspirated foam solution through closed sprinkler heads.

## G

**Gelling:** AR-AFFF foams that contain polymer can "set" or turn into a gel particularly when stored at low temperatures or when exposed to metal ions.

**Glycol Ether:** Environmentally hazardous ingredient commonly found in AFFF and AR-AFFF.

**Ground Monitor:** eg. Angus Fire PGM. A monitor designed to be operated at ground-level.

**GPM:** Gallons per minute. This can refer to US Gallons or Imperial Gallons, these are not the same volume but are sometimes referred to in the same way.

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**Gum:** Water-soluble ingredient in Alcoseal<sup>CS</sup> and Tridol<sup>CS</sup> Ultra AR-AFFF that comes out of solution when brought into contact with polar solvent flammable liquids to form a physical barrier or "raft" that separates the foam blanket from the polar solvent. Also called Polymer.

## H

**Hand Monitor:** eg. Streamline HM-80 and HM-100. Monitor designed to be operated by hand.

**Harmonised Offshore Chemical Notification Format (HOCNF):**

**Hazmat:** Abbreviation for Hazardous Material.

**Heat Resistance:** The ability of a foam blanket to withstand the effects of exposure to heat.

**High Back Pressure Generator**

**(HBPG):** eg. Angus Fire HBPG. A device that introduces air into foam solution to produce expanded foam in a base injection system.

**High Expansion:** Foam with expansion ratio in the range 201:1 to 2000:1.

**High Fluidity:** Modern polymer-free Alcohol Resistant foam concentrate (eg. Niagara<sup>CS</sup>).

**HOCNF:** See Harmonised Offshore Chemical Notification Format

**Hydrocarbon:** Fuel based exclusively on chains or rings of linked hydrogen and carbon atoms. Hydrocarbon fuels are not miscible in water.

**Hydrocarbon Surfactant:** Alternative term for synthetic detergent.

## I

**IBC:** See Intermediate Bulk Container.

**ICAO:** See International Civil Aviation Organization.

**IMO:** See International Maritime Organization.

**Inductor:** A device (portable or fixed) that introduces foam concentrate into the water stream. Also called Educator or Proportioner.

**Interfacial Tension:** The tension in the interface between foam solution and fuel.

**Intermediate Bulk Container (IBC):** 1000 litre capacity container used to supply foam concentrates.

**International Civil Aviation**

**Organization (ICAO):** A United Nations (UN) agency which is charged with matters dealing with the development, co-ordination, and preservation of international civil aviation. Publishes "Annex 14 to the Convention on International Civil Aviation, International Standards and Recommended Practices, Aerodromes, Paragraph 9.2.8" which concludes with a "Note" directing the reader to a test procedure in the ICAO "Airport Service's Manual, Part 1, Chapter 8 (3rd edition, 1990)". This test procedure is a method for assessing the suitability of foam concentrates for use at civilian airports. Want to know more about the test? Call Angus Fire now for more information and applicable foams.

**International Maritime Organisation**

**(IMO):** A United Nations (UN) agency which formulates and publishes conventions concerned with maritime safety. Publishes International Convention for Safety of Life at Sea (SOLAS). Publishes standards for foam systems.

**Induction Rate:** The percentage of foam concentrate mixed or introduced into the water supply line to produce foam solution. Also referred to as Proportioning Rate or Education Rate or Pick-Up Rate.

**ISO:** International Organization for Standardization. Geneva-based worldwide federation of national standards bodies from about 100 countries. Shouldn't the acronym be "IOS"? Yes, if it were an acronym - which it is not. In fact, "ISO" is a

word derived from the Greek "isos" meaning "equal". From "equal" to "standard", the line of thinking that led to the choice of "ISO" as the name of the organization is easy to follow. In addition, the name has the advantage of being valid in each of the organization's three official languages - English, French, and Russian.

## J

**JCDD:** Joint Committee on Design and Development. Former UK Fire Brigade committee that published specifications for fire appliance equipment, including the JCDD 28 (1972) specification for high expansion foam concentrate. Today, this organisation does not exist and has been subsumed into the Home Office.

**Jet-A:** Kerosene-grade jet fuel. Also called JP-5.

**Jet-B:** Jet fuel that is a blend of gasoline and kerosene. Also called JP-4.

**Jet Ratio Controller (JRC):** In-line venturi proportioner that proportions foam concentrate as a rich solution (over 60%) to a self-inducing large capacity monitor such as Angus Fire Colossus. Allows foam concentrate stocks and operating personnel to be a safe distance from the fire.

**JOIFF:** Joint Oil and Industry Fire Forum. Leading international organisation for emergency services management in high risk industry. Angus Fire is a contributing member of this organisation.

**JRC:** See Jet Ratio Controller.

## K

**K-Factor:** The flow rate through a piece of equipment divided by the square root of the pressure (or in other words the volume of water that passes through a piece of equipment in one minute at 1 bar pressure). For example, the K-factor of the Angus Fire K40 is 40. Also called Discharge Coefficient.

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## L

**LC<sub>50</sub>:** The "lethal concentration" in water of a material such as foam concentrate that would kill 50% of a test batch of animals (eg. fish) within a given period of time.

**LASTFIRE:** A study of the fire related risks associated with large diameter open-top floating roof storage tanks. Sixteen oil companies are involved in the project which is co-ordinated by Resource Protection International. The LASTFIRE test is designed specifically to determine foam performance related to storage tank fires. Separate nozzle types are used to simulate different application techniques.

**LEX:** See Low Expansion.

**Liquefied Natural Gas (LNG):**

Liquefied Natural Gas (LNG): Cryogenic flammable liquid consisting mostly of methane. The recommended fire protection comprises a specialist high expansion foam system (eg. Angus Fire LNG Fixed Turbex System and Expandol foam).

**Lloyd's Register (LR):** World's leading ship classification society. Approves foam concentrates and foam equipment for marine and offshore applications. Also undertakes independent witness testing.

**Low-Expansion (LEX):** Foam with expansion ratio in the range 2:1 to 20:1.

**Lowest Use Temperature (LUT):** The lowest temperature at which foam concentrate can be used through conventional equipment such as venturi proportioning devices.

**LPM:** Litres per minute. This is sometimes shown as L/min.

**LUT:** See Lowest Use Temperature.

## M

**Material Safety Data Sheet (MSDS):** Document that communicates hazards associated with a product to the user.

Meaning Material Safety Data Sheet it is compiled in accordance with Annex II as laid down in Article 31 of REACH.

**Marine Safety Agency (MSA):**

UK agency that publishes regulations concerning safety on ships and the prevention of marine pollution. Approves foam concentrates and foam equipment.

**Mechanical Foam:** Foam produced by a physical agitation of a mixture of water, foam concentrate, and air. Also called Airfoam.

**Medium-Expansion (MEX):** Foam with expansion ratio in the range 21:1 to 200:1.

**Mega Colossus:** Large-capacity mobile monitor for applying high quality aspirated foam on to large-diameter storage tank fires.

**Methyl Tertiary Butyl Ether (MTBE):**

Mildly polar flammable liquid used as a component in unleaded gasoline. Alcoseal<sup>66</sup> and Tankmaster<sup>66</sup> are UL Listed for use on MTBE.

**MEX:** See Medium Expansion.

**MIL-F:** US military specification MIL-F-24385F. Limited to testing AFFF and so cannot be used for more advanced FFFP foams. Today largely superseded at civilian airports by new ICAO foam standard. See Qualified Products List.

**Ministry of Defence (MOD):** UK Ministry of Defence publishes Defence Standards 42-40 (hydrocarbon type foams) and 42-41 (alcohol resistant foams).

**Monitor:** A portable, fixed or truck-mounted device to which a large-throughput foam nozzle or cannon is attached to allow the operator to direct the water or foam as required. eg. Angus Fire Streamline range.

**MSDS:** See Material Safety Data Sheet.

**MTBE:** See Methyl Tertiary Butyl Ether.

## N

**National Fire Protection Association**

**(NFPA):** US organisation that is committed to protecting people, property, and the environment from the effects of fire. It has a membership of over 60,000 from over 85 countries. It develops, publishes, and disseminates many standards relating to foam (eg. NFPA 11 Standard for Low-Expansion Foam).

**NATO:** See North Atlantic Treaty Organisation.

**Newtonian:** Foam concentrate that displays constant viscosity at various shear rates.

**NFPA:** See National Fire Protection Association.

**Non-Aspirated:** Foam with expansion ratio in the range 1-2:1. The only aeration is the result of air entrainment and impact. Only film-forming foam concentrates are suitable for non-aspirating applications. Also referred to as Unaspirated.

**Non-Newtonian:** Foam concentrate that displays different viscosity at different shear rates.

**North Atlantic Treaty Organisation**

**(NATO):** Paris-based alliance of over 15 countries near or on the North Atlantic Ocean and the Mediterranean Sea. Provides joint action in time of war, and joint military and economic cooperation in time of peace. Issues stock numbers for foam concentrates and foam equipment.

## O

**OECD:** See Organisation of Economic Cooperation and Development.

**Organisation of Economic Cooperation and Development**

**(OECD):** Paris-based economic think-tank for the world's richest nations. Publishes guidelines for the environmental testing of chemicals such as foam concentrates.

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**Oscillating Monitor:** eg. Angus Fire Streamline OM-80. Monitor designed to automatically sweep from side to side. Commonly used for aircraft hangar and offshore helideck protection.

**OTFR:** Open-Top Floating Roof tank.

## P

**P:** See Protein.

**Per- Fluorinated Compound (PFC):** A perfluorinated compound (PFC) is an organofluorine compound containing only carbon-fluorine bonds and no C-H bonds (Carbon – Hydrocarbon).

**Per- and Poly- Fluorinated Alkyl Substances (PFAS):** Perfluorinated alkylated substances (PFAS) refers to a group of fluorinated carbon-chain chemicals.

**PFAS:** See Per- and Poly- Fluorinated Alkyl Substances

**PFC:** See Per- Fluorinated Compound

**PFOA:** Perfluorooctanoic acid (PFOA), also known as perfluorooctanoate, is a synthetic perfluorinated carboxylic acid. This is a C8 contaminant found in some firefighting foams.

**PFOS:** Perfluorooctanesulfonic acid or perfluorooctane sulfonate (PFOS) is a man-made fluorosurfactant and global pollutant.

**pH:** Measurement of acidity to alkalinity on a scale of 1 to 14. Neutral is 7. Acidic is less than 7. Alkaline is greater than 7.

**Phase Separation:** What happens when AR-AFFF separates into two phases - a thin phase (water and solvent) and a thick phase (hydrated polymer).

**Pick-Up Rate:** The percentage of foam concentrate mixed or introduced into the water supply line to produce foam solution. Also referred to as Induction Rate or Eduction Rate or Proportioning

Rate.

**Polar Solvent:** A liquid whose molecules possess a permanent electric moment (eg. alcohols, amines, ethers, esters, aldehydes, ketones). In fire fighting any flammable liquid that destroys standard foam is generally referred to as a polar solvent. Polar solvents are generally miscible with water.

**Poly- Fluorinated:** A polyfluorinated compound is an organofluorine compound containing some carbon-fluorine bonds and some C-H bonds (Carbon – Hydrocarbon).

**Polymer:** Water-soluble ingredient in Alcoseal and AR-AFFF that comes out of solution when brought into contact with polar solvent flammable liquids to form a physical barrier or "raft" that separates the foam blanket from the polar solvent. Also called Gum.

**Polymer-Free:** Modern AR-AFFF (eg. Niagara) no longer use polymer to achieve alcohol resistance.

**Portable Foam Equipment:** eg. Hi-Combat Range. Foam production equipment that is easily transportable by hand.

**Portable Foam Inductor:** Inductor that is easily transportable by hand.

**Post-Fire Security:** Ability of foam to prevent heat sources from re-igniting fuel after extinguishment.

**Pour Point:** The lowest temperature at which foam concentrate is fluid enough to pour. Generally a few degrees above its freezing point.

**Preburn Time:** The time between ignition of a fire and the commencement of foam application.

**Premix:** A mixture of foam concentrate and water in the correct proportions which can be stored for a specified time.

**Protein (P):** Foam concentrate based on natural protein foaming agent. eg. Nicerol. Also called Standard Protein or Regular Protein.

**Proportioner:** A device that introduces foam concentrate. Also referred to as Inductor or Eductor.

**Proportioning Rate:** The percentage of foam concentrate mixed or introduced into the water supply line to produce foam solution. Also referred to as Induction Rate or Eduction Rate or Pick-Up Rate. UL 162 (7th Edition) and NFPA 11 (1994) both state that foam proportioning must be not less than the recommended concentration, and no more than 30% above the recommended concentration, or 1% above the recommended concentration, whichever is less. What this means is that 1% concentrates must be proportioned in the range 1.0 - 1.3%; 3% concentrates must be proportioned in the range 3.0 - 3.9%; and 6% concentrates must be proportioned in the range 6.0 - 7.0%.

**Pseudoplastic:** A non-Newtonian foam concentrate that displays a decreasing viscosity with an increasing shear rate. Also called Shear-Thinning.

**Pump:** Foam concentrate pumps are usually either positive displacement pumps (recommended by NFPA for foam concentrates) or centrifugal foam pumps (limited to low viscosity foam concentrates).

## Q

**QPD:** Qualified Products Database. See also QPL and Qualified Products List.

**QPL:** See Qualified Products List.

**Qualified Products List:** AFFF products (eg. Tridol<sup>®</sup> M 3) that have been qualified under US military specification MIL-F-24385F.

## R

**RCM:** See Remote Control Monitor.

**REACH:** Is the Registration, Evaluation, Authorisation and Restriction of Chemicals. This is an EU policy which requires the registration of some chemicals within the EU in order

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for them to be transported within the European Union. Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) establishing a European Chemicals Agency, amending Directive 1999/45/EC.

**Refractometer:** A device used to measure the amount of foam concentrate in solution. This device operates on the principle of measuring the velocity of light that travels through the foam solution.

**Remote Control Monitor:** eg. Angus Fire Streamline RCM. Commonly used to protect jetties, offshore platforms, oil tankers, chemical carriers, and on fire fighting tugs.

**RFG:** See Rimseal Foam Generator.

**RFP:** See Rimseal Foam Pourer.

**RI:** Refractive Index. See Refractometer.

**Rimseal Foam Generator (RFG):**

Device permanently installed on floating roof storage tank that is designed to produce aspirated foam from foam solution.

**Rimseal Foam Pourer (RFP):** Device permanently installed on floating roof storage tank that is designed to discharge aspirated foam gently on to the rimseal area.

**RIV:** See Rapid Intervention Vehicle.

## S

**S:** See Syndet.

**Safety Data Sheet:** Means Safety Data Sheet compiled in accordance with Annex II as laid down in Article 31 of REACH;

**SCBA:** Self-Contained Breathing Apparatus.

**SDS:** See Safety Data Sheet.

**SHE:** Safety, Health and Environment.

**Sediment:** The proportion in percentage by volume of solid matter which can be centrifuged out of a foam concentrate. Also called Sludge or Undissolved Solids.

**Semi-Fixed:** Foam equipment that is easily transportable and operates without supervision. eg. Angus Fire Anderson Pourer.

**Semi-Subsurface Injection:** A system used to the protection of fixed roof hydrocarbon and water soluble fuel storage tanks where foam is directed to the fuel surface from the bottom of the tank through a flexible hose normally contained in a sealed container.

**SG:** See Specific Gravity.

**Shear-Thinning:** A non-Newtonian foam concentrate that displays a decreasing viscosity with an increasing shear rate. Also called Pseudoplastic.

**Shear Rate:** The rate at which foam is subjected to shearing.

**Sludge:** See Sediment.

**SOLAS:** See International Maritime Organization.

**Specific Gravity (SG):** Density of foam concentrate divided by density of water. Liquids with an SG less than one are lighter than water and will therefore float on water. Those with an SG greater than one are heavier than water and will sink to the bottom.

**Spray:** See Foam Spray.

**Spreading Coefficient (SC):** A foam solution that has a spreading coefficient greater than zero is film-forming. Defined as the surface tension of cyclohexane minus the surface tension of foam solution minus the interfacial tension of cyclohexane and foam solution.

**Sprinkler, Foam-Water Type:** An air aspirating open type sprinkler constructed to discharge water or foam-water solutions (eg. Angus Fire K40 Mk2 and K20 Mk2).

**Sprinkler, Standard:** A non-air aspirating type sprinkler that discharges water or film-forming foam solutions.

**Stability:** A term used with foam concentrates to determine the performance and security of a foam blanket.

**Stewardship Programme 2010/15:**

In 2006 the United States of America's, Environmental Protection Agency (US-EPA) initiated a voluntary programme whereby the eight major global manufacturers of fluorosurfactants, such as DuPont, 3M, BASF, Daikin, were all tasked with the challenge of reducing product content and emissions from their facilities on a global basis of PFOA, precursor chemicals that can break down into PFOA, and related higher homologue chemicals. All of these chemicals are considered to be based on long-chain chemistry, or C8. These have eight carbon atoms in a line, hence the name C8. The two main aims of the Stewardship Programme were by the end of 2010, each signatory should have achieved a minimum reduction of 95%, and by the end of 2015, each company should be working towards eliminating emissions and product content of these chemicals.

**Storage Stability:** The ability of foam concentrate to withstand long-term storage under varying environmental conditions.

**Stovepipe:** A device intended to provide an open area of free burn during a burnback test.

**Sub-Surface Injection:** A technique used for the protection of fixed roof hydrocarbon fuel storage tanks where fuel-resistant aspirated foam is injected into the base of the tank and rises through the fuel to the surface to effect extinguishment. Also called Base Injection.



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**Surface Tension:** The tension in the interface between foam solution and air. Unit is dyne/cm which is equivalent to mN/m. Typical values are water 72 dyne/cm, Protein 40 dyne/cm, FluoroProtein 20-30 dyne/cm, FFFP/AFFF <20 dyne/cm.

**Surfactant:** Abbreviation for Surface Active Agent. Chemical that reduces the surface tension of water. Examples used in foam concentrates include Hydrocarbon Surfactants (also called Detergent) and Fluorocarbon Surfactant.

**Synthetic:** Foam whose main ingredient is synthetic detergent. eg. Syndet, AFFF, AR-AFFF.

**Syndet (S):** eg. Expandol. A detergent-based foam concentrate that can be used to high expansion but offers limited burnback and heat resistance.

## T

**Thixotropic:** A non-Newtonian foam concentrate that displays a decrease in viscosity with time while it is subjected to constant shearing.

**Top Pourer Set:** eg. Angus Fire TPS. A permanently installed device that generates foam from foam solution and introduces it into storage tanks through a glass vapour-sealing membrane. Also called Foam Chamber.

**Training Foam:** Foam concentrate that is formulated especially for training exercises.

**Transit Time:** The time taken for foam solution to pass from the point where foam concentrate is induced into the water supply to where aeration takes place.

**Type I Discharge Outlet:** Discharge devices that conduct and deliver foam gently on to the liquid surface without submergence of the foam or agitation of the surface. Examples include porous Moeller tubes and foam troughs along the inside of a tank wall. Generally considered obsolete because nearly all currently manufactured

foams are suitable for use with Type II discharge outlets. Some older AR foams (eg. Polydol) still require gentle application by Type I discharge outlets.

**Type II Discharge Outlet:** Discharge devices that do not deliver foam gently on to the liquid surface but are designed to minimise submergence of the foam or agitation of the surface. Examples include top pourer sets, rimseal foam pourers, base injection equipment, or applying the foam off a backboard or the wall of a tank.

**Type III Discharge Outlet:** Discharge devices that deliver foam directly on to the surface of the burning liquid in a manner that causes general agitation. Examples include hand-held branchpipes, monitors, and foam-water sprinklers.

## U

**UL:** See Underwriters Laboratories.

**ULG:** See Unleaded Gasoline.

**Ullage:** A space that should be allowed above a foam concentrate in a bulk storage tank to accommodate the differences in thermal expansion coefficient between the tank construction material and the foam concentrate. Generally a measure of 5 to 10% of the tank volume is more than adequate.

**Unaspirated:** Foam with expansion ratio in the range 1: 1 to 2:1. Only film-forming foam concentrates such as Niagara<sup>CS</sup>, Alcolseal<sup>CS</sup>, Petroseal<sup>CS</sup>, and Tridol<sup>CS</sup> S are suitable for Unleaded Gasoline (ULG): Gasoline in which lead has been replaced with, for example, an oxygenate such as MTBE.

**Underwriters Laboratories (UL):** US organisation with a high reputation for independent assurance of foam concentrate and foam equipment product quality. The names of companies that have demonstrated an ability to manufacture products that meet UL requirements are published annually in the UL Fire Protection

Equipment Directory. The standard used to evaluate products is UL 162 Standard for Foam Equipment and Liquid Concentrates (7th edition).

**Undissolved Solids:** See Sludge.

**United States Coast Guard (USCG):** US Government Department of Transportation organisation that approves foam concentrates and foam equipment.

**United States Department of Agriculture (USDA):** This executive organisation within the United States of America initiated the Stewardship Programme 2010/15.

**United States Environment Protection Agency (US EPA):**

**Unleaded Gasoline (ULG):** Gasoline in which lead has been replaced with, for example, an oxygenate such as MTBE.

**USDA:** See United States Department of Agriculture

**US EPA:** See United States Environment Protection Agency

**USG:** United States Gallons.

**USGPM:** United States Gallons Per Minute.

**USCG:** See United States Coast Guard.

## V

**Variable Inductor:** A portable foam inductor capable of inducing foam at various percentages, usually in the range 1% to 6%.

**Vapour Suppression:** The use of foam to suppress hazardous vapours or prevent ignition in the event of an accidental spillage of a hazardous liquid.

**Venturi:** A constricted portion of a pipe or tube which will increase water velocity, thus momentarily reducing its pressure, and simultaneously creating a vacuum.

**Viscosity:** : The thickness of a liquid or its ability to flow. Normally measured in Ostwald U-tube viscometers giving

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kinematic viscosities in Centistokes (cs) which are equivalent to mm<sup>2</sup>/sec (SI units). Viscosities can also be quoted in a wide range of other units, most commonly as dynamic viscosity in Centipoise or Poise. Kinematic Viscosity is the same as Dynamic Viscosity divided by Density. eg. Water at 20°C with density 1g/cm<sup>3</sup>, kinematic viscosity = 1 cs, and dynamic viscosity = 1 centipoise.

**VS:** Vapour Suppression.

## W

**WASP:** Wide-range Accurate Sprinkler Proportioner. eg. Angus Fire WASP System. A foam concentrate induction system designed to inject automatically the correct quantity of foam concentrate into a water stream over a wide range of variable flows and pressures in closed-head foam/water sprinkler systems.

**WEP System:** Water Expansion Pumping Systems. Today largely superseded by CAFS.

**Wicking Effect:** Occurs when non-aspirated AFFF applied to unignited spillage of low volatility/high flash point fuels (eg. aviation kerosene) causes fuel to ignite more readily.

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