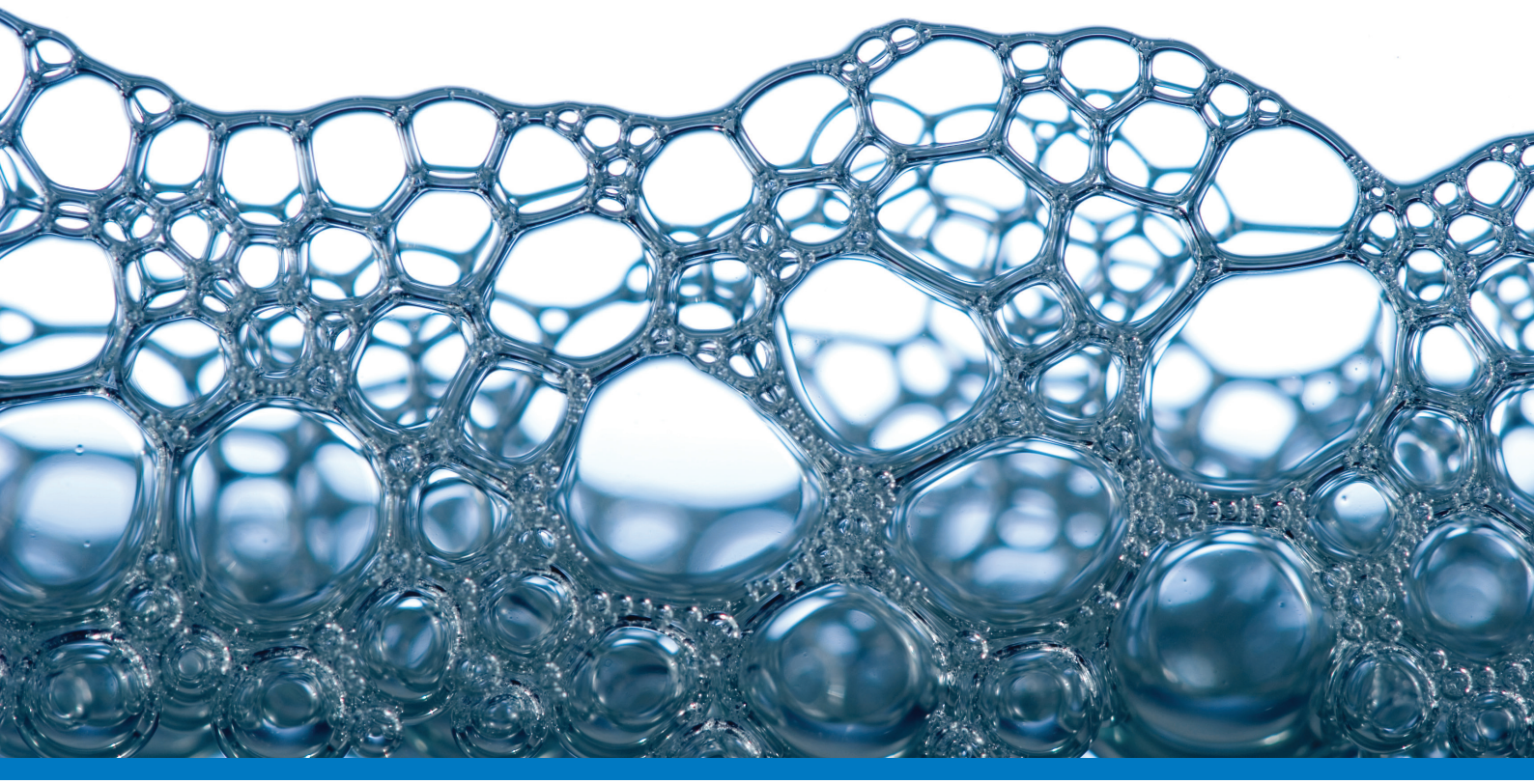
ANGUS FIRE



Firefighting Foam Concentrates 2017

Protecting what matters

INTEGRITY
ANGUS FOAMS

Protecting lives, the environment and critical assets

Firefighting Foam Concentrates Continue to Evolve

Firefighters face an unprecedented, and often unpredictable, range of risks and must be able to rely on their firefighting foams to perform efficiently. Today more emphasis than ever before is placed on limiting the environmental impact of using foam in firefighting.

At Angus Fire our commitment to developing technology leading firefighting foam concentrates has continued into 2017. The key focus is lowering the environmental impact of foam concentrates without compromising their firefighting performance.

In 2006 the USA's, Environmental Protection Agency initiated a voluntary programme whereby the eight main manufacturers of fluorosurfactants were tasked with the challenge of reducing biproduct content and emissions from their facilities on a global basis of PFOA and PFOA related products. Before the conclusion of the Stewardship Programme in 2015, Angus Fire had launched a full range of short-chain (C6) telomer based foam concentrates, which are now in use globally. Since the 1990s we have continued to develop this chemistry in order to offer you increased firefighting performance and where possible, to reduce surfactant content. Increased performance reduces the amount of foam you need to use, thereby reducing your incident costs and reducing firewater runoff.

What Lies Ahead?

Recent changes in legislation have in many parts of the world led to a growing demand for foams that contain no fluorine at all. Today many foam manufacturers aim to create environmentally friendly foams. However most fluorine free foams face a number of issues such as lower performance levels in terms of extinguishment and burnback, no film forming ability and being too viscous, causing induction problems.

Angus Fire has recently developed two fluorine free foams, which are superior to any other fluorine free foams on the market. **Respondol ATF** for municipal firefighters and **JetFoam** for aviation.

Respondol ATF is a high performance fluorine free foam to meet the unique mix of challenges that Fire & Rescue Services face. It is a superior quality, multipurpose foam with reduced environmental impact. **Respondol ATF** offers these key benefits:

- Fast knockdown and extinguishment exceeding the requirements of EN1568 part 3&4 on all fuels and water types.
- Low viscosity, low corrosion for easy induction and storage.

Respondol ATF is the first fluorine free foam to achieve 1A/1A approval using both sea and fresh water on all fuels within the demanding EN1568 part 3&4 testing regime.

JetFoam is the world's first ever film forming fluorine free foam designed specifically for use on aviation risks such as Jet-A1. It is completely Newtonian ensuring there are no issues associated with inducing the foam into fire truck systems. **JetFoam** also exceeds the performance requirements of ICAO Level B. It flows and behaves just like water. The majority of other fluorine free foams have viscosities between 1,220 – 3,200 mm/sec^2, the limit set by ICAO is 200mm/sec^2. JetFoam' s viscosity is just 2mm/sec^2.

Award Winning Environmental Performance

In 2016, **JetFoam** was awarded gold for Environmental Best Practice at the Green Apple Awards.

The gold award, in the Science and Technology category, recognises the qualities of **JetFoam** and Angus Fire's ongoing programme of research and development to provide high performing innovative products with reduced environmental impact.

GREEN APPLE AWARD WINNER 2016

INTEGRITY ANGUS FOAMS

Firefighting Foam Concentrates 2017

Protecting what matters

Petro-chemical Processing

High-risk facilities such as refineries, pharmaceutical plants, process areas, warehouses and rail/loading racks require very specific solutions depending on the chemicals on site. As UL and EN1568 are the most applicable standards in this sector, **Alcoseal**^{C6} (AR-FFFP) or **Tridol**^{C6} **ATF** (AR-AFFF) or **Respondol ATF** (AR-FF) are often the preferred choice to protect these critical areas. For a specific chemical risk, Angus Fire's staff can advise on the most applicable foam type.

Storage Tank Farms

Crude oil contains every oil derived product from bitumen to butane and as a result any fire is a very complex scenario. Open top floating roof tanks can reach diameters in excess of 110m (360ft) and require significant fixed protection systems (as supplied by the Angus Fire Engineering division) as well as high capacity mobile firefighting solutions. Lightning strikes within a tank farm which contains processed or blended products such as petrol or gasoline, can result in catastrophic consequences. Boil-overs in a crude oil storage tank can develop rapidly into multi-tank fires. The protection of bunds is especially important as their capacity is much larger than that of the tank. Medium expansion foam systems to protect the bund will provide both vapour suppression and firefighting without the need for firefighters to put themselves at risk. EN, LASTFIRE and UL162 approved foams and devices deliver the best protection for this type of risk (not just fire, but also vapour suppression). **Tridol**^{C6} **Ultra** 1-3%, **FP70**^{C6} and **Tankmaster**^{C6} are used world-wide in these high risk environments.

Municipal Fire and Rescue & Civil Defence

Local fire and rescue services face a broad range of risks such as road traffic collisions involving small amounts of petrol and diesel as well as tanker loads of highly flammable chemicals in transit. Complex and unpredictable structural firefighting in schools, hospitals, shopping centres, stadia, farms and high-rise residential blocks present a diverse range of challenges. Therefore there is a need for a high performance foam, that not only rapidly extinguishes a fire but also prevents re-ignition to enable firefighters to rescue lives or secure the scene. Angus Fire's Integrity foam concentrates offer firefighters reliable performance each time they are deployed. Angus Fire recommends the use of **Respondol ATF** for a varied risk or **Niagara**^{C6} which is Newtonian, EN1568 and UL162 approved to -18°C (0°F) and is widely used by UK Fire and Rescue Services for these reasons. Training is an important part of any municipal fire service's role to ensure firefighters possess the essential skills required to tackle a wide range of complex emergencies. Angus Fire's Trainol foams (synthetic) and TF (protein based) are ideal for live fire training scenarios.

Off-shore & FPSO

Many off-shore installations are found in hostile environments where equipment must operate at extremely low temperatures, foam concentrates must be able to perform under these conditions as well. In addition space and weight are always at a premium on off-shore facilities which makes the need for a foam concentrate that induces at a low induction rate essential to minimise storage space. Angus Fire offers **Tridol**^{C6} **S1** for use on helidecks and **Niagara**^{C6} 3-3 for all the other risks on board.

INTEGRITY
ANGUS FOAMS

- Firefighter safety – putting the fire out, and keeping it out.
- Lowering the environmental impact, whilst maximising firefighting capability.
- Committed partnership with firefighting professionals.

		Power & Industrial	Aviation	Off-shore & FPSO	LNG & Gas Handling	Petro-Chemical	Storage Tank Farms	Municipal	Forestry
FF & AR-FF - Fluorine Free (for Class A & B fires)									
Where the environmental considerations are paramount fluorine free foams are the first choice.	JetFoam	-	✓	-	-	-	-	-	-
	Syndura	-	✓	-	-	-	-	✓	✓
	Respondol ATF	✓	-	-	-	-	-	✓	✓
AFFF - Aqueous Film Forming Foam									
Rapid flame knockdown on hydrocarbon spill fires.	Tridol M	-	✓	-	-	-	-	-	-
	Tridol S	✓	✓	✓	-	✓	✓	✓	-
	Tridol C	✓	✓	✓	-	✓	✓	✓	-
AR-AFFF - Alcohol Resistant Aqueous Film Forming Foam									
Fast flame knockdown and extinguishment with superior burnback resistance and post-fire security.	Tridol ATF Ultra	✓	✓	✓	-	✓	✓	✓	-
	Tridol ATF S	✓	✓	✓	-	✓	✓	✓	-
	Tridol ATF C	✓	✓	✓	-	✓	✓	✓	-
FP - Fluoroprotein									
Specially developed to extinguish large hydrocarbon storage tank fires at oil refineries and fuel storage depots.	Tankmaster	✓	-	-	-	✓	✓	-	-
	FP70	✓	-	-	-	✓	✓	-	-
	FP350	✓	-	-	-	✓	✓	-	-
	FP600	✓	-	-	-	✓	✓	-	-
FFFP - Film Forming Fluoroprotein									
The world's leading foam for airport fire services, combining the speed of AFFF with the post-fire security of FP.	Petroseal	✓	✓	✓	-	✓	✓	-	-
AR-FFFP - Alcohol Resistant Film Forming Fluoroprotein									
Highly versatile Alcohol-Resistant foams that are suitable for use on hydrocarbon and polar solvent flammable liquids.	Niagara	✓	✓	✓	-	✓	✓	✓	-
	Alcoseal	✓	✓	✓	-	✓	✓	✓	-
Class A									
Specially formulated for applications such as forestry and wildland fire control, structural fires and tyre and paper fires	Forexpan	-	-	-	-	-	-	✓	✓
	Hi-Combat A	-	-	-	-	-	-	✓	✓
Hi-Ex - High Expansion									
Ideal for total flooding and LNG applications.	Expandol	✓	-	✓	✓	-	-	✓	✓
TF - Training Foam									
The latest FF technology ideal for training exercises and fire vehicle testing with minimal environmental impact.	Trainol	✓	✓	✓	✓	✓	✓	✓	✓
	TF	✓	✓	✓	-	✓	✓	✓	✓

Power Generation & Industrial

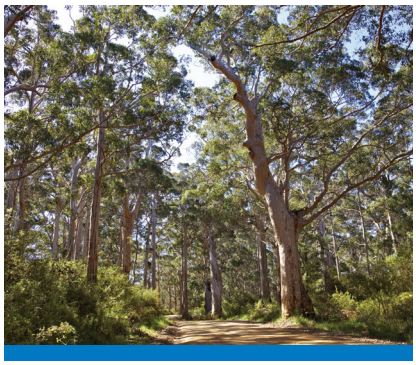
Industrial process and the production of power have developed in recent years, so too have the risks in and around these facilities. Angus Fire recommends foam concentrates with EN approval and UL listings such as **Tridol^{C6} Ultra** for mixed risks, **FP70^{C6}** for hydrocarbon only situations or **Respondol ATF** where reduced environmental impact is a priority. High expansion generators are used in industrial applications to flood enclosed spaces. Angus Fire recommends **Expandol** for these risks.

Aviation

The preservation of life is paramount at any aviation emergency, considering the likelihood of rapid escalation into a major incident. So much so that aerodrome firefighters are tasked with creating a survivable environment within, or around, any aircraft to enable self evacuation or rescue of passengers. Fuels used in this industry are highly combustible and release tremendous amounts of heat when they are burnt (due to their high calorific value). Jet-A and Jet-A1 aviation fuel is stored in large quantities in tanks, tankers and aeroplanes themselves at various locations around the airport. Film forming foams such as Angus Fire's **Petroseal^{C6}** and **Tridol^{C6}** are ideally suited for this application achieving Level B or C passes against the ICAO (International Civil Aviation Organisation) performance test criteria. (ICAO sets three levels of performance, A, B and C with C being the most demanding). When fluorinated performance cannot be utilised due to environmental consideration's, Angus Fire's award winning foam concentrate **JetfFoam** FF is the best alternative with ICAO level B certification. For training purposes Angus Fire recommends Trainol or TF foams.

Liquefied Natural Gas (LNG)

With the production of LNG expected to reach 10% of the global crude production by 2020, storage and processing facilities are growing in their size and complexity. With most processed LNG being transported by sea, these large storage tanks are most commonly located next to loading jetties which require specialised equipment to protect them. Accidental release into collecting ponds presents a serious risk of violent ignition as LNG expands 620 times moving from the liquid to vapour phase. As LNG has a boiling point of -161°C operating temperatures can range from -161 to +1300°C. Angus Fire's slow draining Hi-Expansion foam, **Expandol** is the preferred choice by many installations to control a fire should ignition occur. Angus Fire's series of LNG Turbex foam generators ensures the most economical amount of water is used, to reduce the rate of LNG evaporation. This combination of foam and generator has been installed at many LNG facilities around the world.



Forestry & Class A

Class A fires (wood, paper, timber, etc) are extinguished by wetting the combustible material. This also prevents re-ignition. Foams that reduce the surface tension of water to increase penetrating power are best suited for Class A fires. Angus Fire recommends **Forexpan** and **Hi-Combat A**. **Hi-Combat A** is certified to USDA forestry specification for use with helicopter and fixed wing aircraft, also ground appliances for wildfires. **Forexpan** and **Hi-Combat A** can be used through CAFS systems.

Services from Angus Fire

Supporting firefighting professionals every day

Firefighting Foam School

Angus Fire organises the hands on, theory packed Firefighting Foam and Emergency Planning School in Centro Jovellanos, Asturias, Spain. The school is run in partnership with CFB Risk Management.
The 5 day training covers a blend of theory and practice and is heavily focussed on the overall implications of tank firefighting. It includes an in-depth understanding of the risk and its manifestation, the importance of foam selection, designing and specifying foam fire systems, including tank systems. The practical training includes real fires with real fuels, across a number of training modules. To find out more about the school visit our website, www.angusfire.co.uk

Foam Testing Service

Angus Fire's independent foam testing service includes a suite of tests and delivers a comprehensive, unbiased and reliable test result. For many flammable liquid risks, fire fighting foam is the preferred extinguishing medium; therefore it is vital that it performs when called upon during any stage of its operational life. Regardless of how thoroughly they were developed and tested, foam concentrates can be subjected to harsh climatic conditions outside their intended design criteria or be accidentally spoiled due to contamination or by dilution with water. That is why annual testing is vital and is recommended by many international standards. To find out more about testing service visit our website, www.angusfire.co.uk

Emergency Foam Service

+44 (0)1524 261166

Angus Fire has a long-standing history of providing a global emergency service for the dispatch of firefighting foam concentrates. The emergency foam service provides exceptional support in the event of an emergency. The service operates 24 hours a day, every day. When an emergency call is received, Angus Fire directs its complete foam plant at the incident – foam stocks, orders awaiting dispatch and work in progress are assessed. At the same time, the logistics to deliver the foam are actioned. This may involve a fleet of road tankers and/or aircraft depending on the severity and location of the fire. Angus Fire can mobilise foam from 7 countries, and 4 factories.

Angus Fire Profile

Angus Fire is a global leader in firefighting technology. In more than 100 countries Angus Fire supplies fire safety products and services to customers operating in a wide range of industries such as oil companies, international airports, harbours, ports, to military bases, power stations, and of course to fire and rescue services. Angus is a global name with an impressive history of over 220 years in the firefighting industry. It is this rich heritage and associated expertise, which put Angus Fire at the forefront of the fire industry and makes the company the preferred partner with firefighters worldwide.

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