



LNG Fire & Spill Protection Solutions

High performance engineered systems

Protecting lives, the environment and critical assets

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LNG represents a major challenge for fire fighters, from a liquid to gaseous state it expands by 600 times and is flammable in concentrations between 5% and 15% in air.

Containment of any spills is the key, followed by either a controlled burn off or controlled vaporisation to air – water enhances vaporisation, so the favoured medium is high expansion foam with its low water content.



There are two options for controlling an LNG spill, either:

Passive Protection

Whereby Storage tanks, and their bunded areas are designed specifically to contain an initial spill. This requires a high bund wall which serves to contain the LNG before it is channelled away from tanks into a spill pit or basin where the vapour can disperse safely to high level.

Active Protection

Active protection systems for LNG should be designed for one of two scenarios, either vapour dispersion; or fire control.

In both cases a high expansion foam system is required.

For vapour dispersion, the objective is to reduce the danger associated with an unignited LNG spillage by applying a foam blanket to manage measured upward dispersion of the vapours that are boiling off.

For fire control, the aim is to contain the fire, and prevent a catastrophic failure in case of an ignition. This is achieved by means of a controlled burn off through the high expansion foam blanket that also reduces the radiated heat flux to surrounding plant.

Making the right choice is crucial. The cost of the system for each of the two applications may be a significant factor in the decision making process. Each system will need to have substantially different application rates, operating times and quantities of protecting equipment.



Specialist LNG Protection from Angus Fire

Angus Fire offers specialised equipment, foam concentrates and engineered system designs for LNG risks. A typical system would include: high expansion foam generating equipment, a foam skid or other means of induction, Foam Concentrate, and Water Curtains

Large-scale LNG fire testing at the Texas A&M institute determined that High expansion foam delivered through high performance LNG Turbex Skids using Expandol 3% foam concentrate at an application rate of 10 Litres/square mtr/minute delivered the necessary speed of response and control.

Angus Fire's **LNG Fixed Turbex Hi Expansion Foam Generators** are engineered to the highest standards for exceptional reliability and minimal maintenance. They feature a foam making net and fan, both made from stainless steel to withstand continuous high temperatures without a reduction in material strength or risk of corrosion.

The LNG Turbex Generator can be mounted on a rigid 316 stainless steel skid frame that also supports the essential boiler grade 316 stainless steel hood, (as shown below) to direct the foam down into the containment pit whilst protecting the finished foam from the effects of wind.

The cocoon-shaped Turbex Generator creates a stable slow-draining foam blanket and uniform bubble size resulting in a far more reliable and efficient foam expansion, a major benefit over simple aspirating units.

For a high expansion foam system to be effective, the LNG 500:1 generator must be located at the edge of the bund wall or the containment pit, so that any LNG spillage can be quickly covered with foam.

The high efficiency design of the Angus LNG Turbex Generator has enabled these units to exceed the demanding requirements of the National Fire Protection Association NFPA 11 Fire Exposure Test by withstanding internal temperature of 1000°C and exposure to direct flame for 5 minutes over burning n-heptane. This fire intensity is designed to mimic the high radiation level generated by LNG and the generator performance must be unaffected after this test.

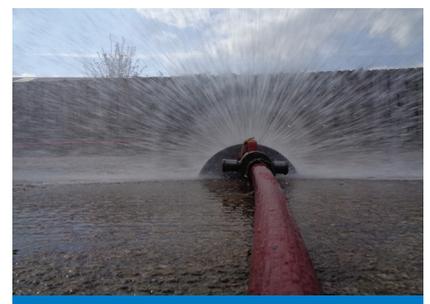
The choice of foam concentrate is an important factor in optimising foam stability and expansion to gain maximum effectiveness, both for fire control and vapour dispersion.

Foam stability helps to reduce the required foam top up rate to a minimum, thereby maintaining effective control of fire or vapour dispersion with minimal foam concentrate usage.

Angus Fire's **fluorine free high expansion foam concentrate Expandol 3%**, produces extremely stable and long lasting foam. It is ideal for use in total flooding applications.

Water sprays provide a water curtain to prevent LNG vapours reaching sensitive areas. They need to be ground mounted and sited so that they produce an overlapping full 180° spray pattern.

Angus Fire's **Hydroshield** produce a full arc of water ensuring there are no gaps in the water fan, especially at ground level, making them ideal for this application.



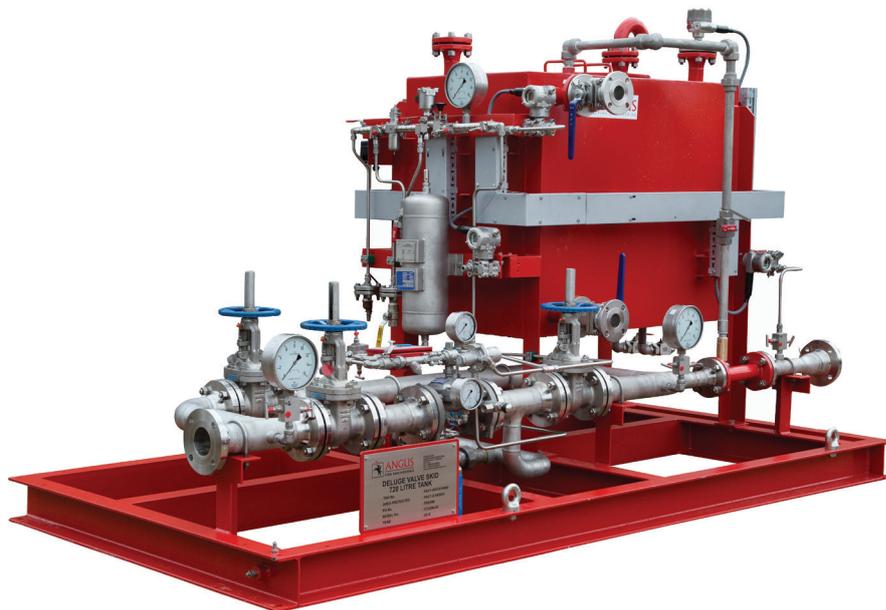
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Complete Offering

Angus Fire has been at the forefront of supplying fire equipment, bespoke skids and systems for LNG risks.

A comprehensive product range includes fixed foam devices, foam induction skids and waterspray equipment. Fully qualified Application Engineers, with a wealth of technical and hands-on experience, design and specify systems in compliance with current NFPA and other International Standards.



For LNG risks, Angus Fire can design and manufacture a fast acting foam proportioning system to mix the foam concentrate into the water supply. This can often be a complex bespoke system of foam skids and remote induction based on site requirements. Foam Induction systems fitted with In-Line Inductors or Balance Pressure Proportioning can be used depending on the specific design. Systems typically require 500:1 expansion, which means relatively small foam tanks can be specified.

Various materials specifications are available which are determined by the environmental site conditions. Angus Fire's vast experience in fire engineering has secured projects with the world's leading contractors. Angus Fire's total capability approach to fire suppression systems includes surveys, consultancy, project management, design and engineering, documentation, equipment supply, fire testing, installation, commissioning and maintenance.

Whatever the Process – production, transportation or storage – Angus Fire offers the products, systems expertise and experience to meet the safety demands of the LNG Industry

Read more on LNG protection here.



Angus Fire

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 and gas, international airports, harbours, ports, military bases, power stations, LNG and fire and rescue services. Angus Fire 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 makes Angus Fire the preferred partner with firefighters worldwide.

