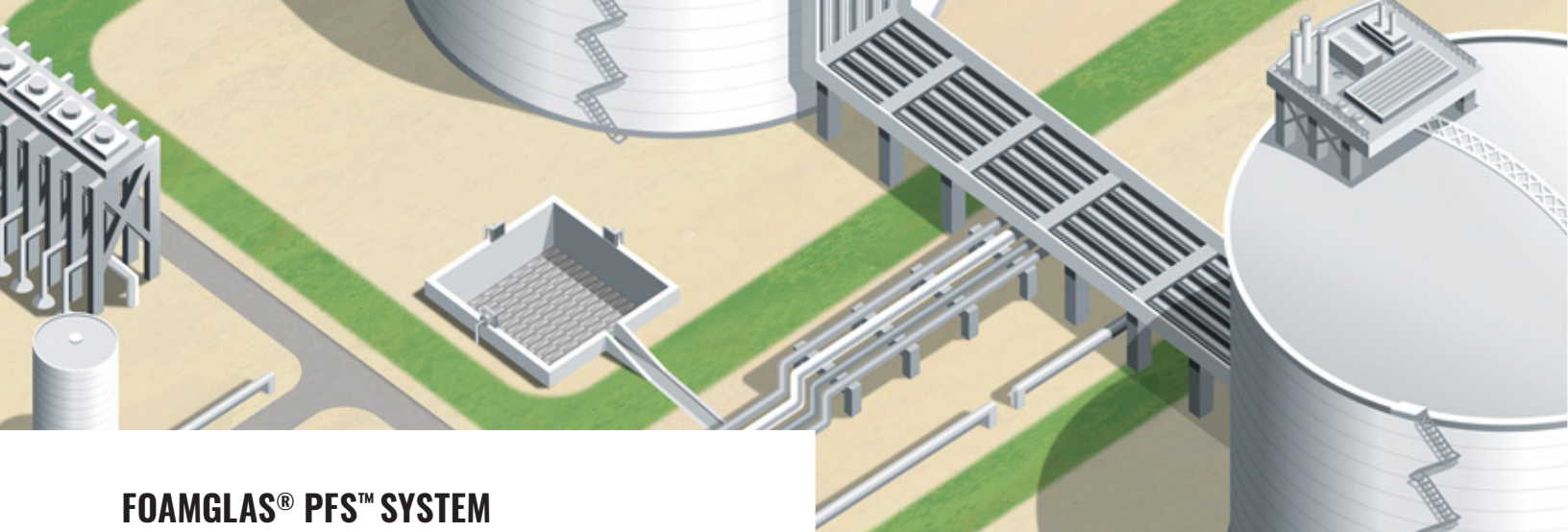




**FOAMGLAS<sup>®</sup>**

**FOAMGLAS<sup>®</sup> PFS<sup>™</sup> SYSTEM**  
**POOL FIRE SUPPRESSANT GENERATION 2**

U.S. PATENT NO. 9,925,401



## FOAMGLAS® PFS™ SYSTEM POOL FIRE SUPPRESSANT GENERATION 2

The FOAMGLAS® PFS™ Pool Fire Suppressant System Generation 2 complements safety programs by delivering a reliable, low-maintenance passive protective solution for the reduction of thermal radiation and flame height in contained liquid natural gas (LNG) fires. The FOAMGLAS® PFS™ system is easy to install and can provide immediate mitigation of the thermal flux, rate of combustion, view, and overall size of an LNG pool fire.

### BENEFITS

- Easy to install
- Continuous protection and immediate control
- Passive and reliable
- Low maintenance
- Long-term resistance to weathering and poor climatic conditions
- Customized design to match the containment area
- May reduce mandated exclusion zone for your facility

### PROJECT REFERENCES<sup>1</sup>

PORI LNG  
YAMAL LNG  
NATIONAL PETROLEUM CORP — BARBADOS  
SINGAPORE LNG  
ELENGY — FRANCE  
LNG MIAMI  
LYSEKIL LNG  
BINTULU MLNG  
FERUS NATURAL GAS FUELS  
APA GROUP — AUSTRALIA  
SAMSUNG — KOREA  
TOTAL PETROCHEMICALS — FRANCE  
ADGAS — UAE  
EG LNG  
BOC — AUSTRALIA  
ISLE OF GRAIN LNG  
RISAVIKA LNG  
CLEAN ENERGY HIGH DESERT LNG  
GASREC LIQUID BIOMETHANE — UK  
FREEPORT LNG  
YEMEN LNG  
PANIGAGLIA LNG

### FIRE CREDENTIALS FOR FOAMGLAS® INSULATION

- Der Norske Verita Type Approval
- Lloyd's Register
- USGG Approval for Noncombustible Inspections

#### Material Tests

- EN ISO 1182 (Class A1)
- ASTM E136 (noncombustible)
- ASTM E84 — Flame Spread (0) Smoke Development (0)

#### Application Tests<sup>1</sup>

- FOAMGLAS® Insulation on LNG, MKOPSC, Texas A&M University
- Fire & Vapor Control Testing, Resource Protection International, Centro Jovellanos
- Extinguishing Trials at Brayton Fire Training Field
- A Novel Method for Controlling Pool Fires  
Fire Technology Journal, Shell Research Limited, Thorton Research Centre

### REGULATORY OVERVIEW

- National Fire Protection Association 59A, Standard for the Production, Storage, and Handling of LNG, has contributed to the conditional withholding and final denial of regulatory approval for several LNG projects by the Federal Energy Regulatory Committee.
- Requirements for exclusion zones can impact overall site layout and design — with direct impact on land acquisition and construction costs for facility owners.
- Mandated exclusion zones for LNG facilities include parameters for both vapor dispersion and thermal radiation (radiant thermal flux).
- NFPA 59A allows for the use of passive fire mitigation techniques in the calculation of radiant heat distances, subject to the approval of the agency having jurisdiction.

<sup>1</sup> Includes Generation 1 systems.



## EASY TO INSTALL

FOAMGLAS® PFS™ system modules are constructed of a clad insulation core and are bridged together to uniformly cover an impounding sump or other containment area. These units are easily installed on-site and do not require any specialized skills or equipment to install or maintain. The product is packed on standard pallets, so no special shipping or handling is required.

## IMMEDIATE CONTROL AND PROVEN RESULTS WITH CELLULAR GLASS SYSTEMS

Fire & Vapor Control Testing commissioned by TOTAL and conducted under the supervision of Resource Protection International at the Centro Jovellanos concluded that the FOAMGLAS® PFS™ system was effective in reducing radiant heat flux and controlling fire from LNG and LPG pool fires.

In scale tests conducted by Shell Research Ltd, a depth of 200 mm (8 inches) of FOAMGLAS® PFS™ system cubes assisted in providing an immediate and automatic control of the fire at a level comparable with that provided of 1–2 meters (3.3–6.6 ft.) of high-expansion foam.

Results of large-scale experiments performed at the Emergency Services Training Institute of Texas A&M University have shown that the view factor of an LNG pool fire suppressed by FOAMGLAS® PFS™ system is comparatively lower than that of high expansion foam, providing real protection from thermal radiation for exposed equipment or personnel. With maximum flame height significantly reduced at a steady state, the thermal radiation is limited to the visible fire within the much lower temperature range of 200°C to 500°C (392°F to 932°F).

Field extinguishing trials conducted were successful in demonstrating the system's performance. These trials, performed on an LNG test pit of 100 square feet, showed that firefighters equipped with a single 20 lb. dry chemical extinguisher were able to directly approach the edge of the containment pit and extinguish the flames within seconds with only a partial charge.

Liquefied Natural Gas pool fires are considered one of the main hazards of LNG facilities. Suppression methods for potential fires are designed to reduce hazards such as radiant heat and flame height. Based on past research, high expansion foam was regarded as the primary technology in suppressing LNG pool fires. FOAMGLAS® PFS™ pool fire suppression systems assist in providing immediate and automatic control of LNG pool fires. The FOAMGLAS® PFS™ pool fire suppression system has been tested to show that both radiant heat and flames were significantly reduced when used as a passive system prior to a gas leak when compared to traditional foam suppression systems used as the only method to attenuate pool fires. In order to help protect a facility from fire and smoke, the use of cellular glass makes sound technical sense.

## UNIQUE PHYSICAL PROPERTIES

The FOAMGLAS® PFS™ system contains specially formulated low-density cellular glass that has a combination of physical properties not found in traditional fire suppressant foams. Made of cellular glass, the material is both extremely buoyant and nonflammable. The pool fire suppressant module system is noncorrosive and resistant to water and vermin. It is also fiber-free, and has a high compressive strength. Damaged or post-incident waste materials can be disposed of as standard refuse, and can be compacted for reduced waste volume.

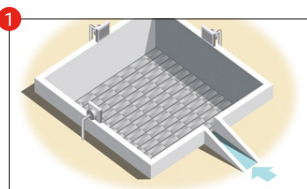
## FOR POOL FIRE SUPPRESSION

Industrial fire safety is more important now than ever before. Production demands require oil and gas facilities to run continuously without fear of costly safety issues. Many companies are also assigning a greater priority to communicating their successful safety records both internally and externally.

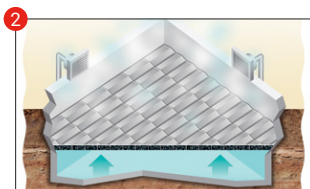
After widespread adoption of the Generation 1 system, the FOAMGLAS® PFS™ Generation 2 pool fire suppression system addresses requirements for extended resistance to

weathering and poor climatic conditions, as well as improving the working surface to ease snow removal. This system complements safety programs by delivering a reliable, low-maintenance passive solution for the reduction of thermal radiation and flame height in contained liquid natural gas (LNG) fires. The FOAMGLAS® PFS™ system is easy to install and can provide immediate mitigation of the thermal flux, rate of combustion, view, and overall size of an LNG pool fire.

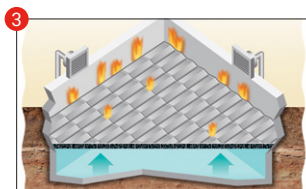
## HOW IT WORKS



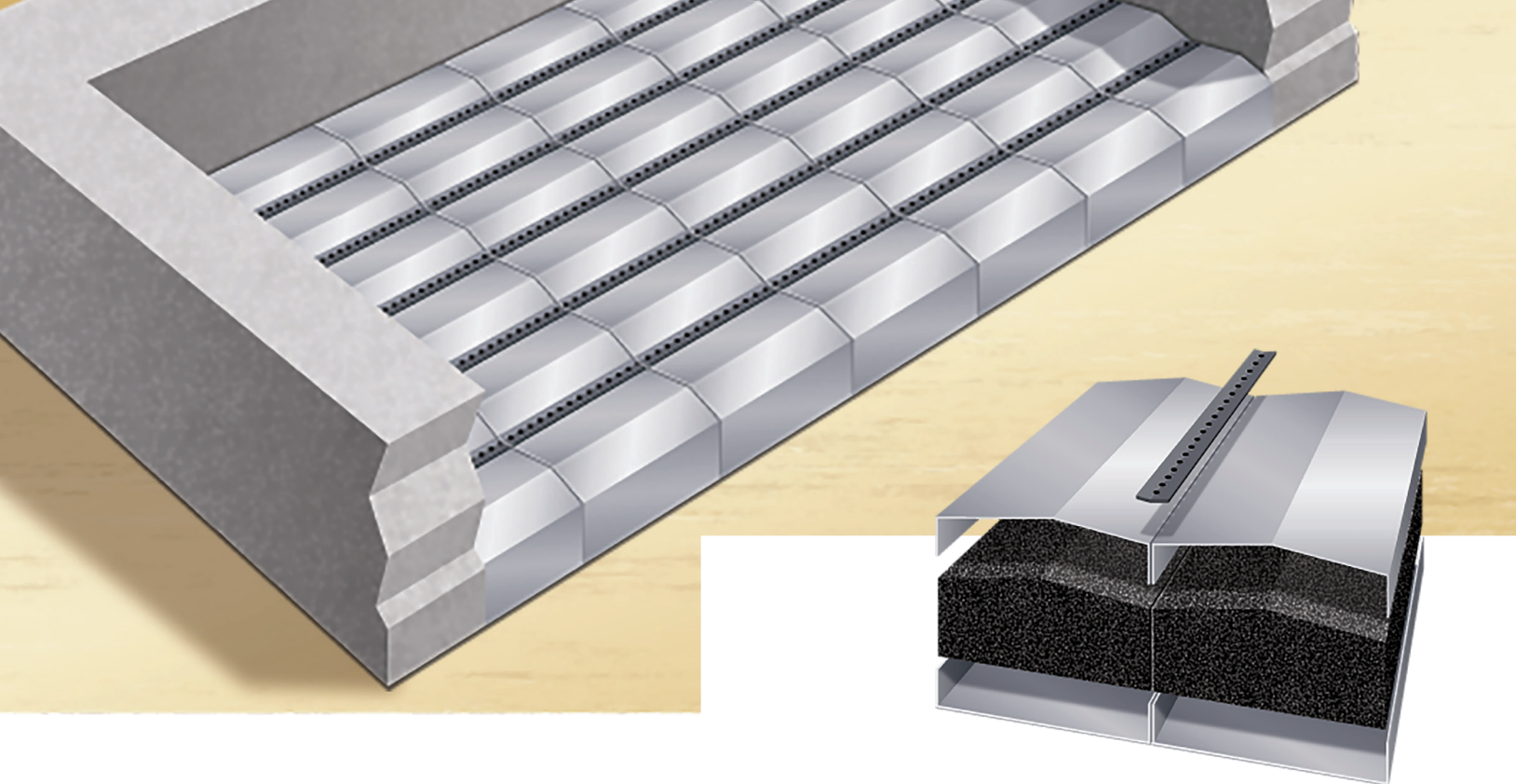
The FOAMGLAS® PFS™ system is a passive system that remains in place to assist in providing immediate and automatic control of LNG pool fires without deployment delays.



Because the FOAMGLAS® PFS™ system is highly buoyant, the pool fire suppressant modules rise immediately to the surface of the LNG to provide an insulating cap that can aid in reducing vaporization.



In the event of ignition, the FOAMGLAS® PFS™ system modules quickly limit thermal radiation and flame height.



# FOAMGLAS®

Pittsburgh Corning, LLC  
One Owens Corning Pkwy  
Toledo, OH 43659

For web-based Sales and Technical Service inquiries,  
please visit [www.foamglas.com](http://www.foamglas.com).

To contact by phone or email:

## **Industrial & Commercial Sales**

### **Americas**

+1 800 327 6126

### **Asia-Pacific**

Singapore: +65 9635 9184

China: +86 (0) 21 6101 7179

Japan: +81 3 6365 4307

### **Europe, Middle East & Africa**

+32 13 661 721

## **Technical Services**

### **Americas & Asia Pacific**

+1 800 327 6126

[foamglastechnical@owenscorning.com](mailto:foamglastechnical@owenscorning.com)

### **Europe, Middle East & Africa**

+32 13 611 468

[industry.tech@owenscorning.com](mailto:industry.tech@owenscorning.com)

The information contained herein is accurate and reliable to the best of our knowledge. But, because Pittsburgh Corning, LLC has no control over installation workmanship, accessory materials, or conditions of application, NO EXPRESSED OR IMPLIED WARRANTY OF ANY KIND, INCLUDING THOSE OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, IS MADE as to the performance of an installation containing Pittsburgh Corning, LLC products. In no event shall Pittsburgh Corning, LLC be liable for any damages arising because of product failure, whether incidental, special, consequential, or punitive, regardless of the theory of liability upon which any such damages are claimed. Pittsburgh Corning, LLC provides written warranties for many of its products, and such warranties take precedence over the statements contained herein.