

MICROPACK
FIRE & GAS



APPLICATION OF VISUAL FLAME DETECTION™

LNG & CNG

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The LNG market is experiencing rapid growth around the globe with supply forecast to rise by 48 Bcf/d by 2035

With this meteoric rise in supply and demand, the design of correct safety systems is critical.



ISO 9001:2008 Certified

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Introduction

The LNG market is experiencing rapid growth around the globe with supply forecast to rise by 48 Bcf/d by 2035¹. This is partly due to the reversal in the US energy market with the shale revolution and the planned liquefaction plants. Australia, East Africa and Qatar being the other major suppliers of LNG. Demand is forecast to increase in Asia and Europe. With this meteoric rise in supply and demand of LNG comes an even greater need to have flame and gas detection systems which are appropriate for the hazards posed by the processes involved.

LNG Process

LNG is predominantly methane (CH₄) condensed into a liquid form by refrigerating it to -161°C. At this stage the LNG is ready to be stored locally or transported around globe on specially designed ships. After the LNG arrives at its destination, it then goes through the process of regasification where it expands to 600 times its liquid state. The typical process and areas where Visual Flame Detection, along with other technologies, would be applied are as follows (Figure 1):

- Gas Production
- Transportation via pipeline
- Liquefaction
- Storage / Transportation – Floating / Fixed
- LNG Terminal
 - Regasification
 - Storage
- Transportation/Distribution
- Power Generation / Petrochemical Industry

LNG Flame and Gas Detection Research

In 2007 significant research on the appropriate fire and gas detection and protection methods was carried out at the Texas A&M University Emergency Services Training Institute. This centre was built to demonstrate LNG spillage and research amongst other safety measures, the correct flame detection to use for pool fire scenarios. (fig. 2).

Micropack were heavily involved in the research and participated in the LNG pool fire testing. The IChemE produced a summarising paper for their Symposium Series No 153, titled; LNG FIRE SAFETY ENGINEERING RESEARCH INTERNATIONAL LIVE FIRE TRAINING WORKSHOPS². The paper is written to determine the following:

- *“To understand the vapour cloud dispersion characteristics of small scale LNG spills;*
- *To validate various existing models and CFD models for LNG dispersion;*
- *To measure the effectiveness of foam and water curtain on mitigating LNG fire;*
- *To ensure the readiness of new equipment.”*

IChemE Conclusion

In doing these tests various flame and gas detection technologies were utilised and the conclusion was as follows;

“ *Tests to date highlight the effectiveness and benefits of rapid gas detection using open path systems, visual CCTV flame detection and high expansion foam systems, to provide effective fast vapour dispersion and fire control capabilities.* ”

This conclusion demonstrates that Visual Flame Detection from Micropack should be **the first choice for all LNG applications.**

LNG & CNG—Superior Safety Solutions

The use of compressed natural gas and LNG to fuel vehicles has increased dramatically around the globe. The result is definitely cleaner and more efficient operations, however, it does mean that to mitigate against the hazards posed by the use of these fuels, correct flame and gas detection technology should be utilised.

Typical applications which need to be considered for flame detection are fuelling stations which could potentially be unmanned, vehicle parking, storage areas and maintenance buildings.

Go Further with Confidence



In the high hazard applications that LNG and CNG is processed, safety matters and that is why Visual Flame Detection™ from Micropack will allow you to go further with confidence. The explosion proof FDS301 Visual Flame Detector™ from Micropack has been tested and certified by FM Global for the detection of a 3ft (0.9m) methane fire at a distance of 100 ft. (30m).

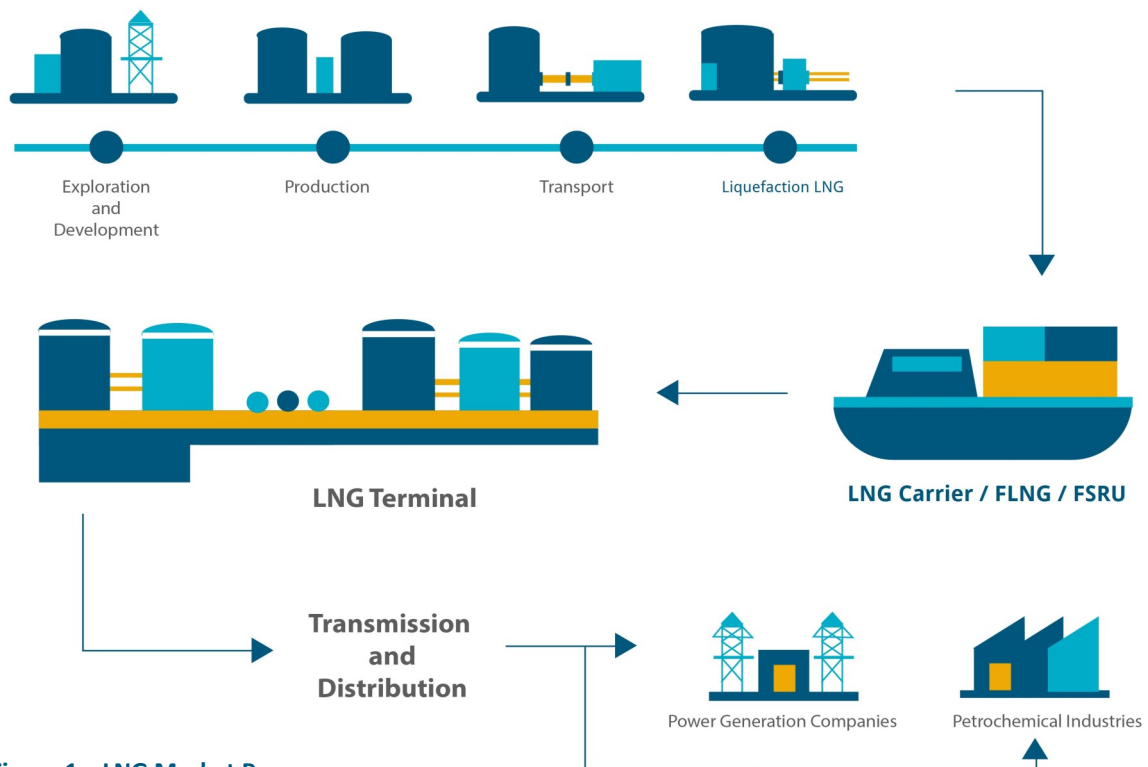


Figure 1—LNG Market Process



Figure 2—Large LNG Pool Fire

Visual Flame Detection™ LNG References

Visual Flame Detection™ has been successfully installed in various LNG & CNG applications around the globe. One such example being a newly constructed liquefaction plant in the US where numerous Visual Flame Detectors are being utilised to protect the facility against liquid pool fires. A selection of other references are:

- Guangdong LNG Terminal & Trunkline China
- Tangguh LNG Offshore Indonesia
- Atlantic LNG Trinidad
- LNG Fuelling Station Netherlands

History

Visual Flame Detection™ is designed for use in the harshest environments, with its roots being traced back to the offshore Oil and Gas industry where fast response flame detection is critical and false alarms are not an option. The FDS301 is also certified as SIL 2 capable by Exida further demonstrating the high reliability of the technology.

Live Colour Video

The FDS301 is also capable of outputting a live colour video feed from each detector. This ensures operators have the most critical information to hand when making split second decisions in the event of a fire. The live video feed has proved invaluable in saving lives during real fires.

This feature has been utilised successfully in another application where LNG is stored in tanker trucks parked in close proximity to a built up area. In the event of a fire, the video is transmitted to a remote control room to allow the fire teams to act appropriately in the event of a fire.

References:

1. BP Energy Outlook 2016 Edition. Outlook to 2035
2. IChemE Symposium Series No 153, titled; LNG FIRE SAFETY ENGINEERING RESEARCH INTERNATIONAL LIVE FIRE TRAINING WORKSHOPS

Author

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5 reasons to use Visual Flame Detection™ for LNG & CNG Applications



When Safety Matters. Visual Flame Detection™ will provide a fast response to LNG pool and methane gas jet fires.



Challenging environment. Where other technologies would either false alarm or miss fires, Visual Flame Detection™ is unrivalled in its false alarm immunity and flame detection capability.



Go further with confidence. On-board micro-SD card in every unit capable of recording any occurring fire. Lessons could be learned from this video and preventative safety measures introduced.



Live Video Feedback. Incorporating a colour camera in each unit, the FDS301 offers a cost effective combined flame detection and CCTV solution.



Safety Integrity Level

Certified as SIL 2 Capable by
EXIDA



Figure 3—FDS301 Visual Flame Detector protecting LNG Fuelling Station

FDS301 TECHNICAL SPECIFICATION

Environmental

Operating Temp - 60°C to +85°C (-76°F to +185°F)
Storage Temp: - 60°C to +85°C (-76°F to +185°F)
Humidity 0 to 95% RH non-condensing

Operating Voltage

24Vdc Nominal – (18 to 32 Vdc Range)

Power Consumption

6 watts minimum (no heater), 10 watts typical, 15 watts maximum (with heater)

Speed of Response

~7 seconds (Typical)

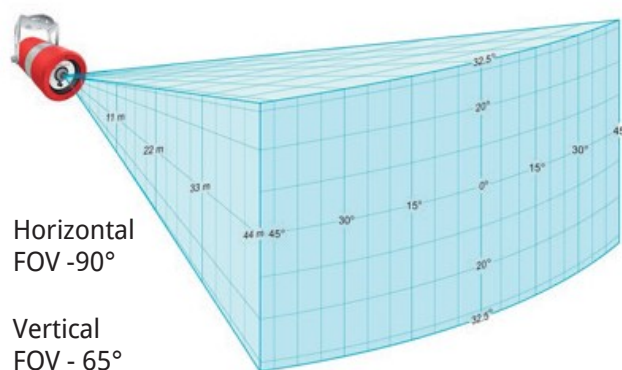
Flame Sensitivity

Fuel	Fire Size	Distance
Methane Jet Fire	0.9m ² (3ft) plume	30m (100 feet)
Ethanol	0.1m ² (1sqft) pan	25m (85 feet)
n-Heptane: Pan Fire	0.1m ² (1sqft) pan	44m (144 feet)
n-Heptane: in direct sunlight	0.1m ² (1sqft) pan	44m (144 feet)
n-Heptane: in modulated sunlight	0.1m ² (1sqft) pan	44m (144 feet)
n-Heptane: modulated black body	0.1m ² (1sqft) pan	44m (144 feet)
n-Heptane: Arc welding	0.1m ² (1sqft) pan	44m (144 feet)
n-Heptane: 1000watt lamp	0.1m ² (1sqft) pan	44m (144 feet)
Gasoline Fire	0.1m ² (1sqft) pan	44m (144 feet)
JP4	0.36m ² (3.8sqft)	61m (200 feet)
Ethylene Glycol	0.1m ² (1sqft) pan	15m (50 feet)
Diesel	0.1m ² (1sqft) pan	40m (130 feet)
Crude Oil (heavy fuel oil) Pan Fire	0.25m ² (2.7sqft)	40m (130 feet)
Silane fire	0.61m (2ft) plume	13m (42ft)

Enclosure

Dimensions: 100 Diameter x 200 Length Overall (mm)
Material: LM25 (Red epoxy), 316L stainless steel
Entries: 1 – M25, ¾" NPT (Variants on Request)
Weight: 2.5kg (LM25) or 6kg (316L)

Field of View



Outputs

Relay contacts - alarm and fault
Current source 4-20mA
RS485, HART
Live colour video – PAL and NTSC

Certification

ATEX : II 2 G Ex db IIC T4 (FM07ATEX0033)
Factory Mutual : 3260 (3029978)
IEC 61508 : SIL 2 (MP 080203 C001)
IECEX FME 07.0002
Class 1 DIV 1 GROUPS B,C,D,T4
Class 1 Zone 1 AEx/Ex d IIC T4
EN54-10 (Vds)

