

# Liquid methane: LNG (-162°) Characteristics and risks

Guideline

# Physical properties LNG (Liquefied Natural Gas)

- UN 1972/ GEVI 223
- Methane (CH<sub>4</sub>)/natural gas
- -162 °C
- 1 litre LNG = 0.5 kg. (1 litre LNG= 600 litre natural gas)
- Explosion limit 5 16 vol %
- See chemical cards book

#### **LNG RISKS**

- Extremely flammable gas.
- Extremely low temperatures (-162 °C (freezing injuries and effects on construction components (becoming brittle)). Use special protective clothing for possible contact.
- LNG is heavier than air when released (be aware of underground pools/sewers where LNG can accumulate).
- Risk of explosion in closed spaces (ATTENTION: parking garages, workshops and filling stations, etc.).
- Suffocating in high concentrations (take victim to fresh air and resuscitate).
- Warmed gas is no longer visible (cloud is no longer visible as white vapour).

#### **CHARACERISTICS OF LNG INCIDENTS**

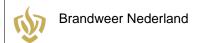
- Take account of the risk of low-lying gas at great distances. LNG warms up and mixes with air.
- The (visible) cloud depends on the temperature of the LNG and environmental factors such as the
  outside air temperature and humidity. A visible cloud does not always have to be LNG. It could be
  condensation! LNG is <u>odourless</u> and colourless (visible as white mist due to condensation of the
  surrounding air (water vapour)).

### **SAFE ACTION**

- Start **OGS procedure** in connection with <u>explosion risk</u> and unknown <u>(large) effect zone</u> (assemble behind the safety line and remain upwind).
- Wear complete emergency response clothing, including breathing protection.
- ALWAYS use a <u>methane detector (sniffer)</u> or explosion danger meter and <u>infra-red imaging camera</u> (to make cold and gas clouds visible).
- Stay upwind (be aware of sloping terrain) and do NOT come into contact with the liquid/gas cloud.
- Only use mobile telephones, walkie-talkies, beepers, etc. in safe areas.

### **OPERATING PROCEDURE FOR LNG INCIDENTS**

- Warn the operator or owner of the vehicle/filling station.
- Request expert assistance from the LIOGS (Landelijk Informatiepunt Ongevallen Gevaarlijke stoffen) [national information centre for accidents involving dangerous substances] 010-2468642.
- Warn/evacuate the area to a significant distance (100 metres).
- Be aware of ignition sources in the surroundings (e.g. cars).
- Preferably do not extinguish LNG fires. Where necessary, cool objects heated by radiated heat (prevent contact between water and LNG!). Only extinguish LNG fires if necessary (risk of escalation).
- Treat skin contact with the substance as a burn injury.
- Prevent water coming into contact with the blow-off safety feature in connection with the risk of it freezing closed. Only use water in consultation with an expert.



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• Check the degree of filling of all types of tanks in connection with risk estimation (ask the owner/driver).

#### **CHARACTERISTICS OF LNG SCENARIOS**

## Scenario: blowing off an LNG tank

- If the pressure in a tank is excessive, the system blows off using a blow-off safety feature.
- Squeaking or growling noises are typical (a flare may occur).
- Occurs when pressure builds up in a tank as a consequence of little use or insufficient cooling capacity.
- **Action:** Ensure the safety of the immediate surroundings (approx. 10 metres) (measure the risk of explosion and evacuate), transfer after safe signal.
- LNG procedure: fuel tank, bunkering, tanker truck, filling station and loading & unloading.

## Scenario: radiated heating of an LNG tank (different type of fire than LNG)

- Intact tank construction provides significant passive safety against heating caused by radiated heat.
- Heating of LNG installations increases the pressure in the relevant section/tank (activation of blow-off safety features).
- Cooling of this type of installation/tank is possible with water as long as there is NO LNG leakage.
- **Action:** cool the surroundings/prevent escalation, preferably do NOT extinguish an LNG fire (cool the LNG tank with 10l/m²/min).
- LNG procedure: fuel tank, bunkering, tanker truck, filling station and loading & unloading.

## Scenario: LNG leakage

- Liquid or gaseous LNG will be released in the case of LNG leakage. Possible creation of a cold boiling pool.
- LNG leakage will be recognisable as a white mist.
- The visible limit of the gas cloud is overall also the contour of 100% LEL (always continue to measure!).
- Action: prevent fire/prevent escalation; mix up the gas cloud with a (street) water cannon.
- Do not apply water or foam to a cold boiling pool of LNG!
- LNG procedure: fuel tank, bunkering, tanker truck, filling station and loading & unloading.

## Scenario: LNG fire (flare fire and pool fire)

- A LNG fire radiates a great deal of heat.
- Action: (Pool) do NOT extinguish the fire (pool will burn off very quickly).
- Cool the surroundings within a distance of 5 x the radius of the pool. Fight possible effects.
- Small LNG pool fire: extinguish with powder (if possible).
- LNG procedure: fuel tank, bunkering, tanker truck, filling station and loading & unloading.

## Scenario: damaged LNG tank as a consequence of an accident (external influence)

- There can be several types of damage. Visible and also invisible.
- Recognise damage (dents, breaks in insulation or loss of vacuum).
- Use an infra-red imaging camera to detect damage.
- If vacuum is lost: accelerated heating of the contents of a tank.
- Action: Secure tank and surroundings, assist recovery/technical emergency service and transfer to the operator.
- LNG procedure: fuel tank, bunkering, tanker truck, filling station.