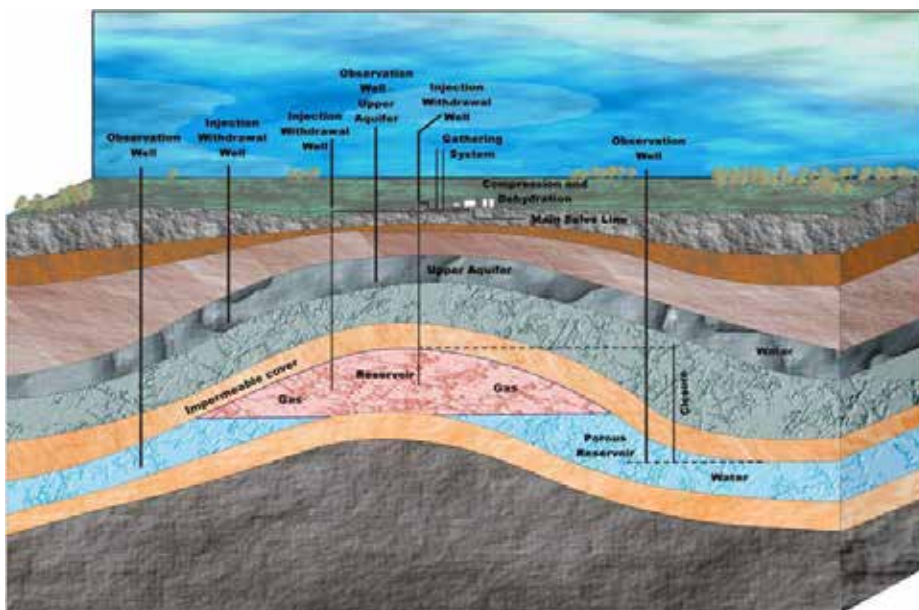


Natural gas storage is ideal because it enables to compensate the increased gas consumption during winter with an easy and low-risk storage during summer. Natural gas can be stored in liquefied form in huge tanks, but also in underground geologic formations.

## Underground gas storage

There are 2 types of underground storage:

### In aquifer reservoir



Porous and permeable rock, saturated with water with impermeable cover  
Depth: From 400 to 1600 meters

Natural gas is injected into the formation, building up pressure and pushing down resident water. Control wells are used to monitor gas movements and water quality within the different layers. At the surface, operating wells are connected to a central station with underground pipelines: Compressing stations, laboratories for quality controls and treatment units to purify the gas, - composed of water and sulphur compounds - are necessary.

#### Advantages : \*

These tanks allow storage of a larger quantity of gas. Ten years will be required to fill the tank completely but the gas can be used the first year.

#### Note :

Chémery (In France Center) is the largest and deepest aquifer tank in the world with a capacity of 7 billion of  $m_3$  of natural gas.

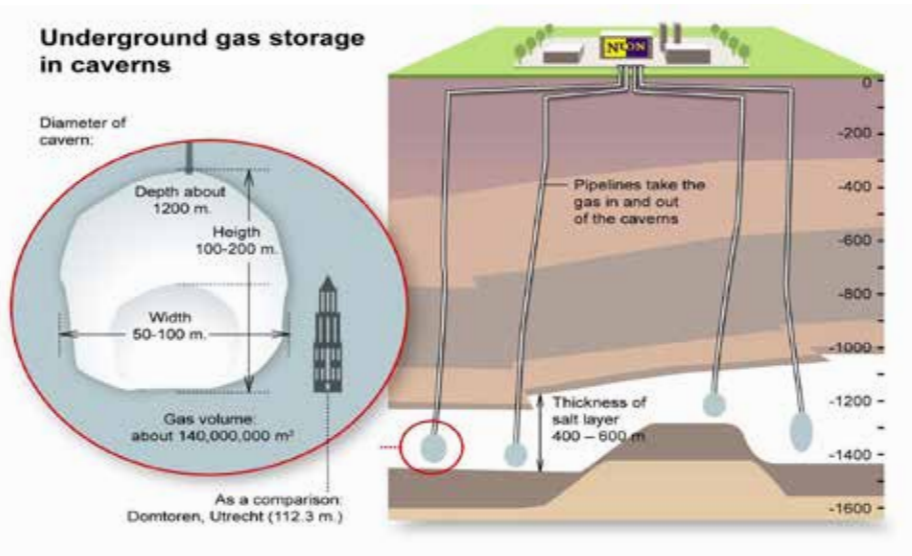
### In salt cavern

Thick salt layers covered by clay,  
Depth: from 1000 to 1500 meters.

Salt is dissolved after the water injection. The salt\* water mix is evacuated and the gas is injected and stored at high pressure.

This smaller type of storage, allows large quantities of gas to be stored and gas can be quickly and easily injected and removed from the cavern and is operational in general in less than 2 hours.

Isolated of oxygen by several hundred of meters, the gas in the tank is unexposed to ignition which could take place on surface.



### Storage in tanks

Natural gas can also be stored in tanks in liquid phase (cooled down to  $-160^{\circ}C$ ). Most of these tanks are located in LNG terminals. After storage, gas is humid and odorless.

# Application Note

## Natural Gas Storage

### Risks and detected gas

In case of leakage, a huge quantity of gas will immediately be released, catalytic detectors need oxygen, that's why we recommend the use of IR detectors.



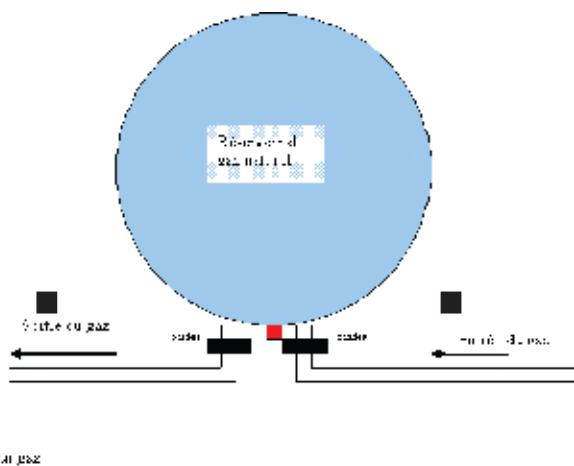
The GD10 is recommended to prevent risks of methane explosion (valves, pumps, pipes...)

### Where to position the detectors

#### Gas detection

1. Position the detector the closest to the pipes flanges and gas exits
2. Keep in mind the air circulation.
3. It is preferable to position the detectors along the pipes or pumping station.

Note: The GD10P should be mounted horizontally.



#### Flame detection

1. Place the flame detector upward and looking down to supervise the valves and the interfaces (areas between different buildings on the site).
2. Consider the max detection distance, the potential source of false alarms to determine the best flame detector. Attention to exteriors elements which could look like fire and create a false alarm.
3. Take into account air flow.

	Fuel	Fire size	IR3	UVIR <sup>2</sup>
Maximum Detection Distance	Methane	1 ft <sup>2</sup> (0.1m <sup>2</sup> ) Pan fire, 32 in (0.8m) height	Std. rg: 50m (165ft) Long rg. : 100m (330 ft)	200 ft (60m)
Potential source of false alarm	Arc welding	#7014, 3/16 in, 190A	3.6 m (12 ft)	7.6 m (25 ft)
	Electrostatic Arc			
	Solar Radiation	Modulated		
(Rejected by signal treatment but might impact the sensitivity)	Hot Surfaces / IR radiation	Modulated		
	100 W Incandescent lamps	Modulated		
	Halogen lamp	100 W Modulated	2.4 m (8ft)	2.4 m (8 ft)

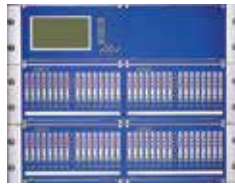
No effect

Limited effect

## Solutions and advantages

Teledyne Gas & Flame Detection recommend the below equipment for the natural gas storage:

### Controller



**MX62**  
To centralize information and activate the needed security system.

### Gas detection



**Meridian**

Simply attach the specific toxic or combustible sensor to the universal detector head and the detector will automatically determine the type of gas to be detected.



**OLCT100**

Designed for the detection of explosive gases, toxic gases or oxygen, whatever your application the OLCT100 exists in catalytic, electrochemical, semiconductor, or poison control version.

### Flame detection



**IR3 (DF-TV7-T)**

Excellent performance and false alarm immunity and highest SIL level certified flame detector on the market.

**UVIR<sup>2</sup> (DF-TV7-V)**

Extremely high immunity to false alarm while showing one of the best UVIR sensitivity on the market.

### Open path



**Spyglass**

The Spyglass system detects hydrocarbon gases by analyzing the absorption of radiation caused by gases in the atmosphere and comparing it to background atmospheric absorption. This is accomplished between a pair of units: a Flash Source and a Detector that can monitor a distance of up to 200 meters.



The infrared detector **GD10P**

Used for combustible gas detection because of a reduced maintenance and an appreciate cost reduction / highlight features.

### Transportable detection

**BM 25 Wireless Transportable Multi-Gas Area Monitor**

Designed to detect one to five gases for mobile or temporary work applications, team protection, area surveillance or places where fixed detection systems are not suitable.



### Portable gas detection

The multi-gas **PS200** detector: recommended for the maintenance team for its robustness.





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