

Valutazione Analisi Indici per Eurogas Energy

Nella tabella seguente si riassumono i risultati dell'analisi.

	STOCCAGGIO	CARICO/SCARICO	COMPRESSORI
D	94.29	257	300.4
F	15.25	4.41	3.06
F'	0.78	0.312	0.2
C	3.22	4.41	3.06
C'	0.773	1.19	0.97
A	130.36	420	11.5
A'	8.67	32.5	2.96
G	2252.98 (C)	11520 (C)	300.4 (B)
G'	30.15 (A)	288 (B)	39.05 (A)

In base ai valori di G' calcolati per ogni unità ed a quanto definito in Appendice IV al DM 15/05/1996, il deposito in esame risulta essere di:

I classe

"Deposito in cui le unità logiche, individuate e valutate ai sensi dell'Appendice II, risultano di categoria A. Al deposito va attribuita questa classe anche nel caso in cui una sola unità logica, escluse quelle di stoccaggio, risulti di categoria B, purché con valore dell'indice di rischio generale compensato G' inferiore a 500, ovvero 700 se trattasi di unità di travaso ferrocisterne."

A.4 Rottura limitata serbatoio in zona liquido

Si assume come ipotesi estremamente conservativa una perdita da un foro di diametro equivalente pari a 2" ed una durata del rilascio pari a 30 min.

```
INPUT
Model name           : Two-phase release from vessel or pipe
Case description..... : Session 1
Chemical name.....   : Propane
Type of release.....  : Release through hole in
vessel
Vessel volume.....   : 150 m3
Vessel type.....     : Horizontal cylinder
Length cylinder.....  : 17.9 m
Filling degree.....  : 50 %
Hole diameter.....    : 50 mm
Height leak above tank bottom..... : 0 m
Initial temperature..... : 15 °C
Discharge coefficient..... : 0.62 -
Ambient temperature..... : 25 °C
Time t after start release..... : 1800 s

RESULTS
Mass flow rate at time t..... : 0 kg/s
Exit vapour mass fraction at time t..... : 0 %
Exit temperature at time t..... : 7.86 °C
Pressure in vessel at time t..... : 5.983 Bar
Temperature in vessel at time t..... : 7.86 °C
Total mass released at time t..... : 38200 kg
Mass of liquid in vessel at time t..... : 0 kg
Mass of vapour in vessel at time t..... : 1693.9 kg
Filling degree at time t..... : 0 %
Height of liquid at time t..... : 0 m
Average mass flow rate..... : 29.521 kg/s
...Based upon time..... : 1269.4 s
Maximum mass flow rate..... : 30.69 kg/s
```

► la quantità totale di GPL rilasciate è pari a 1693.9 kg

```
INPUT
Model name           : Spray release of pressurized liquefied gas
Case description..... : Session 1
Chemical name.....   : Propane
Type of release.....  : Release through hole in
vessel
Mass flow rate of the source..... : 29.521 kg/s
Outflow orientation..... : Horizontal
Height leak above ground level..... : 0.1 m
Ambient temperature..... : 25 °C
Ambient relative humidity..... : 70 %
Exit temperature..... : 7.86 °C
Exit vapour mass fraction..... : 0 %
Discharge coefficient..... : 0.62 -
Hole diameter..... : 50 mm
Duration of the release..... : 1800 s

RESULTS
Nett air-borne mass flow rate..... : 29.52 kg/s
Jet diameter after rain out..... : 0.28 m
Temperature after rain out..... : -42.25 °C
Vapour mass fraction after rain out..... : 32 %
Total mass liquid rained out..... : 0 kg
Jet diameter after air entrainment..... : 1.18 m
Temperature of air/vapour mixture..... : -77.83 °C
Concentration in air/vapour mixture..... : 2.7246E5 mg/m3
Volumetric flow rate..... : 73.45 m3/s
```

Date le condizioni del rilascio, l'analisi delle conseguenze ha portato alla definizione di due possibili scenari, ovvero:

- Flash Fire

- UVCE

Flash Fire

Nel seguito si riportano i calcoli eseguiti riferendosi alle condizioni meteo D/5.

Concentrazione pari al LEL

INPUT	
Model name	: Dense gas; jet dispersion; concentration contour
Case description.....	: Session 1
Chemical name.....	: Propane
Outflow orientation.....	: Horizontal
Mass flow rate of the source.....	: 29.5 kg/s
Duration of the release.....	: 180 s
Diameter of expanded jet.....	: 0.0006 m
Height leak above ground level.....	: 0.1 m
Initial liquid mass fraction.....	: 58 %
Vapour temperature after expansion.....	: -42.5 °C
Wind speed at 10 m height.....	: 5 m/s
Pasquill stability class.....	: D (Neutral)
Ambient temperature.....	: 25 °C
Ambient relative humidity.....	: 70 %
Roughness length description.....	: Habitated land
Time t after start release.....	: 180 s
Distance from release (X).....	: 0 m
Distance perpendicular to wind direction (Y).....	: 0 m
Height (Z).....	: 0 m
threshold concentration.....	: 38504 mg/m3
RESULTS	
Maximum length of the vapour cloud.....	: 8 m
Maximum width of the vapour cloud.....	: 3 m
Minimum distance to threshold concentration.....	: 1 m
Maximum distance to threshold concentration.....	: 9 m

Concentrazione pari ½ LEL

INPUT	
Model name	: Dense gas; jet dispersion; concentration contour
Case description.....	: Session 1
Chemical name.....	: Propane
Outflow orientation.....	: Horizontal
Mass flow rate of the source.....	: 29.5 kg/s
Duration of the release.....	: 180 s
Diameter of expanded jet.....	: 0.0006 m
Height leak above ground level.....	: 0.1 m
Initial liquid mass fraction.....	: 58 %
Vapour temperature after expansion.....	: -42.5 °C
Wind speed at 10 m height.....	: 5 m/s
Pasquill stability class.....	: D (Neutral)
Ambient temperature.....	: 25 °C
Ambient relative humidity.....	: 70 %
Roughness length description.....	: Habitated land
Time t after start release.....	: 180 s
Distance from release (X).....	: 0 m
Distance perpendicular to wind direction (Y).....	: 0 m
Height (Z).....	: 0 m
threshold concentration.....	: 19252 mg/m3
RESULTS	
Maximum length of the vapour cloud.....	: 30 m
Maximum width of the vapour cloud.....	: 6 m
Minimum distance to threshold concentration.....	: 1 m
Maximum distance to threshold concentration.....	: 31 m

Effetto di danno	Soglia	Distanza di danno [m]
Elevata letalità	LEL	9
Inizio letalità	½ LEL	31

A.5 Rottura limitata serbatoio in zona vapore

Si assume come ipotesi estremamente conservativa una perdita da un foro di diametro equivalente pari a 2".

```
INPUT
odel name           : Vapour release from vessel or pipe
Case description..... : Session 1
Chemical name.....   : Propane
Type of release.....  : Release through hole in
vessel
Vessel volume.....   : 150 m3
Vessel type.....     : Horizontal cylinder
Length cylinder.....  : 17.9 m
Filling degree.....   : 50 %
Hole diameter.....    : 50 mm
Height leak above tank bottom..... : 3 m
Initial temperature..... : 15 °C
Discharge coefficient..... : 0.62 -
Time t after start release..... : 1800 s

RESULTS
Mass flow rate at time t..... : 1.69 kg/s
Pressure in vessel at time t..... : 4.906 Bar
Temperature in vessel at time t..... : 1.56 °C
Total mass released at time t..... : 3722 kg
Mass of liquid in vessel at time t..... : 34730 kg
Mass of vapour in vessel at time t..... : 809.09 kg
Filling degree at time t..... : 44 %
Diameter expanded jet at time t..... : 0.06 m
Average mass flow rate..... : 1.312 kg/s
...Based upon time..... : 7200 s
Maximum mass flow rate..... : 2.4208 kg/s
```

► Portata media pari a 1.69 kg/s.

Data la natura del rilascio, l'analisi delle conseguenze ha portato alla definizione di due possibili scenari, ovvero:

- Jet Fire
- Flash Fire

Jet Fire

Si riportano i calcoli eseguiti nel seguito.

```
INPUT
Model name           : Two-phase Jet fire
Case description..... : Session 1
Mass flow rate of the source..... : 2.4208 kg/s
Distance from release (X)..... : 100 m
Exposure duration to heat radiation..... : 60 s

RESULTS
Length of the flame..... : 25.27 m
Width of the flame..... : 3.1588 m
Heat radiation level at X..... : 0.41266 kW/m2
Fraction of mortality at X..... : 0 %
```

Effetto di danno	Soglia	Distanza di danno [m]
Danni alle strutture	12.5 kW/m ²	28.5

Flash Fire

Sia la soglia del LEL che ½ LEL non viene raggiunta.