

SIMULAZIONI RILASCIO GAS TOSSICO LIQUEFATTO IN COLLI SU CONTAINER

L'ipotesi riguarda il danneggiamento di un container contenente gas tossico in colli durante la movimentazione all'interno del terminal. L'incidente comporta la rottura di un collo e il rilascio di gas in fase liquida; l'evaporazione della pozza all'interno del contenitore e la successiva dispersione del gas in atmosfera, attraverso le fessure presenti tra le pareti del contenitore stesso.

Ipotesi simulazioni

Sostanza pericolosa:	Fosgene (COCl ₂)
Stato fisico:	Gas liquefatto
Classificazione:	Molto tossico
LC50:	356.4 mg/m ³
IDLH:	8.1 mg/m ³
Tipo di contenitore:	Fusto (in container)
Volume:	1m ³ (in 40m ³)
Tipo di rottura:	Rottura grave
Dimensione foro fusto:	51 mm
Dimensione foro container: (foro equivalente per le fessure)	51 mm
Condizioni meteo:	4D
(maggiormente ricorrenti)	

Risultati delle simulazioni

Scenario incidentale	Raggi di danno [m]		Durata effetti [s]
	LC50	IDLH	
Rilascio tossico	67	600	< 180

Tabella 1

Per quanto riguarda la classe di probabilità dell'evento di cui trattasi, tenuto conto:

- del numero di contenitori di gas molto tossici liquefatti in colli movimentati nel porto di Genova;
- dei dati disponibili sulla frequenza e la direzione dei venti che interessano il porto di Genova (principalmente venti di tramontana, che spirando da terra verso mare, tendono ad allontanare eventuali nubi tossiche dalla città);

la frequenza di un rilascio tossico che interessi le aree urbane è stimata < 1E-06 occ/anno; l'evento è quindi da ritenersi, secondo la bibliografia di settore, estremamente improbabile.

----- START OF SESSION 1(mYBTPDIS) -----

INPUT

Model..... : Two phase bottom discharge (TPDIS)
(202)
Version..... : 5.06
Reference..... : Yellow Book (CPR-14E), 3rd edition
1997, Chapter 2 and Modelling source
terms for the atmospheric dispersion
of hazardous substances, Jaakko
Kukkonen
Case description..... : Rilascio tossico da fusto - IMO 2.3
- Fosgene
Chemical name..... : Carbonic dichloride (phosgene)
Use which representative step..... : Second 20% average (toxic)
Type of release..... : Release through hole in vessel
Hole diameter..... : 51 mm
Hole rounding..... : Sharp edges
Discharge coefficient..... : 0.62 -
Height difference between pipe entrance and exit..... : 0 m
Vessel volume..... : 1 m3
Vessel type..... : Vertical cylinder
Height cylinder..... : 1 m
Filling degree..... : 80 %
Expansion type..... : Adiabatic
Pressure inside vessel determination..... : Use vapour pressure
Initial temperature in vessel..... : 16 °C
Type of calculation..... : Calculate until device is empty

RESULTS

Initial mass in vessel..... : 1108.6 kg
Initial (vapour) pressure in vessel..... : 1.3826 bar
Time needed to empty vessel..... : 87.971 s
Mass flow rate at time t..... : 0 kg/s
Total mass released..... : 1104 kg
Pressure in vessel at time t..... : 1.0151 bar
Temperature in vessel at time t..... : -12.78 °C
Exit vapour mass fraction at time t..... : 100 %
Mass of liquid in vessel at time t..... : 0 kg
Mass of vapour in vessel at time t..... : 4.6384 kg
Height of liquid at time t..... : 0 m
Filling degree at time t..... : 0 %
Pressure at pipe exit at time t..... : 1.0151 bar
Temperature at pipe exit at time t..... : -12.78 °C
Maximum mass flow rate..... : 14.517 kg/s
Representative release rate..... : 13.716 kg/s
Representative outflow duration..... : 80 s
Representative temperature..... : 15.621 °C
Representative pressure..... : 1.4395 bar
Representative vapour mass fraction..... : 0 %

----- END OF SESSION 1 -----

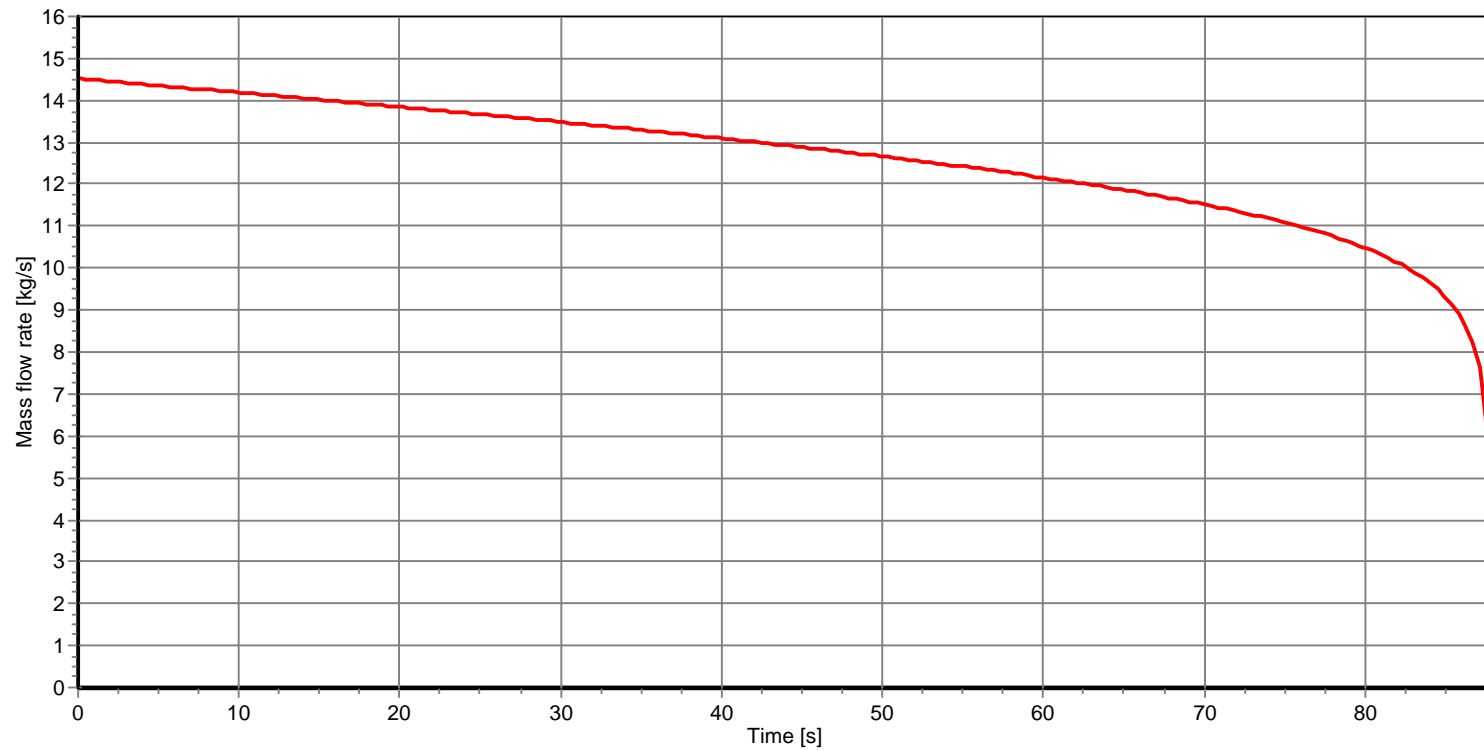
Administrative & version data:

Main program (production date) : Effects (24 Apr 2009 03:00:37)
Run mode (complexity level) : Expert
Model name : Two phase bottom discharge (TPDIS) (202)
Date of this calculation : 10 Oct 2013 10:19:06
License owner : rachele
Calculation performed by : rachele
Software library version : 7.6.4.3276
Model driver version(s) : 5.06
Model driver last modification : 10 July 2007
Model executable version(s) : N/A
Session nr. : 1
References : Yellow Book (CPR-14E), 3rd edition 1997, Chapter 2 and Modelling
source terms for the atmospheric dispersion of hazardous
substances, Jaakko Kukkonen
Project file name : "Standard project.alf"
Chemical database used : "Purple Book (1999).rdp" (30 ago 2013 15:58:00)
Environment database used : "Purple Book (1999).Env" (20 mag 2008 09:53:47)
System database used : "Purple Book (1999).SPF" (20 mag 2008 09:53:47)
Dispersion database used : "Purple Book (1999).dpf" (20 mag 2008 09:53:47)
Map background file used : "" (01 gen 0 00:00:00)
Project file directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container"
Chemical database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Environment database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
System database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Dispersion database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Map background directory : ""

End of administrative & version data:

Effects 7.6.4.3276 Calculation: 10 Oct 2013 10:20:43
Model: Two phase bottom discharge (TPDIS) (202)
Graph: Mass flow rate vs Time

Rilascio tossico da fusto - IMO 2.3 - Fosgene



```
----- START OF SESSION 1(mYBPoolEvaporation) -----
INPUT
Model..... : Pool evaporation (194)
Version..... : 5.17
Reference..... : Yellow Book CPR14E 2rd Edition -
                Chapter 5: Evaporation
Case description..... : Rilascio tossico da fusto - IMO 2.3
                - Fosgene
Chemical name..... : Carbonic dichloride (phosgene)
Use which representative step..... : Second 20% average (toxic)
Evaporation from land or water..... : Land
Type of release..... : Continuous
Total mass released..... : 1104 kg
Mass flow rate of the source..... : 13.716 kg/s
Type of pool grow on land..... : Spreading in bunds
Temperature of the pool..... : 16 °C
Maximum pool surface area..... : 15 m2
Temperature of the subsoil..... : 16 °C
Wind speed at 10 m height..... : 1 m/s
Ambient temperature..... : 16 °C
Ambient relative humidity..... : 66 %
Solar radiation flux..... : Calculate value
Cloud cover..... : 50 %
Date: day number..... : 15
Date: month number..... : 4
Latitude of the location..... : 44 deg
Type of subsoil..... : Carbon steel
Subsoil roughness description..... : relatively flat sandy soil, gravel
Maximum evaluation time for evaporation..... : 1800 s
```

RESULTS

```
Heat flux from solar radiation..... : 1.2141 kW/m2
Outflow time of the continuous release..... : 80.49 s
Time pool spreading ends..... : 17 s
Representative release rate..... : 0.29711 kg/s
Representative outflow duration..... : 1762.8 s
Representative temperature..... : 6.9542 °C
Representative pool radius..... : 2.1851 m
Total evaporated mass..... : 523.74 kg
... duration evaporation time..... : 1799.5 s
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----- END OF SESSION 1 -----
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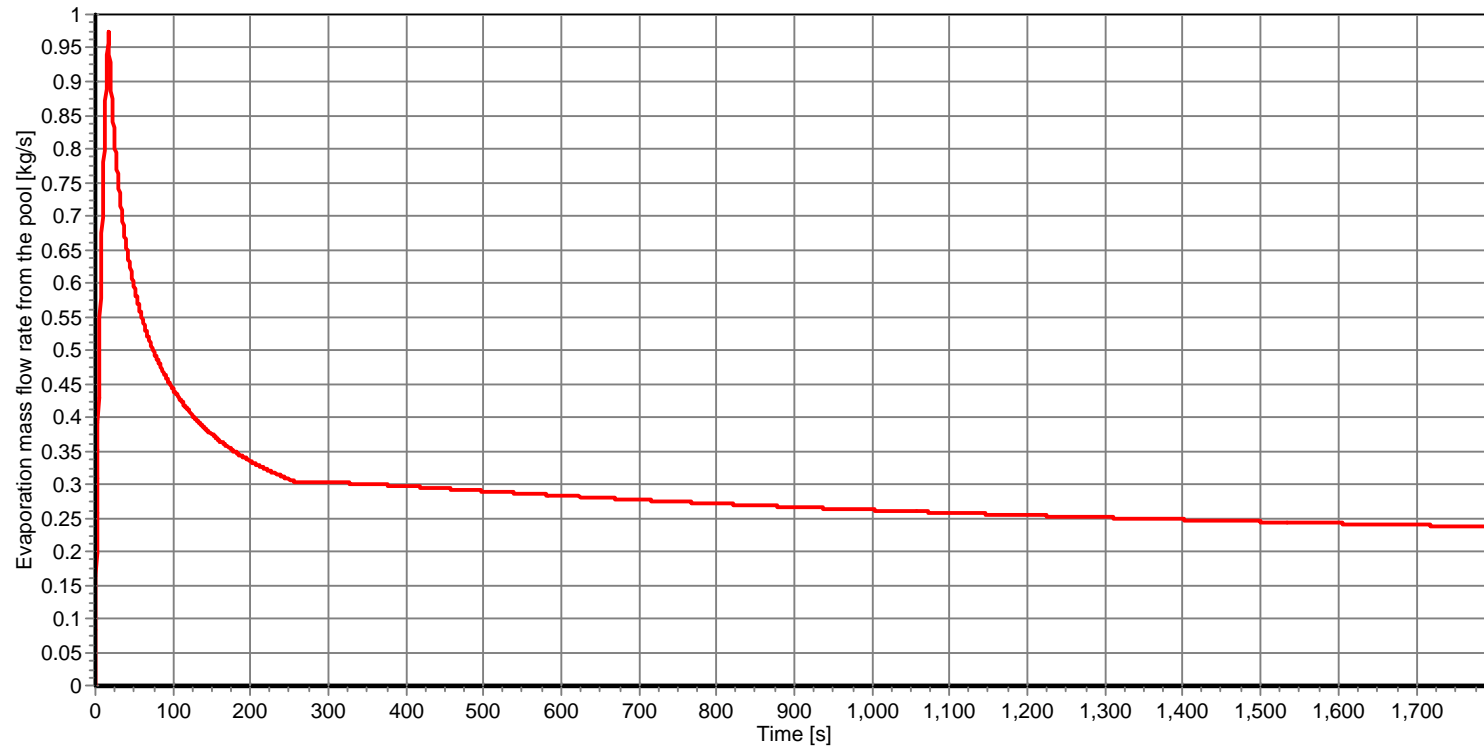
Administrative & version data:

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Main program (production date) : Effects (24 Apr 2009 03:00:37)
Run mode (complexity level) : Expert
Model name : Pool evaporation (194)
Date of this calculation : 10 Oct 2013 10:41:29
License owner : rachele
Calculation performed by : rachele
Software library version : 7.6.4.3276
Model driver version(s) : 5.17
Model driver last modification : 15 Oct 2008
Model executable version(s) : N/A
Session nr. : 1
References : Yellow Book CPR14E 2rd Edition - Chapter 5: Evaporation
Project file name : "Standard project.alf"
Chemical database used : "Purple Book (1999).rdb" (30 ago 2013 15:58:00)
Environment database used : "Purple Book (1999).Env" (20 mag 2008 09:53:47)
System database used : "Purple Book (1999).SPF" (20 mag 2008 09:53:47)
Dispersion database used : "Purple Book (1999).dpf" (20 mag 2008 09:53:47)
Map background file used : "Standard project.gbf" (01 gen 00:00:00)
Project file directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container"
Chemical database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Environment database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
System database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Dispersion database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Map background directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container"
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End of administrative & version data:
```

Effects 7.6.4.3276 Calculation: 10 Oct 2013 10:42:29
Model: Pool evaporation (194)
Graph: Evaporation mass flow rate vs. Time (Pool Evaporation)

Rilascio tossico da fusto - IMO 2.3 - Fosgene



----- START OF SESSION 1(mYBNewVapourRelease) -----

INPUT

Model..... : Vapour release (89)
Version..... : 5.09
Reference..... : Yellow Book, CPR-14E, 3rd edition
 1997, Paragraph 2.5.4
Case description..... : Rilascio tossico da container - IMO
 2.3 - Fosgene
Chemical name..... : Carbonic dichloride (phosgene)
Use which representative step..... : Second 20% average (toxic)
Type of release..... : Release through hole in vessel
Hole diameter..... : 51 mm
Hole rounding..... : Sharp edges
Discharge coefficient..... : 0.62 -
Initial temperature in pipeline..... : 16 °C
Pressure inside vessel determination..... : Use vapour pressure
Vessel volume..... : 40 m3
Vessel type..... : Horizontal cylinder
Length cylinder..... : 6 m
Filling degree : 0.5 %
Type of calculation..... : Calculate until device is empty

RESULTS

Initial mass in vessel..... : 503.29 kg
Total mass released..... : 9.301 kg
Time needed to empty vessel..... : 27.392 s
Maximum mass flow rate..... : 0.67119 kg/s
Representative release rate..... : 0.56165 kg/s
Representative outflow duration..... : 17 s
Representative temperature..... : 13.517 °C
Representative pressure..... : 1.2635 bar
Representative density..... : 5.2437 kg/m3

----- END OF SESSION 1 -----

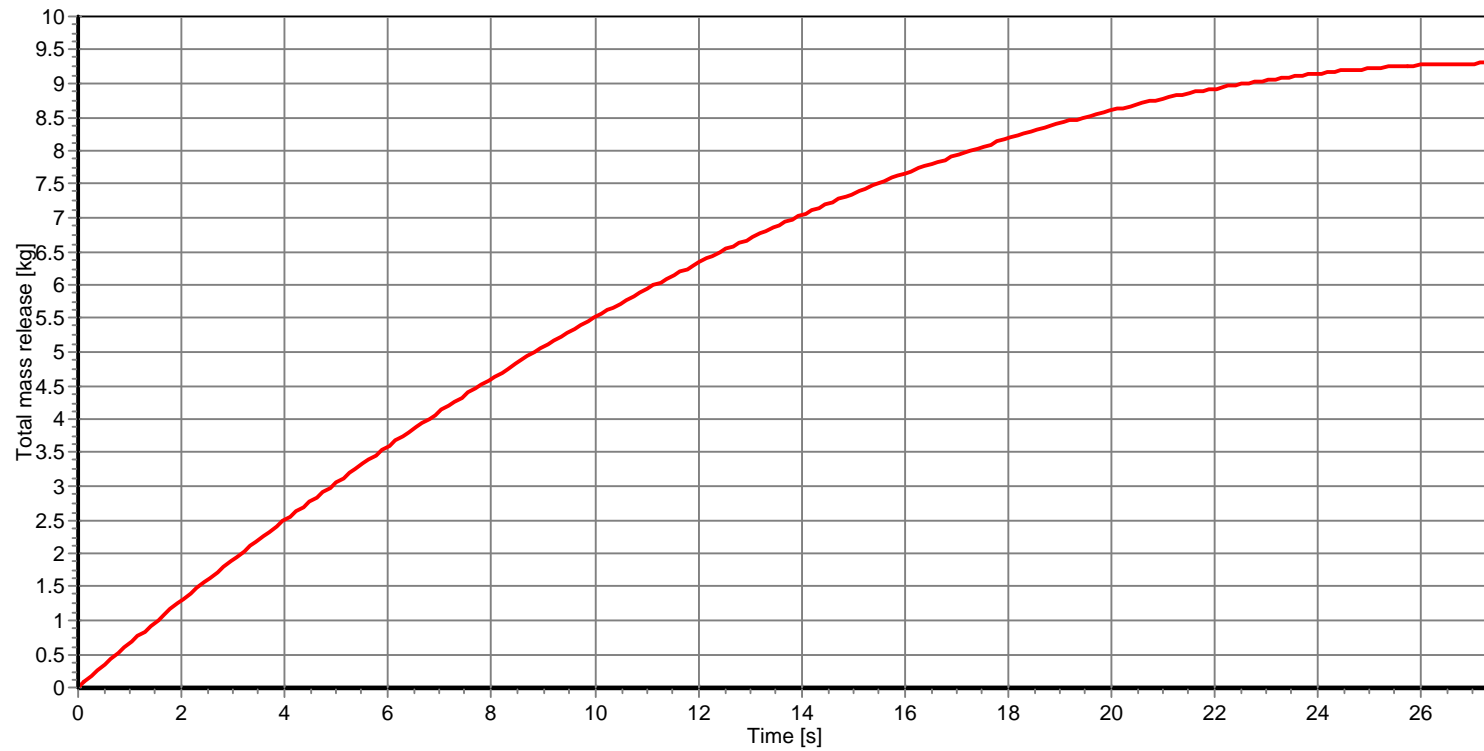
Administrative & version data:

Main program (production date) : Effects (24 Apr 2009 03:00:37)
Run mode (complexity level) : Expert
Model name : Vapour release (89)
Date of this calculation : 10 Oct 2013 16:19:03
License owner : rachele
Calculation performed by : rachele
Software library version : 7.6.4.3276
Model driver version(s) : 5.09
Model driver last modification : 10 July 2007
Model executable version(s) : N/A
Session nr. : 1
References : Yellow Book, CPR-14E, 3rd edition 1997, Paragraph 2.5.4
Project file name : "Rilascio tossico - IMO 2.3 - Fosgene da container.alf"
Chemical database used : "Purple Book (1999).rdb" (30 ago 2013 15:58:00)
Environment database used : "Purple Book (1999).Env" (20 mag 2008 09:53:47)
System database used : "Purple Book (1999).SPF" (20 mag 2008 09:53:47)
Dispersion database used : "Purple Book (1999).dpf" (20 mag 2008 09:53:47)
Map background file used : "Rilascio tossico - IMO 2.3 - Fosgene da container.gbfi" (01 gen 0 00:00:00)
Project file directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"
Chemical database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Environment database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
System database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Dispersion database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Map background directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"

End of administrative & version data:

Effects 7.6.4.3276 Calculation: 10 Oct 2013 16:47:41
Model: Vapour release (89)
Graph: Total mass release vs Time

Rilascio tossico da container - IMO 2.3 - Fosgene



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Project : IMO 2.3 - Fosgene da container
Session 1
----- START OF SESSION 1(mYBSlabNewCalculationConcentration) -----
INPUT
Model..... : Dense gas release; concentration
              (199)
Version..... : 5.13
Reference.... : Yellow Book 3rd edition 1997 chapter
              4; Ermak, D.L. User manual for SLAB
              Lawrence Livermore National
              Laboratory, June 1990
Case description..... : Rilascio tossico container - IMO 2.3
              - Fosgene IDLH - 30"
Chemical name..... : Carbonic dichloride (phosgene)
Type of release..... : Horizontal Jet release
Mass flow rate of the source..... : 0.56165 kg/s
Duration of the release..... : 17 s
Initial liquid mass fraction..... : 0 %
Diameter of expanded jet..... : 1 m
Temperature after release..... : 13.5 °C
  X-coordinate of release..... : 0 m
  Y-coordinate of release..... : 0 m
  Z-coordinate (height) of release..... : 1.3 m
Ambient temperature..... : 16 °C
Meteorological data..... : Pasquill
Pasquill stability class..... : D (Neutral)
Wind speed at 10 m height..... : 4 m/s
Ambient relative humidity..... : 66 %
Roughness length description..... : City centre with high and low rise
                                   buildings.
Time t after start release..... : 30 s
Concentration averaging time..... : 20 s
  Distance from release (Xd)..... : 600 m
  Distance perpendicular to wind direction (Yd)..... : 0 m
  Height (Zd)..... : 1.7 m
Predefined concentration..... : User defined
Threshold concentration..... : 8.1 mg/m3
Contour plot accuracy..... : 1 %
Predefined wind direction..... : User defined
Wind comes from (West = 180 degrees)..... : 180 deg
Perform Maximum concentration vs Distance graph..... : Yes
Resolution of the time consuming graphs..... : High

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RESULTS
Concentration at (Xd, Yd, Zd, t)..... : 0 mg/m3
Maximum concentration at (Yd, Zd)..... : 1.3503E06 mg/m3
...at distance..... : 1.01 m
Inverse Monin-Obukhov length (1/L) used..... : 0 1/m

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----- END OF SESSION 1 -----

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Administrative & version data:
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Main program (production date) : Effects (24 Apr 2009 03:00:37)
Run mode (complexity level) : Expert
Model name : Dense gas release; concentration (199)
Date of this calculation : 10 Oct 2013 17:06:16
License owner : rachele
Calculation performed by : rachele
Software library version : 7.6.4.3276
Model driver version(s) : 5.13
Model driver last modification : 31 Jul 2008
Model executable version(s) : TNO_DENSEGAS.EXE 20 May 2008 09:53:42 (CRC=E1B5A7AE)
Session nr. : 1
References : Yellow Book 3rd edition 1997 chapter 4; Ermak, D.L. User manual
              for SLAB Lawrence Livermore National Laboratory, June 1990
Project file name : "Rilascio tossico - IMO 2.3 - Fosgene da container.alf"
Chemical database used : "Purple Book (1999).rdb" (30 ago 2013 15:58:00)
Environment database used : "Purple Book (1999).Env" (20 mag 2008 09:53:47)
System database used : "Purple Book (1999).SPF" (20 mag 2008 09:53:47)
Dispersion database used : "Purple Book (1999).dnpf" (20 mag 2008 09:53:47)
Map background file used : "Rilascio tossico - IMO 2.3 - Fosgene da container.gbf" (01 gen 0 00:00:00)
Project file directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"
Chemical database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Environment database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
System database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Dispersion database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Map background directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"
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End of administrative & version data:
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Session 2
----- START OF SESSION 2(mYBSlabNewCalculationConcentration) -----
INPUT
Model..... : Dense gas release; concentration
              (199)
Version..... : 5.13
Reference.... : Yellow Book 3rd edition 1997 chapter

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4; Ermak, D.L. User manual for SLAB
Lawrence Livermore National
Laboratory, June 1990
Case description..... : Rilascio tossico container - IMO 2.3
- Fosgene LC50 - 30"
Chemical name..... : Carbonic dichloride (phosgene)
Type of release..... : Horizontal Jet release
Mass flow rate of the source..... : 0.56165 kg/s
Duration of the release..... : 17 s
Initial liquid mass fraction..... : 0 %
Diameter of expanded jet..... : 1 m
Temperature after release..... : 13.5 °C
X-coordinate of release..... : 0 m
Y-coordinate of release..... : 0 m
Z-coordinate (height) of release..... : 1.3 m
Ambient temperature..... : 16 °C
Meteorological data..... : Pasquill
Pasquill stability class..... : D (Neutral)
Wind speed at 10 m height..... : 4 m/s
Ambient relative humidity..... : 66 %
Roughness length description..... : City centre with high and low rise
buildings.
Time t after start release..... : 30 s
Concentration averaging time..... : 20 s
Distance from release (Xd)..... : 600 m
Distance perpendicular to wind direction (Yd)..... : 0 m
Height (Zd)..... : 1.7 m
Predefined concentration..... : User defined
Threshold concentration..... : 356.4 mg/m3
Contour plot accuracy..... : 1 %
Predefined wind direction..... : User defined
Wind comes from (West = 180 degrees)..... : 180 deg
Perform Maximum concentration vs Distance graph..... : Yes
Resolution of the time consuming graphs..... : High

RESULTS

Concentration at (Xd, Yd, Zd, t)..... : 0 mg/m3
Maximum concentration at (Yd, Zd)..... : 1.3503E06 mg/m3
...at distance..... : 1.01 m
Inverse Monin-Obukhov length (1/L) used..... : 0 1/m

----- END OF SESSION 2 -----

Administrative & version data:

Main program (production date) : Effects (24 Apr 2009 03:00:37)
Run mode (complexity level) : Expert
Model name : Dense gas release; concentration (199)
Date of this calculation : 10 Oct 2013 17:06:17
License owner : rachele
Calculation performed by : rachele
Software library version : 7.6.4.3276
Model driver version(s) : 5.13
Model driver last modification : 31 Jul 2008
Model executable version(s) : TNO_DENSEGAS.EXE 20 May 2008 09:53:42 (CRC=E1B5A7AE)
Session nr. : 2
References : Yellow Book 3rd edition 1997 chapter 4; Ermak, D.L. User manual
for SLAB Lawrence Livermore National Laboratory, June 1990
Project file name : "Rilascio tossico - IMO 2.3 - Fosgene da container.alf"
Chemical database used : "Purple Book (1999).rdb" (30 ago 2013 15:58:00)
Environment database used : "Purple Book (1999).Env" (20 mag 2008 09:53:47)
System database used : "Purple Book (1999).SPF" (20 mag 2008 09:53:47)
Dispersion database used : "Purple Book (1999).dpf" (20 mag 2008 09:53:47)
Map background file used : "Rilascio tossico - IMO 2.3 - Fosgene da container.gbf" (01 gen 0 00:00:00)
Project file directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"
Chemical database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Environment database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
System database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Dispersion database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Map background directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"

End of administrative & version data:

Session 3

----- START OF SESSION 3(mYBSlabNewCalculationConcentration) -----

INPUT

Model..... : Dense gas release; concentration
(199)
Version..... : 5.13
Reference..... : Yellow Book 3rd edition 1997 chapter
4; Ermak, D.L. User manual for SLAB
Lawrence Livermore National
Laboratory, June 1990
Case description..... : Rilascio tossico container - IMO 2.3
- Fosgene IDLH - 60"
Chemical name..... : Carbonic dichloride (phosgene)
Type of release..... : Horizontal Jet release
Mass flow rate of the source..... : 0.56165 kg/s
Duration of the release..... : 17 s

Initial liquid mass fraction..... : 0 %
Diameter of expanded jet..... : 1 m
Temperature after release..... : 13.5 °C
X-coordinate of release..... : 0 m
Y-coordinate of release..... : 0 m
Z-coordinate (height) of release..... : 1.3 m
Ambient temperature..... : 16 °C
Meteorological data..... : Pasquill
Pasquill stability class..... : D (Neutral)
Wind speed at 10 m height..... : 4 m/s
Ambient relative humidity..... : 66 %
Roughness length description..... : City centre with high and low rise buildings.
Time t after start release..... : 60 s
Concentration averaging time..... : 20 s
Distance from release (Xd)..... : 600 m
Distance perpendicular to wind direction (Yd)..... : 0 m
Height (Zd)..... : 1.7 m
Predefined concentration..... : User defined
Threshold concentration..... : 8.1 mg/m3
Contour plot accuracy..... : 1 %
Predefined wind direction..... : User defined
Wind comes from (West = 180 degrees)..... : 180 deg
Perform Maximum concentration vs Distance graph..... : Yes
Resolution of the time consuming graphs..... : High

RESULTS

Concentration at (Xd, Yd, Zd, t)..... : 0 mg/m3
Maximum concentration at (Yd, Zd)..... : 1.3503E06 mg/m3
...at distance..... : 1.01 m
Inverse Monin-Obukhov length (1/L) used..... : 0 1/m

----- END OF SESSION 3 -----

Administrative & version data:

Main program (production date) : Effects (24 Apr 2009 03:00:37)
Run mode (complexity level) : Expert
Model name : Dense gas release; concentration (199)
Date of this calculation : 10 Oct 2013 17:06:18
License owner : rachele
Calculation performed by : rachele
Software library version : 7.6.4.3276
Model driver version(s) : 5.13
Model driver last modification : 31 Jul 2008
Model executable version(s) : TNO_DENSEGAS.EXE 20 May 2008 09:53:42 (CRC=E1B5A7AE)
Session nr. : 3
References : Yellow Book 3rd edition 1997 chapter 4; Ermak, D.L. User manual for SLAB Lawrence Livermore National Laboratory, June 1990
Project file name : "Rilascio tossico - IMO 2.3 - Fosgene da container.alf"
Chemical database used : "Purple Book (1999).rdb" (30 ago 2013 15:58:00)
Environment database used : "Purple Book (1999).Env" (20 mag 2008 09:53:47)
System database used : "Purple Book (1999).SPF" (20 mag 2008 09:53:47)
Dispersion database used : "Purple Book (1999).dpf" (20 mag 2008 09:53:47)
Map background file used : "Rilascio tossico - IMO 2.3 - Fosgene da container.gbfi" (01 gen 0 00:00:00)
Project file directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"
Chemical database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Environment database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
System database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Dispersion database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Map background directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"

End of administrative & version data:

Session 4

----- START OF SESSION 4(mYBSlabNewCalculationConcentration) -----

INPUT

Model..... : Dense gas release; concentration (199)
Version..... : 5.13
Reference..... : Yellow Book 3rd edition 1997 chapter 4; Ermak, D.L. User manual for SLAB Lawrence Livermore National Laboratory, June 1990
Case description..... : Rilascio tossico container - IMO 2.3 - Fosgene LC50 - 60"
Chemical name..... : Carbonic dichloride (phosgene)
Type of release..... : Horizontal Jet release
Mass flow rate of the source..... : 0.56165 kg/s
Duration of the release..... : 17 s
Initial liquid mass fraction..... : 0 %
Diameter of expanded jet..... : 1 m
Temperature after release..... : 13.5 °C
X-coordinate of release..... : 0 m
Y-coordinate of release..... : 0 m
Z-coordinate (height) of release..... : 1.3 m
Ambient temperature..... : 16 °C
Meteorological data..... : Pasquill
Pasquill stability class..... : D (Neutral)

Wind speed at 10 m height..... : 4 m/s
Ambient relative humidity..... : 66 %
Roughness length description..... : City centre with high and low rise buildings.
Time t after start release..... : 60 s
Concentration averaging time..... : 20 s
Distance from release (Xd)..... : 600 m
Distance perpendicular to wind direction (Yd)..... : 0 m
Height (Zd)..... : 1.7 m
Predefined concentration..... : User defined
Threshold concentration..... : 356.4 mg/m3
Contour plot accuracy..... : 1 %
Predefined wind direction..... : User defined
Wind comes from (West = 180 degrees)..... : 180 deg
Perform Maximum concentration vs Distance graph..... : Yes
Resolution of the time consuming graphs..... : High

RESULTS

Concentration at (Xd, Yd, Zd, t)..... : 0 mg/m3
Maximum concentration at (Yd, Zd)..... : 1.3503E06 mg/m3
...at distance..... : 1.01 m
Inverse Monin-Obukhov length (1/L) used..... : 0 1/m

----- END OF SESSION 4 -----

Administrative & version data:

Main program (production date) : Effects (24 Apr 2009 03:00:37)
Run mode (complexity level) : Expert
Model name : Dense gas release; concentration (199)
Date of this calculation : 10 Oct 2013 17:06:19
License owner : rachele
Calculation performed by : rachele
Software library version : 7.6.4.3276
Model driver version(s) : 5.13
Model driver last modification : 31 Jul 2008
Model executable version(s) : TNO_DENSEGAS.EXE 20 May 2008 09:53:42 (CRC=E1B5A7AE)
Session nr. : 4
References : Yellow Book 3rd edition 1997 chapter 4; Ermak, D.L. User manual for SLAB Lawrence Livermore National Laboratory, June 1990
Project file name : "Rilascio tossico - IMO 2.3 - Fosgene da container.alf"
Chemical database used : "Purple Book (1999).rdb" (30 ago 2013 15:58:00)
Environment database used : "Purple Book (1999).Env" (20 mag 2008 09:53:47)
System database used : "Purple Book (1999).SPF" (20 mag 2008 09:53:47)
Dispersion database used : "Purple Book (1999).dpf" (20 mag 2008 09:53:47)
Map background file used : "Rilascio tossico - IMO 2.3 - Fosgene da container.gbfi" (01 gen 00:00:00)
Project file directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"
Chemical database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Environment database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
System database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Dispersion database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Map background directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"

End of administrative & version data:

Session 5

----- START OF SESSION 5(mYBSlabNewCalculationConcentration) -----

INPUT

Model..... : Dense gas release; concentration (199)
Version..... : 5.13
Reference..... : Yellow Book 3rd edition 1997 chapter 4; Ermak, D.L. User manual for SLAB Lawrence Livermore National Laboratory, June 1990
Case description..... : Rilascio tossico container - IMO 2.3 - Fosgene IDLH - 120"
Chemical name..... : Carbonic dichloride (phosgene)
Type of release..... : Horizontal Jet release
Mass flow rate of the source..... : 0.56165 kg/s
Duration of the release..... : 17 s
Initial liquid mass fraction..... : 0 %
Diameter of expanded jet..... : 1 m
Temperature after release..... : 13.5 °C
X-coordinate of release..... : 0 m
Y-coordinate of release..... : 0 m
Z-coordinate (height) of release..... : 1.3 m
Ambient temperature..... : 16 °C
Meteorological data..... : Pasquill
Pasquill stability class..... : D (Neutral)
Wind speed at 10 m height..... : 4 m/s
Ambient relative humidity..... : 66 %
Roughness length description..... : City centre with high and low rise buildings.
Time t after start release..... : 120 s
Concentration averaging time..... : 20 s
Distance from release (Xd)..... : 600 m
Distance perpendicular to wind direction (Yd)..... : 0 m
Height (Zd)..... : 1.7 m

Redefined concentration..... : User defined
Threshold concentration..... : 8.1 mg/m3
Contour plot accuracy..... : 1 %
Predefined wind direction..... : User defined
Wind comes from (West = 180 degrees)..... : 180 deg
Perform Maximum concentration vs Distance graph..... : Yes
Resolution of the time consuming graphs..... : High

RESULTS

Concentration at (Xd, Yd, Zd, t)..... : 8.6682 mg/m3
Maximum concentration at (Yd, Zd)..... : 1.3503E06 mg/m3
...at distance..... : 1.01 m
Inverse Monin-Obukhov length (1/L) used..... : 0 1/m

----- END OF SESSION 5 -----

Administrative & version data:

Main program (production date) : Effects (24 Apr 2009 03:00:37)
Run mode (complexity level) : Expert
Model name : Dense gas release; concentration (199)
Date of this calculation : 10 Oct 2013 17:06:20
License owner : rachele
Calculation performed by : rachele
Software library version : 7.6.4.3276
Model driver version(s) : 5.13
Model driver last modification : 31 Jul 2008
Model executable version(s) : TNO_DENSEGAS.EXE 20 May 2008 09:53:42 (CRC=E1B5A7AE)
Session nr. : 5
References : Yellow Book 3rd edition 1997 chapter 4; Ermak, D.L. User manual
for SLAB Lawrence Livermore National Laboratory, June 1990
Project file name : "Rilascio tossico - IMO 2.3 - Fosgene da container.alf"
Chemical database used : "Purple Book (1999).rdb" (30 ago 2013 15:58:00)
Environment database used : "Purple Book (1999).Env" (20 mag 2008 09:53:47)
System database used : "Purple Book (1999).SPF" (20 mag 2008 09:53:47)
Dispersion database used : "Purple Book (1999).dpf" (20 mag 2008 09:53:47)
Map background file used : "Rilascio tossico - IMO 2.3 - Fosgene da container.gbf" (01 gen 0 00:00:00)
Project file directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"
Chemical database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Environment database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
System database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Dispersion database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Map background directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"

End of administrative & version data:

Session 6

----- START OF SESSION 6(mYBSlabNewCalculationConcentration) -----

INPUT

Model..... : Dense gas release; concentration
(199)
Version..... : 5.13
Reference..... : Yellow Book 3rd edition 1997 chapter
4; Ermak, D.L. User manual for SLAB
Lawrence Livermore National
Laboratory, June 1990
Case description..... : Rilascio tossico container - IMO 2.3
- Fosgene IDLH - 180"
Chemical name..... : Carbonic dichloride (phosgene)
Type of release..... : Horizontal Jet release
Mass flow rate of the source..... : 0.56165 kg/s
Duration of the release..... : 17 s
Initial liquid mass fraction..... : 0 %
Diameter of expanded jet..... : 1 m
Temperature after release..... : 13.5 °C
X-coordinate of release..... : 0 m
Y-coordinate of release..... : 0 m
Z-coordinate (height) of release..... : 1.3 m
Ambient temperature..... : 16 °C
Meteorological data..... : Pasquill
Pasquill stability class..... : D (Neutral)
Wind speed at 10 m height..... : 4 m/s
Ambient relative humidity..... : 66 %
Roughness length description..... : City centre with high and low rise
buildings.
Time t after start release..... : 180 s
Concentration averaging time..... : 20 s
Distance from release (Xd)..... : 600 m
Distance perpendicular to wind direction (Yd)..... : 0 m
Height (Zd)..... : 1.7 m
Predefined concentration..... : User defined
Threshold concentration..... : 8.1 mg/m3
Contour plot accuracy..... : 1 %
Predefined wind direction..... : User defined
Wind comes from (West = 180 degrees)..... : 180 deg
Perform Maximum concentration vs Distance graph..... : Yes
Resolution of the time consuming graphs..... : High

RESULTS

Concentration at (Xd, Yd, Zd, t)..... : 3.8098 mg/m3
Maximum concentration at (Yd, Zd)..... : 1.3503E06 mg/m3
...at distance..... : 1.01 m
Inverse Monin-Obukhov length (1/L) used..... : 0 1/m

----- END OF SESSION 6 -----

Administrative & version data:

Main program (production date) : Effects (24 Apr 2009 03:00:37)
Run mode (complexity level) : Expert
Model name : Dense gas release; concentration (199)
Date of this calculation : 10 Oct 2013 17:06:21
License owner : rachele
Calculation performed by : rachele
Software library version : 7.6.4.3276
Model driver version(s) : 5.13
Model driver last modification : 31 Jul 2008
Model executable version(s) : TNO_DENSEGAS.EXE 20 May 2008 09:53:42 (CRC=E1B5A7AE)
Session nr. : 6
References : Yellow Book 3rd edition 1997 chapter 4; Ermak, D.L. User manual
for SLAB Lawrence Livermore National Laboratory, June 1990
Project file name : "Rilascio tossico - IMO 2.3 - Fosgene da container.alf"
Chemical database used : "Purple Book (1999).rdb" (30 ago 2013 15:58:00)
Environment database used : "Purple Book (1999).Env" (20 mag 2008 09:53:47)
System database used : "Purple Book (1999).SPF" (20 mag 2008 09:53:47)
Dispersion database used : "Purple Book (1999).dpp" (20 mag 2008 09:53:47)
Map background file used : "Rilascio tossico - IMO 2.3 - Fosgene da container.gbf" (01 gen 0 00:00:00)
Project file directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"
Chemical database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Environment database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
System database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Dispersion database directory : "C:\Program Files (x86)\TNO\Effects 7.6\Shared data\Databases"
Map background directory : "C:\PC08_Rachele\RISP\RISP_2013\Simulazioni trasporti\IMO 2.3\Fosgene Container\Fase II"

End of administrative & version data:

Effects 7.6.4.3276 Calculation: 10 Oct 2013 17:09:11
Model: Dense gas release; concentration (199)
Graph: Concentration Contour Plot at Zd

rachele

- Rilascio tossico container - IMO 2.3 - Fosgene IDLH - 30"
- Rilascio tossico container - IMO 2.3 - Fosgene LC50 - 30"
- Rilascio tossico container - IMO 2.3 - Fosgene IDLH - 60"
- Rilascio tossico container - IMO 2.3 - Fosgene LC50 - 60"
- Rilascio tossico container - IMO 2.3 - Fosgene IDLH - 120"
- Rilascio tossico container - IMO 2.3 - Fosgene IDLH - 180"

