# Jet Fire

## Workspace: 72438-3InvioGN-11R

### Study: Invio GN a metanodotto

#### Equipment Item: 11R Linea di mandata gas

72438-3InvioGN-11R\Invio GN a metanodotto\11R Linea di mandata gas

| | | |
|---|---|---|
| Material | **GAS NATURALE** | |
| East | 0 | m |
| North | 0 | m |

### Scenario (Leak) : 81,3

72438-3InvioGN-11R\Invio GN a metanodotto\11R Linea di mandata gas\81,3

#### Weather: Category 2/F

| | |
|---|---|
| **Wind speed [m/s]** | **2** |
| **Pasquill stability** | **F stable - night with moderate clouds and light/moderate wind** |
| **Atmospheric temperature [degC]** | **25** |
| **Relative humidity [fraction]** | **0,75** |
| **Solar radiation flux [kW/m2]** | 0,5 |

#### Jet fire model results

**INPUT DATA**

**Scenario**

| | | |
|---|---|---|
| Elevation | **4** | m |
| Release angle from horizontal | **0** | deg |

**Jet Fire Parameters**

| | | |
|---|---|---|
| Jet fire method | Cone model | |
| Wind orientation about the z-axis (anti-clockwise from the East) | **0** | deg |
| Rotation about the z-axis (anti-clockwise from the east) | **0** | deg |
| Rate modification factor | 3 | |

## Calculated inputs

| | | |
|---|---|---|
| Mass flow rate | 67,986 | kg/s |
| Temperature after atmospheric expansion | -56,7906 | degC |
| Liquid fraction | 0 | fraction |
| Velocity after atmospheric expansion (input) | **300** | m/s |
| Rainout fraction time averaged | **0** | fraction |

## OUTPUT DATA

| | | |
|---|---|---|
| Flame emissive power | 282,1 | kW/m2 |
| Fraction of emissivity | 0,219523 | fraction |
| Jet velocity | 300 | m/s |
| Flame length | 70,5185 | m |
| Frustum length | 51,3465 | m |
| Frustum base width | 10,1074 | m |
| Frustum tip width | 18,0035 | m |
| Frustum lift-off distance | 21,8136 | m |
| Flame length in still air | 104,179 | m |
| Hole to flame angle | 33,8431 | deg |
| Expanded diameter | 0,530104 | m |
| Plane angular rotation | 0 | deg |

Flame on ground impingement with partial truncation

## Radiation Intensity Ellipse Results

### INPUT DATA

For ellipses 'observer direction' refers to whether inclination is 'fixed' or 'variable'. Orientation is always variable.

| | | |
|---|---|---|
| Observer direction | Variable | |
| Exposure duration | 20 | s |
| Height of interest | **1,7** | m |

### OUTPUT DATA

**Radiation intensity**

| Incident radiation [kW/m2] | Lethality [%] | View factor | Probit | Dose [(W/m2)^ProbitN.s] | Ellipse half-length [m] | Ellipse half-width [m] | Ellipse centre downwind distance [m] | Effect downwind distance [m] | Ellipse area [m2] |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 0 | 0,0106345 | -1,38321 | 865.119 | 102,492 | 118,063 | 53,1678 | 155,66 | 38015 |
| 5 | 0,000174704 | 0,0177242 | 0,360367 | 1.709.491 | 80,1999 | 91,9893 | 52,1541 | 132,354 | 23177,2 |
| 7 | 0,02405 | 0,0248139 | 1,50883 | 2.677.313 | 68,1848 | 77,6692 | 51,1639 | 119,349 | 16637,4 |
| 12,5 | 6,52536 | 0,0443105 | 3,48789 | 5.800.162 | 51,4174 | 57,0617 | 48,564 | 99,9814 | 9217,32 |
| 37,5 | 98,7381 | 0,132931 | 7,23773 | 25.094.924 | 31,1698 | 27,0976 | 42,2497 | 73,4195 | 2653,47 |

## Radiation v Distance Results

### INPUT DATA

| | | |
|---|---|---|
| Maximum distance | 155,66 | m |
| Observer type radiation modelling flag | Planar | |
| Observer direction | Variable | |
| Height of interest | **1,7** | m |

### OUTPUT DATA

| Downwind distance [m] | Maximum incident radiation [kW/m2] | Lethality level [fraction] |
|---|---|---|
| 0 | 14,5648 | 0,161014 |
| 3,17674 | 17,6913 | 0,372014 |
| 6,35348 | 22,2759 | 0,677236 |
| 9,53022 | 29,8962 | 0,928438 |
| 12,707 | 50,085 | 0,999371 |
| 15,8837 | 92,5972 | 1 |
| 19,0604 | 166,163 | 1 |

| | | |
|---|---|---|
| 22,2372 | 251,981 | 1 |
| 25,4139 | 282,1 | 1 |
| 28,5907 | 263,637 | 1 |
| 31,7674 | 191,39 | 1 |
| 34,9441 | 154,305 | 1 |
| 38,1209 | 130,631 | 1 |
| 41,2976 | 114,021 | 1 |
| 44,4744 | 101,593 | 1 |
| 47,6511 | 91,7876 | 1 |
| 50,8278 | 83,6574 | 1 |
| 54,0046 | 76,5555 | 0,999999 |
| 57,1813 | 70,0226 | 0,999994 |
| 60,3581 | 63,8227 | 0,999975 |
| 63,5348 | 57,3721 | 0,999887 |
| 66,7115 | 50,9405 | 0,999487 |
| 69,8883 | 44,4782 | 0,9976 |
| 73,065 | 38,181 | 0,989252 |
| 76,2418 | 32,3082 | 0,958103 |
| 79,4185 | 27,0225 | 0,868495 |
| 82,5952 | 22,4621 | 0,687368 |
| 85,772 | 19,6722 | 0,514251 |
| 88,9487 | 17,8311 | 0,382214 |
| 92,1255 | 16,1104 | 0,259124 |
| 95,3022 | 14,5366 | 0,159404 |
| 98,4789 | 13,1178 | 0,0889169 |
| 101,656 | 11,83 | 0,0445529 |
| 104,832 | 10,7102 | 0,0206964 |
| 108,009 | 9,71601 | 0,00884398 |
| 111,186 | 8,8346 | 0,00350173 |
| 114,363 | 8,05314 | 0,00129433 |
| 117,539 | 7,35965 | 0,000449893 |
| 120,716 | 6,74327 | 0,000148077 |
| 123,893 | 6,19433 | 4,64495E-05 |
| 127,07 | 5,70426 | 1,39655E-05 |
| 130,246 | 5,26585 | 4,04813E-06 |

| | | |
|---|---|---|
| 133,423 | 4,87258 | 1,13648E-06 |
| 136,6 | 4,51889 | 3,10359E-07 |
| 139,777 | 4,19999 | 8,27643E-08 |
| 142,953 | 3,91172 | 2,16273E-08 |
| 146,13 | 3,65048 | 0 |
| 149,307 | 3,4132 | 0 |
| 152,484 | 3,19716 | 0 |
| 155,66 | 2,99999 | 0 |

## Weather: Category 5/D

| | |
|---|---|
| **Wind speed [m/s]** | **5** |
| **Pasquill stability** | **D neutral - little sun and high wind or overcast/windy night** |
| **Atmospheric temperature [degC]** | 25 |
| **Relative humidity [fraction]** | 0,75 |
| **Solar radiation flux [kW/m2]** | 0,5 |

## Jet fire model results

### INPUT DATA

### Scenario

| | | |
|---|---|---|
| Elevation | **4** | m |
| Release angle from horizontal | **0** | deg |

### Jet Fire Parameters

| | | |
|---|---|---|
| Jet fire method | Cone model | |
| Wind orientation about the z-axis (anti-clockwise from the East) | **0** | deg |
| Rotation about the z-axis (anti-clockwise from the east) | **0** | deg |
| Rate modification factor | 3 | |

### Calculated inputs

| | | |
|---|---|---|
| Mass flow rate | 67,986 | kg/s |
| Temperature after atmospheric expansion | -56,7906 | degC |
| Liquid fraction | 0 | fraction |
| Velocity after atmospheric expansion (input) | **300** | m/s |
| Rainout fraction time averaged | **0** | fraction |

### OUTPUT DATA

| | | |
|---|---|---|
| Flame emissive power | 335,768 | kW/m2 |
| Fraction of emissivity | 0,218471 | fraction |

| | | |
|---|---|---|
| Jet velocity | 300 | m/s |
| Flame length | 75,3249 | m |
| Frustum length | 54,2359 | m |
| Frustum base width | 10,1074 | m |
| Frustum tip width | 12,9909 | m |
| Frustum lift-off distance | 21,8136 | m |
| Flame length in still air | 104,179 | m |
| Hole to flame angle | 17,5137 | deg |
| Expanded diameter | 0,530104 | m |
| Plane angular rotation | 0 | deg |

Flame on ground impingement with partial truncation

## Radiation Intensity Ellipse Results

**INPUT DATA**

For ellipses 'observer direction' refers to whether inclination is 'fixed' or 'variable'. Orientation is always variable.

| | | |
|---|---|---|
| Observer direction | Variable | |
| Exposure duration | 20 | s |
| Height of interest | **1,7** | m |

**OUTPUT DATA**

**Radiation intensity**

| Incident radiation [kW/m2] | Lethality [%] | View factor | Probit | Dose [(W/m2)^ProbitN.s] | Ellipse half-length [m] | Ellipse half-width [m] | Ellipse centre down wind distance [m] | Effect down wind distance [m] | Ellipse area [m2] |
|---|---|---|---|---|---|---|---|---|---|
| 3 | 0 | 0,0089347 4 | -1,38321 | 865.119 | 89,2395 | 119,512 | 57,5281 | 147,524 | 33505,7 |
| 5 | 0,000174704 | 0,0148912 | 0,360367 | 1.709.491 | 72,6579 | 93,306 | 56,0576 | 128,715 | 21298,2 |
| 7 | 0,02405 | 0,0208477 | 1,50883 | 2.677.313 | 63,9924 | 79,0048 | 54,8529 | 118,845 | 15883 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 12,5 | 6,52536 | 0,0372281 | 3,48789 | 5.800.162 | 52,4373 | 58,651 | 52,2447 | 104,682 | 9661,97 |
| 37,5 | 98,7381 | 0,111684 | 7,23773 | 25.094.924 | 36,6448 | 30,0471 | 46,0604 | 82,7052 | 3459,11 |

## Radiation v Distance Results

### INPUT DATA

| | | |
|---|---|---|
| Maximum distance | 147,071 | m |
| Observer type radiation modelling flag | Planar | |
| Observer direction | Variable | |
| Height of interest | **1,7** | m |

### OUTPUT DATA

| Downwind distance [m] | Maximum incident radiation [kW/m2] | Lethality level [fraction] |
|---|---|---|
| 0 | 12,7221 | 0,0732502 |
| 3,00144 | 17,0889 | 0,328242 |
| 6,00289 | 23,9447 | 0,760084 |
| 9,00433 | 35,3768 | 0,979265 |
| 12,0058 | 55,755 | 0,999836 |
| 15,0072 | 94,0967 | 1 |
| 18,0087 | 165,54 | 1 |
| 21,0101 | 277,177 | 1 |
| 24,0115 | 335,768 | 1 |
| 27,013 | 335,768 | 1 |
| 30,0144 | 335,768 | 1 |
| 33,0159 | 317,679 | 1 |
| 36,0173 | 261,558 | 1 |
| 39,0188 | 225,88 | 1 |
| 42,0202 | 199,801 | 1 |
| 45,0216 | 179,621 | 1 |
| 48,0231 | 163,432 | 1 |
| 51,0245 | 150,072 | 1 |
| 54,026 | 138,751 | 1 |

| | | |
|---|---|---|
| 57,0274 | 128,859 | 1 |
| 60,0289 | 119,847 | 1 |
| 63,0303 | 111,114 | 1 |
| 66,0317 | 101,892 | 1 |
| 69,0332 | 91,2597 | 1 |
| 72,0346 | 78,3192 | 0,999999 |
| 75,0361 | 63,3402 | 0,999972 |
| 78,0375 | 47,9679 | 0,998958 |
| 81,039 | 40,0234 | 0,993053 |
| 84,0404 | 35,3481 | 0,979126 |
| 87,0419 | 30,445 | 0,936538 |
| 90,0433 | 26,0503 | 0,839949 |
| 93,0447 | 22,2338 | 0,674916 |
| 96,0462 | 19,019 | 0,468307 |
| 99,0476 | 16,3455 | 0,275391 |
| 102,049 | 14,1302 | 0,137046 |
| 105,051 | 12,292 | 0,0582789 |
| 108,052 | 10,7605 | 0,0215074 |
| 111,053 | 9,4776 | 0,00700743 |
| 114,055 | 8,39686 | 0,00205155 |
| 117,056 | 7,48053 | 0,000548249 |
| 120,058 | 6,69871 | 0,000135647 |
| 123,059 | 6,0277 | 3,14721E-05 |
| 126,061 | 5,44837 | 6,92132E-06 |
| 129,062 | 4,94539 | 1,45634E-06 |
| 132,063 | 4,5064 | 2,9555E-07 |
| 135,065 | 4,12131 | 5,82458E-08 |
| 138,066 | 3,78192 | 1,12125E-08 |
| 141,068 | 3,48147 | 0 |
| 144,069 | 3,21436 | 0 |
| 147,071 | 2,9771 | 0 |