

Jet Fire

Workspace: 72452 Ottimizz-00

Study: FSRU in rigassificazione

Equipment Item: 12R Linea princip riscaldatori

72452 Ottimizz-00\FSRU in rigassificazione\12R Linea princip riscaldatori

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

Scenario (Leak) : 30mm

72452 Ottimizz-00\FSRU in rigassificazione\12R Linea princip riscaldatori\30mm

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 | 12,5 | m |
| Release angle from horizontal | 0 | deg |

Jet Fire Parameters

| | | |
|--------------------------|------------|-----|
| Jet fire method | Cone model | |
| Crosswind angle | 0 | deg |
| Rate modification factor | 3 | |

Calculated inputs

| | | |
|----------------|----------|------|
| Mass flow rate | 0,459004 | kg/s |
|----------------|----------|------|

| | | |
|--|------------|----------|
| Temperature after atmospheric expansion | 6,73324 | degC |
| Liquid fraction | 0 | fraction |
| Velocity after atmospheric expansion (input) | 300 | m/s |
| Rainout fraction time averaged | 0 | fraction |

OUTPUT DATA

| | | |
|---------------------------|-----------|----------|
| Flame emissive power | 86,5024 | kW/m2 |
| Fraction of emissivity | 0,104257 | fraction |
| Jet velocity | 300 | m/s |
| Flame length | 9,8637 | m |
| Frustum length | 8,1096 | m |
| Frustum base width | 0,374453 | m |
| Frustum tip width | 1,60885 | m |
| Frustum lift-off distance | 1,79236 | m |
| Flame length in still air | 11,9029 | m |
| Hole to flame angle | 13,099 | deg |
| Expanded diameter | 0,0512669 | m |
| Plane angular rotation | 0 | deg |

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 | 10,7 | m |

OUTPUT DATA

Radiation intensity

| Incident radiation | Lethality [%] | View factor | Probability | Dose [(W/m2)^ProbabilityN.s] | Ellipse half- | Ellipse half- | Ellipse centre downw | Effect downwind | Ellipse area |
|--------------------|---------------|-------------|-------------|------------------------------|---------------|---------------|----------------------|-----------------|--------------|
|--------------------|---------------|-------------|-------------|------------------------------|---------------|---------------|----------------------|-----------------|--------------|

| on [kW/ m ²] | | | | | length [m] | width [m] | ind distance [m] | distance [m] | [m ²] |
|--------------------------------|-----------------|---------------|------------------|------------|--------------------|--------------------|------------------------|-----------------|-------------------|
| 3 | 0 | 0,0346 811 | - 1,383 21 | 865.119 | 6,388 32 | 6,968 48 | 7,038 | 13,4263 | 139,8 54 |
| 5 | 0,00017 4704 | 0,0578 019 | 0,360 367 | 1.709.491 | 5,047 22 | 4,855 22 | 6,62787 | 11,6751 | 76,98 6 |
| 7 | 0,02405 | 0,0809 226 | 1,508 83 | 2.677.313 | 4,034 99 | 3,522 99 | 6,28467 | 10,3197 | 44,65 85 |
| 12,5 | 6,52536 | 0,1445 05 | 3,487 89 | 5.800.162 | Not reach ed | Not reach ed | | 8,31272 | n/a |
| 37,5 | 98,7381 | 0,4335 14 | 7,237 73 | 25.094.924 | Not reach ed | Not reach ed | | n/a | n/a |

Radiation v Distance Results

INPUT DATA

| | | |
|--|-------------|---|
| Maximum distance | 19,3819 | m |
| Observer type radiation modelling flag | Planar | |
| Observer direction | Variable | |
| Height of interest | 10,7 | m |

OUTPUT DATA

| Downwind distance [m] | Maximum incident radiation [kW/m ²] | Lethality level [fraction] |
|-----------------------|--|----------------------------|
| 0 | 1,95727 | 0 |
| 0,395549 | 2,54022 | 0 |
| 0,791098 | 3,28045 | 0 |
| 1,18665 | 4,12006 | 5,79162E-08 |
| 1,5822 | 5,00292 | 1,76397E-06 |
| 1,97775 | 5,65851 | 1,23682E-05 |
| 2,3733 | 6,88982 | 0,000196109 |
| 2,76884 | 8,2816 | 0,00176537 |

| | | |
|---------|---------|-------------|
| 3,16439 | 9,40986 | 0,00654398 |
| 3,55994 | 10,3077 | 0,0149917 |
| 3,95549 | 11,0324 | 0,026288 |
| 4,35104 | 11,6308 | 0,039364 |
| 4,74659 | 12,1318 | 0,0532464 |
| 5,14214 | 12,5506 | 0,0670249 |
| 5,53769 | 12,8956 | 0,0798978 |
| 5,93324 | 13,166 | 0,0909486 |
| 6,32879 | 13,3569 | 0,0992578 |
| 6,72434 | 13,4572 | 0,103787 |
| 7,11989 | 13,4893 | 0,105262 |
| 7,51543 | 13,3087 | 0,0971215 |
| 7,91098 | 13,0064 | 0,0843253 |
| 8,30653 | 12,5103 | 0,065613 |
| 8,70208 | 11,7945 | 0,0435969 |
| 9,09763 | 10,8787 | 0,0235004 |
| 9,49318 | 9,70743 | 0,0087721 |
| 9,88873 | 8,42735 | 0,00213325 |
| 10,2843 | 7,10689 | 0,000291503 |
| 10,6798 | 6,14292 | 4,1275E-05 |
| 11,0754 | 5,83473 | 1,95671E-05 |
| 11,4709 | 5,28755 | 4,32179E-06 |
| 11,8665 | 4,74335 | 7,20561E-07 |
| 12,262 | 4,23592 | 9,68287E-08 |
| 12,6576 | 3,77023 | 1,05497E-08 |
| 13,0531 | 3,35159 | 0 |
| 13,4487 | 2,98037 | 0 |
| 13,8442 | 2,65399 | 0 |
| 14,2398 | 2,36842 | 0 |
| 14,6353 | 2,11921 | 0 |
| 15,0309 | 1,9018 | 0 |
| 15,4264 | 1,71199 | 0 |
| 15,822 | 1,54602 | 0 |
| 16,2175 | 1,40057 | 0 |
| 16,6131 | 1,27277 | 0 |



| | | |
|---------|----------|---|
| 17,0086 | 1,16016 | 0 |
| 17,4042 | 1,06063 | 0 |
| 17,7997 | 0,972402 | 0 |
| 18,1953 | 0,893944 | 0 |
| 18,5908 | 0,823964 | 0 |
| 18,9864 | 0,761359 | 0 |
| 19,3819 | 0,705187 | 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 | 12,5 | m |
| Release angle from horizontal | 0 | deg |

Jet Fire Parameters

| | | |
|--------------------------|------------|-----|
| Jet fire method | Cone model | |
| Crosswind angle | 0 | deg |
| Rate modification factor | 3 | |

Calculated inputs

| | | |
|--|----------|----------|
| Mass flow rate | 0,459004 | kg/s |
| Temperature after atmospheric expansion | 6,73324 | degC |
| Liquid fraction | 0 | fraction |
| Velocity after atmospheric expansion (input) | 300 | m/s |
| Rainout fraction time averaged | 0 | fraction |

OUTPUT DATA

| | | |
|------------------------|-----------|----------|
| Flame emissive power | 79,3183 | kW/m2 |
| Fraction of emissivity | 0,0941911 | fraction |
| Jet velocity | 300 | m/s |
| Flame length | 10,8881 | m |
| Frustum length | 9,10884 | m |

| | | |
|---------------------------|-----------|-----|
| Frustum base width | 0,374453 | m |
| Frustum tip width | 1,39983 | m |
| Frustum lift-off distance | 1,79236 | m |
| Flame length in still air | 11,9029 | m |
| Hole to flame angle | 7,59366 | deg |
| Expanded diameter | 0,0512669 | m |
| Plane angular rotation | 0 | deg |

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 | 10,7 | m |

OUTPUT DATA

Radiation intensity

| Incident radiation [kW/m ²] | Lethality [%] | View factor | Probability | Dose [(W/m ²) ^{ProbitN.s}] | Ellipse half-length [m] | Ellipse half-width [m] | Ellipse centre downwind distance [m] | Effect downwind distance [m] | Ellipse area [m ²] |
|---|---------------|-------------|-------------|--|-------------------------|------------------------|--------------------------------------|------------------------------|--------------------------------|
| 3 | 0 | 0,0378223 | -1,38321 | 865.119 | 6,56776 | 6,56961 | 7,36568 | 13,9334 | 135,552 |
| 5 | 0,000174704 | 0,0630371 | 0,360367 | 1.709.491 | 5,3099 | 4,51266 | 7,18644 | 12,4963 | 75,2781 |
| 7 | 0,02405 | 0,088252 | 1,50883 | 2.677.313 | 4,40274 | 3,21825 | 6,85136 | 11,2541 | 44,5135 |
| 12,5 | 6,52536 | 0,157593 | 3,48789 | 5.800.162 | 1,83527 | 0,950129 | 7,6849 | 9,52017 | 5,47814 |
| 37,5 | 98,7381 | 0,472779 | 7,23773 | 25.094.924 | Not reached | Not reached | | n/a | n/a |

Radiation v Distance Results

INPUT DATA

| | | |
|--|-------------|---|
| Maximum distance | 21,6426 | m |
| Observer type radiation modelling flag | Planar | |
| Observer direction | Variable | |
| Height of interest | 10,7 | m |

OUTPUT DATA

| Downwind distance [m] | Maximum incident radiation [kW/m2] | Lethality level [fraction] |
|-----------------------|------------------------------------|----------------------------|
| 0 | 1,82861 | 0 |
| 0,441687 | 2,41084 | 0 |
| 0,883373 | 3,15463 | 0 |
| 1,32506 | 3,93986 | 2,48242E-08 |
| 1,76675 | 4,73573 | 7,01022E-07 |
| 2,20843 | 5,898 | 2,29356E-05 |
| 2,65012 | 7,36571 | 0,000454438 |
| 3,09181 | 8,53577 | 0,00244551 |
| 3,53349 | 9,45522 | 0,00685157 |
| 3,97518 | 10,1951 | 0,0136295 |
| 4,41687 | 10,8231 | 0,0225469 |
| 4,85855 | 11,373 | 0,0332818 |
| 5,30024 | 11,8569 | 0,045286 |
| 5,74193 | 12,2917 | 0,0582685 |
| 6,18361 | 12,6745 | 0,0714899 |
| 6,6253 | 13,0068 | 0,0843401 |
| 7,06699 | 13,2813 | 0,0959178 |
| 7,50867 | 13,4809 | 0,104874 |
| 7,95036 | 13,5865 | 0,109795 |
| 8,39205 | 13,562 | 0,108643 |
| 8,83373 | 13,3546 | 0,0991563 |
| 9,27542 | 12,894 | 0,0798355 |
| 9,71711 | 12,0973 | 0,0522019 |

| | | |
|---------|----------|-------------|
| 10,1588 | 10,907 | 0,0239968 |
| 10,6005 | 9,34765 | 0,0061398 |
| 11,0422 | 7,56228 | 0,000624554 |
| 11,4839 | 6,68803 | 0,000132807 |
| 11,9255 | 5,98428 | 2,83468E-05 |
| 12,3672 | 5,2147 | 3,46334E-06 |
| 12,8089 | 4,49788 | 2,85826E-07 |
| 13,2506 | 3,84092 | 1,51802E-08 |
| 13,6923 | 3,27278 | 0 |
| 14,134 | 2,79249 | 0 |
| 14,5757 | 2,3911 | 0 |
| 15,0173 | 2,05732 | 0 |
| 15,459 | 1,77979 | 0 |
| 15,9007 | 1,54854 | 0 |
| 16,3424 | 1,35509 | 0 |
| 16,7841 | 1,19286 | 0 |
| 17,2258 | 1,05534 | 0 |
| 17,6675 | 0,938492 | 0 |
| 18,1092 | 0,83866 | 0 |
| 18,5508 | 0,752895 | 0 |
| 18,9925 | 0,678824 | 0 |
| 19,4342 | 0,614517 | 0 |
| 19,8759 | 0,558425 | 0 |
| 20,3176 | 0,509262 | 0 |
| 20,7593 | 0,465981 | 0 |
| 21,201 | 0,427718 | 0 |
| 21,6426 | 0,393754 | 0 |

