Resultados obtenidos del Cálculo de Consecuencias empleando el programa
FRED

Lazo 03: Fuga de líquido a presión por sobrepresión de separador de producción 0002-V-1001 A/B

Process conditions

Temperature = 65.55 °C

Pressure = 6.874 bara

Release summary

Mass flow rate = 104.2 kg/s

Flux = 16600.3 kg/m²/s

Static exit pressure = 4.764 bara

Exit temperature = 65.55 °C

Exit density = 653 kg/m³

Exit velocity = 25.42 m/s

Residence time = 0 s

Vapour fraction at exit = 0 mol/mol

Expanded exit velocity = 48.01 m/s

Air equivalent source diameter = 1.518 m

Jet Fire Summary

Flame length (of frustum) = 86.53 m

Cone width of flame base = 8.853 m

Cone width of flame end = 49.86 m

Flame lift-off = 2.657 m

Flame angle from vertical = 84.5 deg
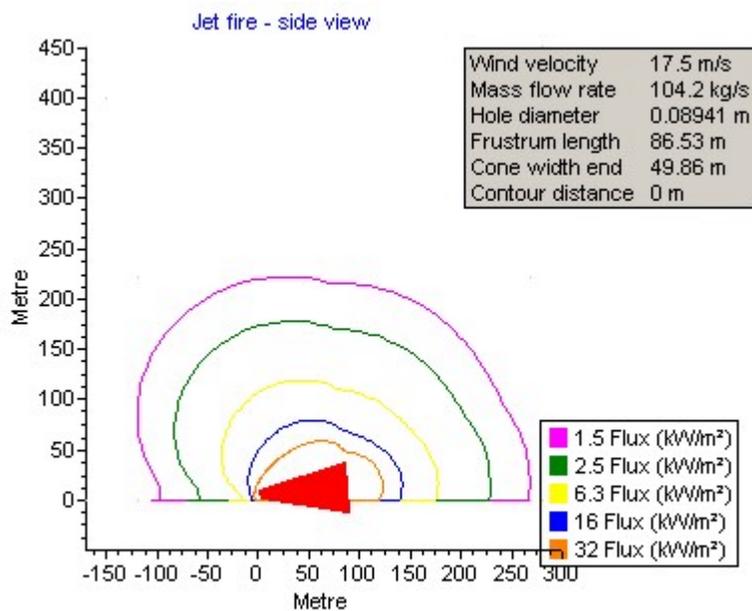
Flame angle, clockwise from North = 41.48 deg

Surface emissive power = 142.7 kW/m²
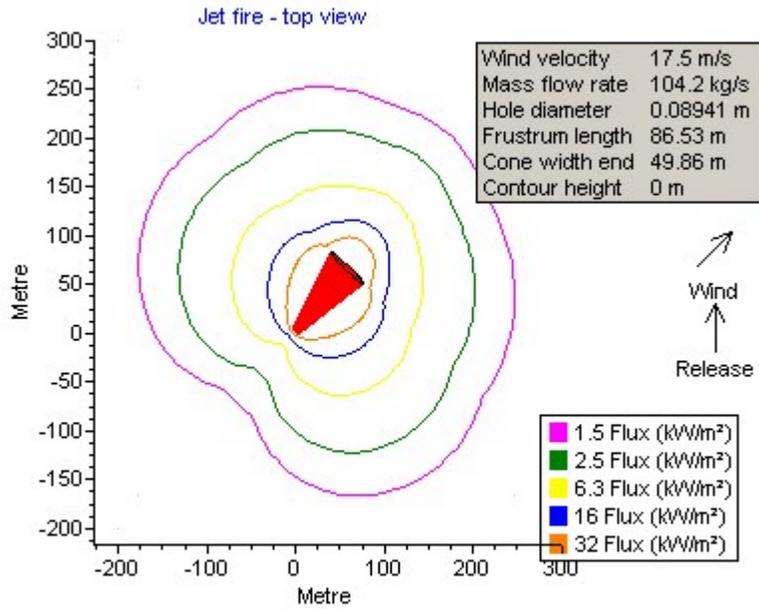
Fraction of heat radiated = 0.3159

Total combustion power = 4614.3 MW
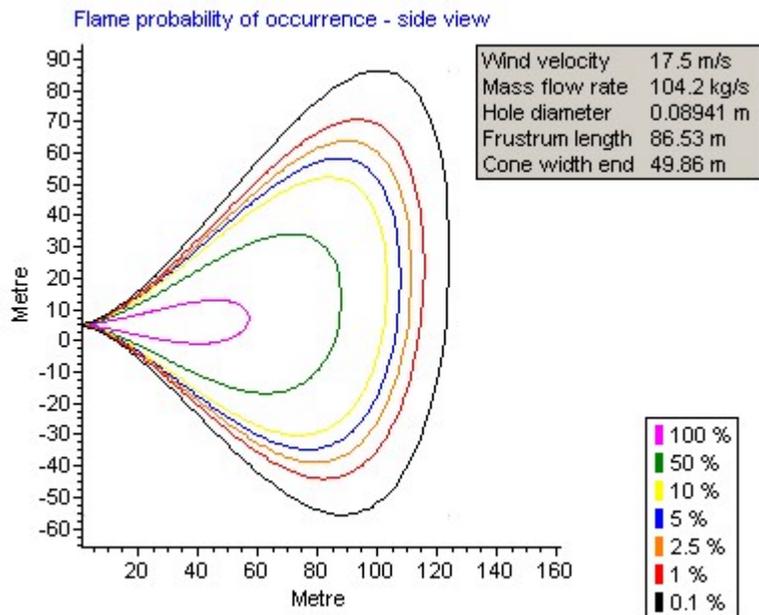
Heat of combustion = 44273.4 kJ/kg

Side view

Top view

Jet fire - top view

Wind velocity	17.5 m/s
Mass flow rate	104.2 kg/s
Hole diameter	0.08941 m
Frustrum length	86.53 m
Cone width end	49.86 m
Contour height	0 m

Wind

Release

- 1.5 Flux (kW/m²)
- 2.5 Flux (kW/m²)
- 6.3 Flux (kW/m²)
- 16 Flux (kW/m²)
- 32 Flux (kW/m²)

Impingement

Flame probability of occurrence - side view

Wind velocity	17.5 m/s
Mass flow rate	104.2 kg/s
Hole diameter	0.08941 m
Frustrum length	86.53 m
Cone width end	49.86 m

- 100 %
- 50 %
- 10 %
- 5 %
- 2.5 %
- 1 %
- 0.1 %

245

Lazo 02: Fuga de gas por sobrepresión en separador de producción 0002-V-1001 A/B

Process conditions

Temperature = 65.55 °C

Pressure = 6.874 bara

Release summary

Mass flow rate = 3.478 kg/s

Flux = 984.9 kg/m²/s

Static exit pressure = 3.757 bara

Exit temperature = 19.28 °C

Exit density = 3.114 kg/m³

Exit velocity = 316.3 m/s

Residence time = 0 s

Vapour fraction at exit = 1 mol/mol

Expanded exit velocity = 594.9 m/s

Air equivalent source diameter = 0.07876 m

Jet Fire Summary

Flame length (of frustum) = 13.9 m

Cone width of flame base = 2.063 m

Cone width of flame end = 2.407 m

Flame lift-off = 7.221 m

Flame angle from vertical = 81.73 deg

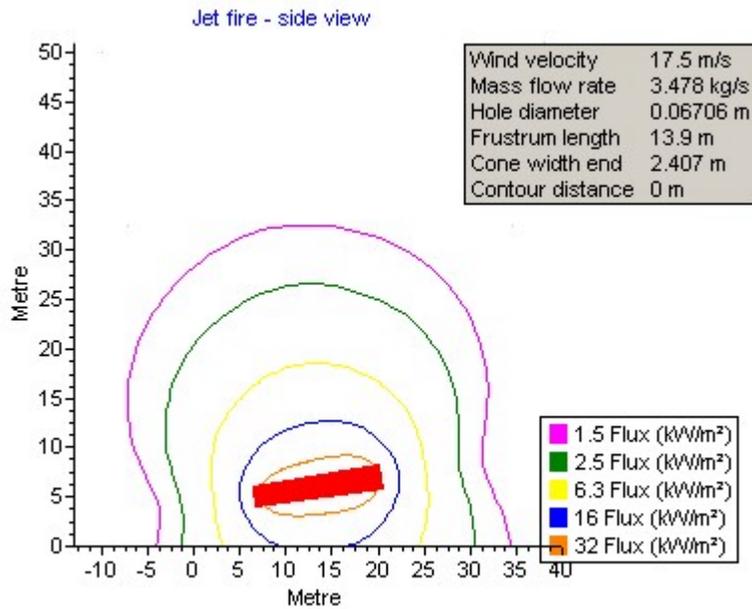Flame angle, clockwise from North = 24.75 deg

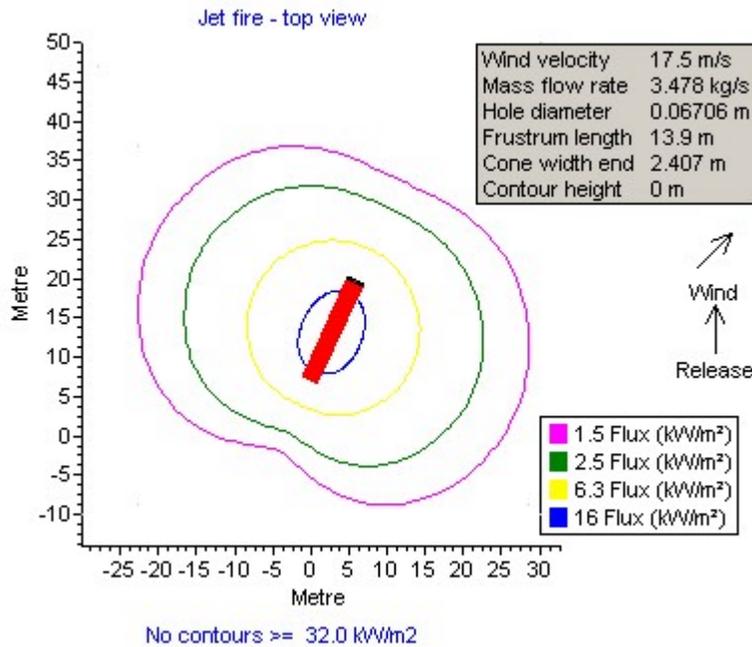Surface emissive power = 149.8 kW/m²

Fraction of heat radiated = 0.1306

Total combustion power = 121 MW

Heat of combustion = 34788.2 kJ/kg

Side view

Top view

Impingement

Flame probability of occurrence - side view

Wind velocity	17.5 m/s
Mass flow rate	3.478 kg/s
Hole diameter	0.06706 m
Frustrum length	13.9 m
Cone width end	2.407 m

Colour	Value
100 %	
50 %	
10 %	
5 %	
2.5 %	
1 %	
0.1 %	

Lazo 05: Fuga de gas por sobrepresión en tanque de BHD 0002-TK-1001

Process conditions

Temperature = 65.55 °C

Pressure = 1.055 bara

Release summary

Mass flow rate = 0.219 kg/s

Flux = 62.02 kg/m²/s

Static exit pressure = 1.013 bara

Exit temperature = 62.1 °C

Exit density = 0.7326 kg/m³

Exit velocity = 84.67 m/s

Residence time = 0 s

Vapour fraction at exit = 1 mol/mol

Expanded exit velocity = 84.67 m/s

Air equivalent source diameter = 0.05239 m

Jet Fire Summary

Flame length (of frustum) = 6.541 m

Cone width of flame base = 0.6827 m

Cone width of flame end = 1.601 m

Flame lift-off = 0.3613 m

Flame angle from vertical = 86.46 deg

Flame angle, clockwise from North = 38.53 deg

Surface emissive power = 134.2 kW/m²

Fraction of heat radiated = 0.4563

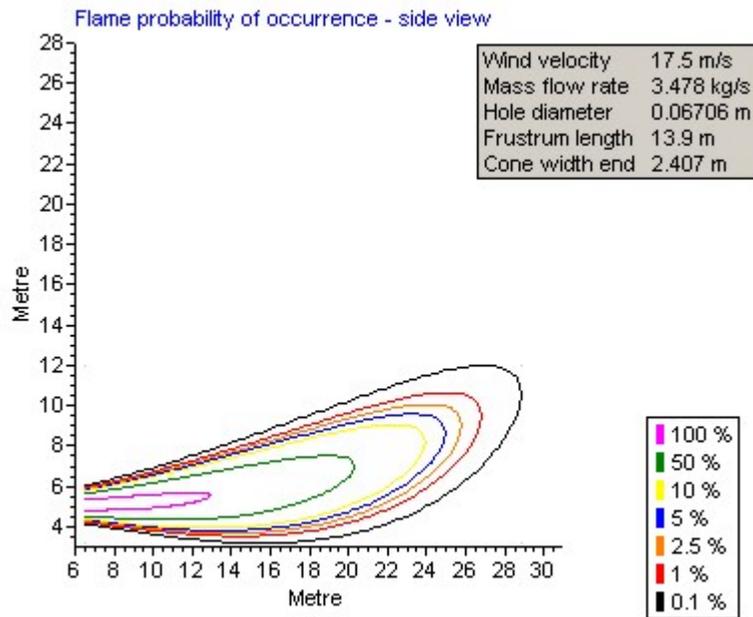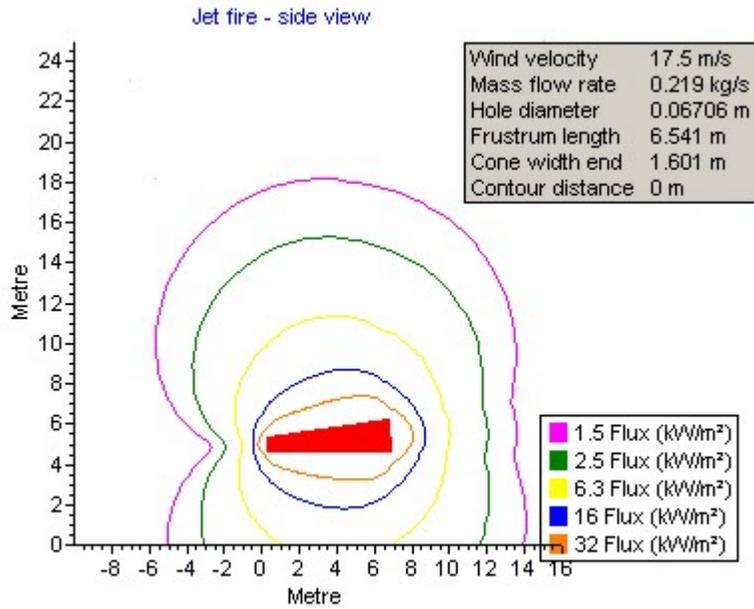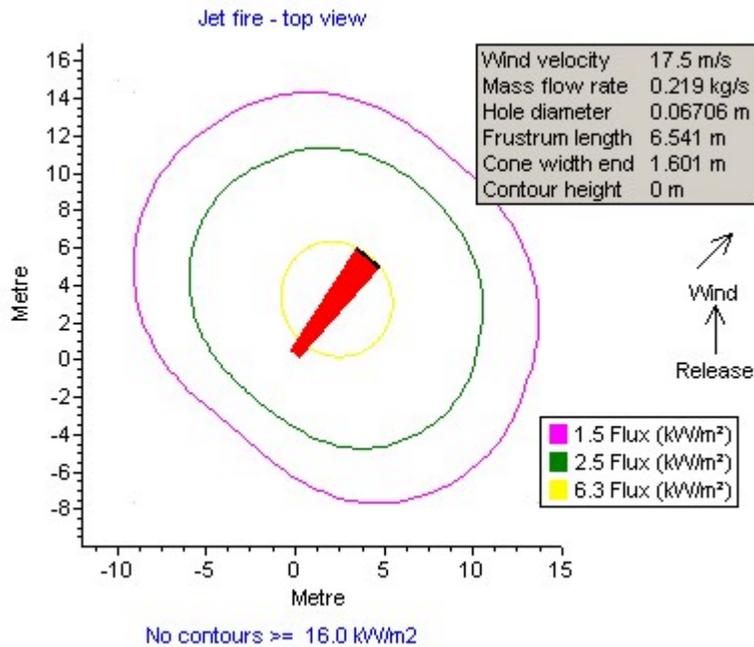Total combustion power = 7.62 MW

Heat of combustion = 34788.2 kJ/kg

Side view

Jet fire - side view

Wind velocity	17.5 m/s
Mass flow rate	0.219 kg/s
Hole diameter	0.06706 m
Frustrum length	6.541 m
Cone width end	1.601 m
Contour distance	0 m

- 1.5 Flux (kW/m²)
- 2.5 Flux (kW/m²)
- 6.3 Flux (kW/m²)
- 16 Flux (kW/m²)
- 32 Flux (kW/m²)

Top view

Jet fire - top view

Wind velocity	17.5 m/s
Mass flow rate	0.219 kg/s
Hole diameter	0.06706 m
Frustrum length	6.541 m
Cone width end	1.601 m
Contour height	0 m

Wind

Release

- 1.5 Flux (kW/m²)
- 2.5 Flux (kW/m²)
- 6.3 Flux (kW/m²)

No contours >= 16.0 kW/m2

Impingement

Flame probability of occurrence - side view

Wind velocity	17.5 m/s
Mass flow rate	0.219 kg/s
Hole diameter	0.06706 m
Frustrum length	6.541 m
Cone width end	1.601 m

	100 %
	50 %
	10 %
	5 %
	2.5 %
	1 %
	0.1 %

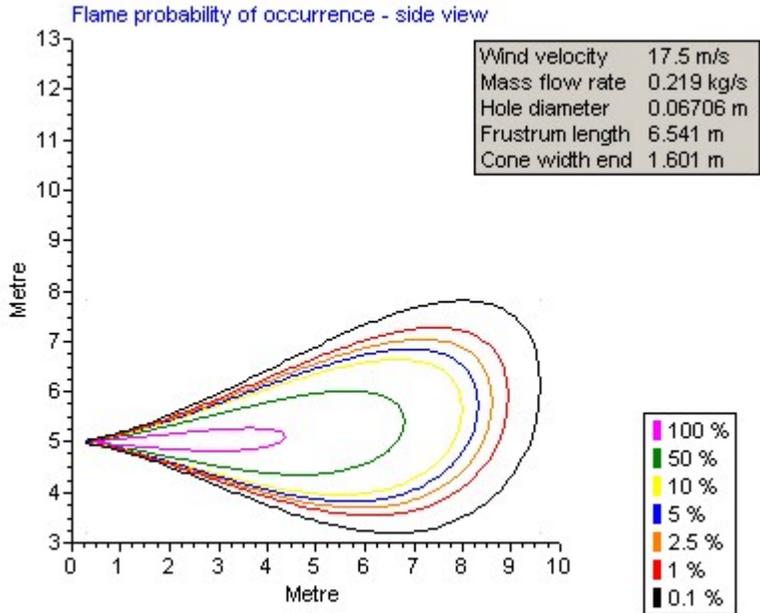**Lazo 07: Fuga de gas por sobrepresión en depurador de gas 0002-V-1301**

Process conditions

Temperature = 65.55 °C

Pressure = 5.495 bara

Release summary

Mass flow rate = 4.934 kg/s

Flux = 785.9 kg/m²/s

Static exit pressure = 3.006 bara

Exit temperature = 20.2 °C

Exit density = 2.484 kg/m³

Exit velocity = 316.4 m/s

Residence time = 0 s

Vapour fraction at exit = 1 mol/mol

Expanded exit velocity = 570 m/s

Air equivalent source diameter = 0.09584 m

Jet Fire Summary

Flame length (of frustum) = 16.02 m

Cone width of flame base = 2.373 m

Cone width of flame end = 2.929 m

Flame lift-off = 8.305 m

Flame angle from vertical = 81.4 deg

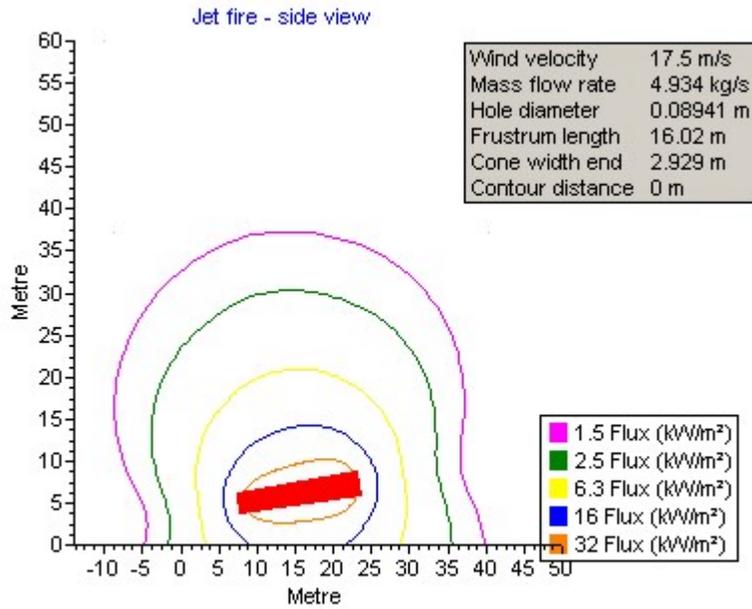Flame angle, clockwise from North = 25.45 deg

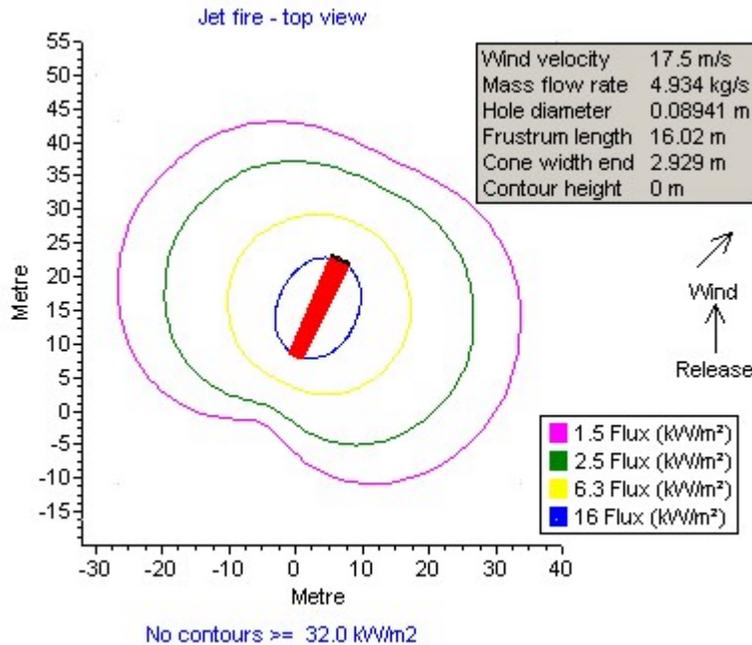Surface emissive power = 152.9 kW/m²

Fraction of heat radiated = 0.1288

Total combustion power = 171.6 MW
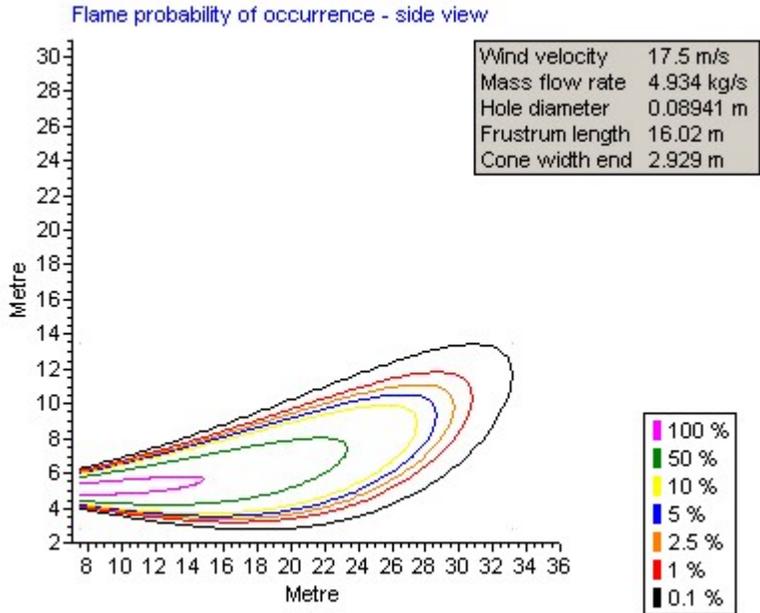
Heat of combustion = 34788.2 kJ/kg

Side view

Jet fire - side view

Wind velocity   17.5 m/s
Mass flow rate   4.934 kg/s
Hole diameter   0.08941 m
Frustrum length   16.02 m
Cone width end   2.929 m
Contour distance   0 m

■ 1.5 Flux (kW/m²)
■ 2.5 Flux (kW/m²)
■ 6.3 Flux (kW/m²)
■ 16 Flux (kW/m²)
■ 32 Flux (kW/m²)

Top view

Jet fire - top view

Wind velocity   17.5 m/s
Mass flow rate   4.934 kg/s
Hole diameter   0.08941 m
Frustrum length   16.02 m
Cone width end   2.929 m
Contour height   0 m

Wind

Release

■ 1.5 Flux (kW/m²)
■ 2.5 Flux (kW/m²)
■ 6.3 Flux (kW/m²)
■ 16 Flux (kW/m²)

No contours >= 32.0 kW/m2

Impingement

Flame probability of occurrence - side view

Wind velocity	17.5 m/s
Mass flow rate	4.934 kg/s
Hole diameter	0.08941 m
Frustrum length	16.02 m
Cone width end	2.929 m

100 %	
50 %	
10 %	
5 %	
2.5 %	
1 %	
0.1 %	

Lazo 08: Fuga de líquido a presión por sobrepresión en depurador de gas 0002-V-1301

Process conditions

Temperature = 65.55 °C

Pressure = 5.495 bara

Release summary

Mass flow rate = 5.698 kg/s

Flux = 14520.3 kg/m²/s

Static exit pressure = 3.882 bara

Exit temperature = 65.55 °C

Exit density = 653.4 kg/m³

Exit velocity = 22.22 m/s

Residence time = 0 s

Vapour fraction at exit = 0 mol/mol

Expanded exit velocity = 41.98 m/s

Air equivalent source diameter = 0.3795 m

Jet Fire Summary

Flame length (of frustum) = 27.16 m

Cone width of flame base = 2.77 m

Cone width of flame end = 12.48 m

Flame lift-off = 0.7269 m

Flame angle from vertical = 86.12 deg
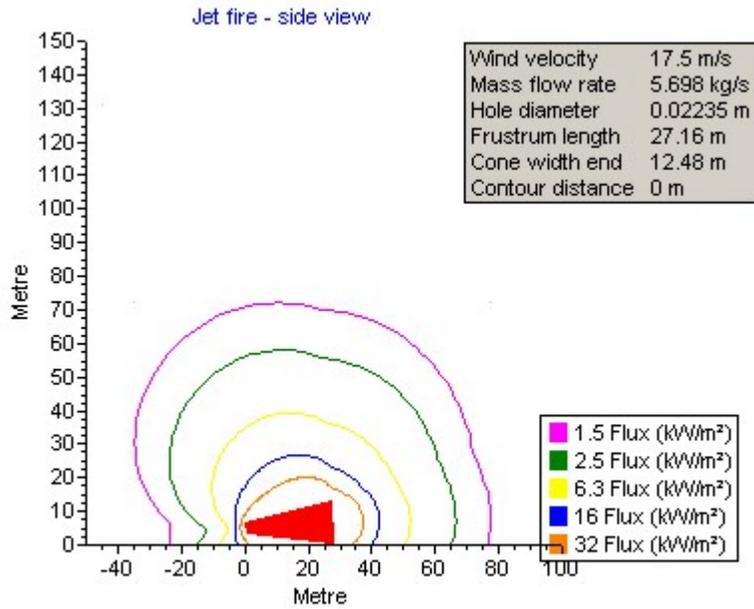
Flame angle, clockwise from North = 41.89 deg

Surface emissive power = 144.7 kW/m²

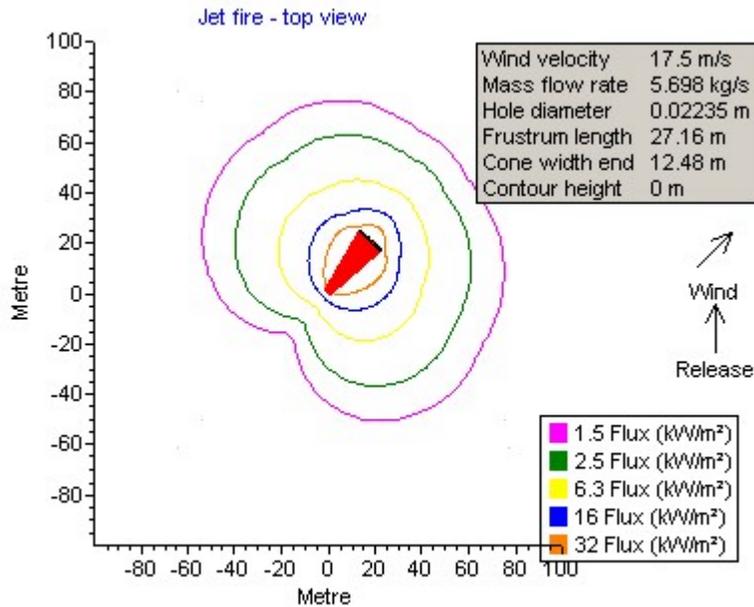Fraction of heat radiated = 0.4516

Total combustion power = 252.8 MW
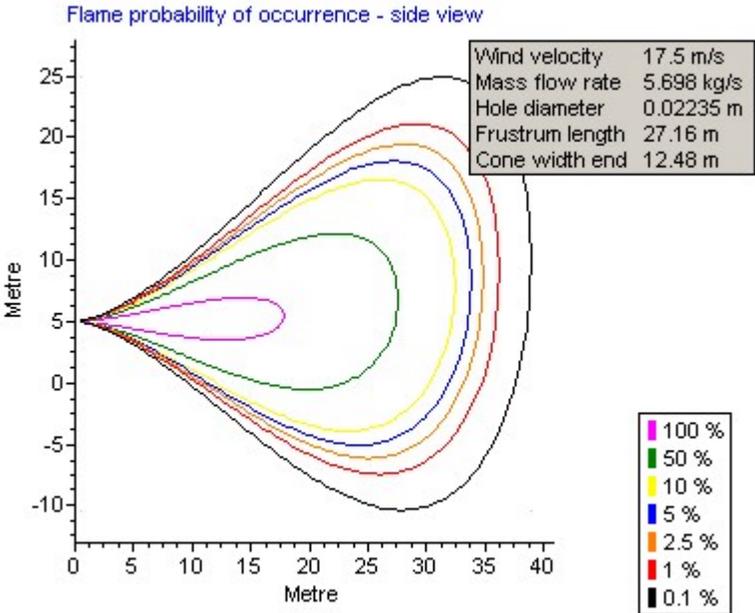
Heat of combustion = 44371.1 kJ/kg

Side view

Top view

Impingement

Flame probability of occurrence - side view

Wind velocity	17.5 m/s
Mass flow rate	5.698 kg/s
Hole diameter	0.02235 m
Frustrum length	27.16 m
Cone width end	12.48 m

100 %
50 %
10 %
5 %
2.5 %
1 %
0.1 %

257

Lazo 11: Fuga de gas por sobrepresión en tambor K.O. del mechurrio 0002-V-1801

Process conditions

Temperature = 65.55 °C

Pressure = 4.461 bara

Release summary

Mass flow rate = 2.25 kg/s

Flux = 637.2 kg/m²/s

Static exit pressure = 2.442 bara

Exit temperature = 20.89 °C

Exit density = 2.013 kg/m³

Exit velocity = 316.5 m/s

Residence time = 0 s

Vapour fraction at exit = 1 mol/mol

Expanded exit velocity = 540.8 m/s

Air equivalent source diameter = 0.06645 m

Jet Fire Summary

Flame length (of frustum) = 11.91 m

Cone width of flame base = 1.733 m

Cone width of flame end = 2.031 m

Flame lift-off = 5.859 m

Flame angle from vertical = 82.13 deg

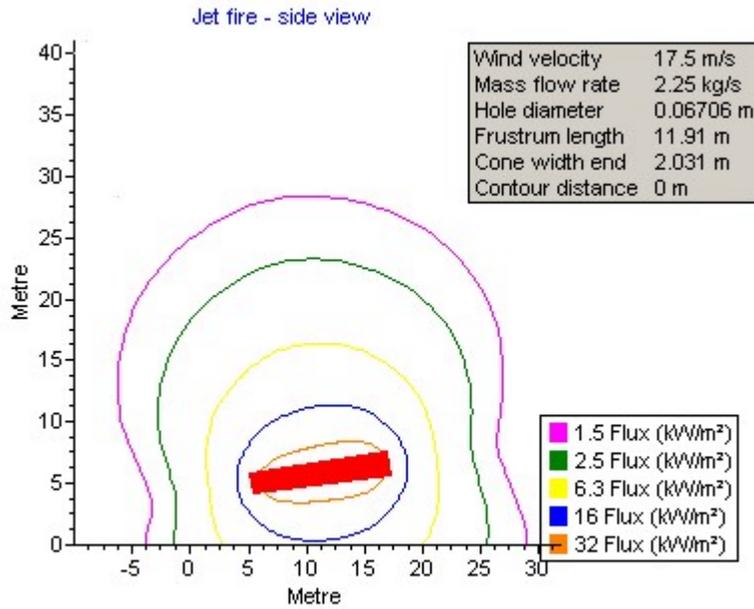Flame angle, clockwise from North = 25.86 deg

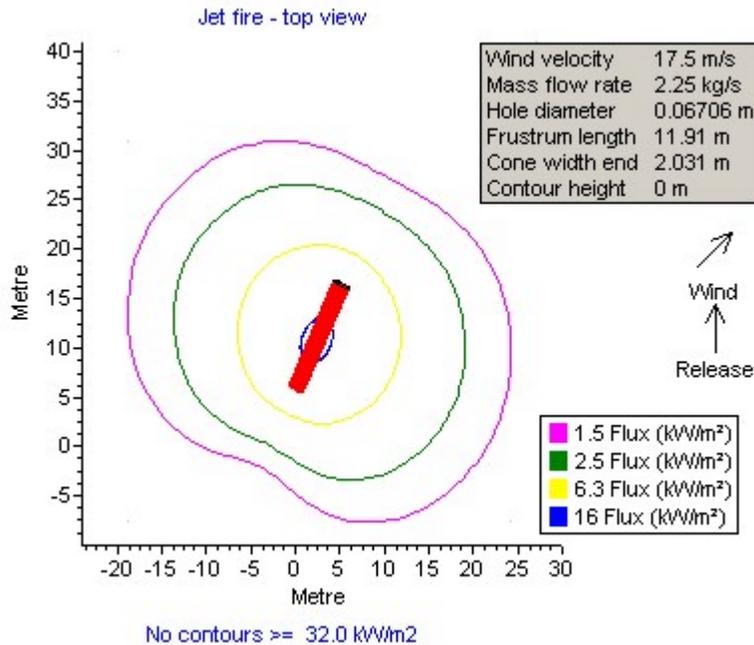Surface emissive power = 147.3 kW/m²

Fraction of heat radiated = 0.143

Total combustion power = 78.28 MW
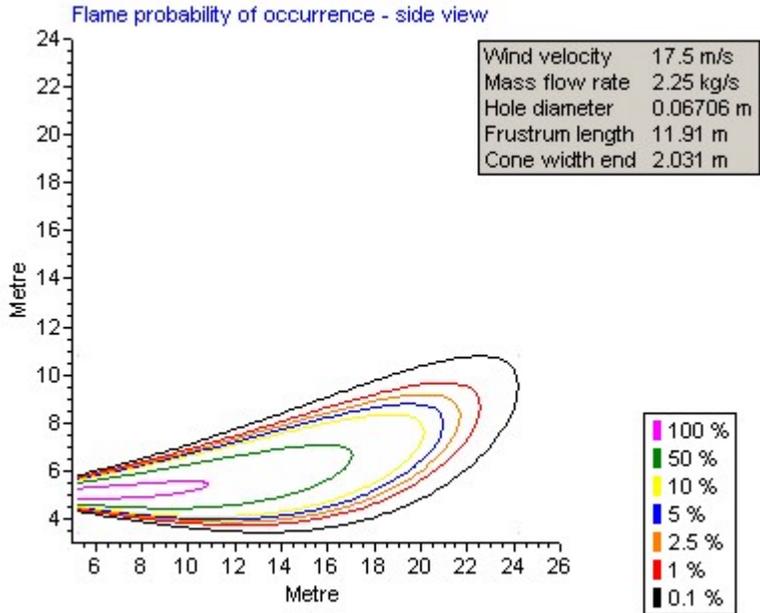
Heat of combustion = 34788.2 kJ/kg

Side view

Jet fire - side view

Wind velocity 17.5 m/s
Mass flow rate 2.25 kg/s
Hole diameter 0.06706 m
Frustrum length 11.91 m
Cone width end 2.031 m
Contour distance 0 m

- 1.5 Flux (kW/m²)
- 2.5 Flux (kW/m²)
- 6.3 Flux (kW/m²)
- 16 Flux (kW/m²)
- 32 Flux (kW/m²)

Top view

Jet fire - top view

Wind velocity 17.5 m/s
Mass flow rate 2.25 kg/s
Hole diameter 0.06706 m
Frustrum length 11.91 m
Cone width end 2.031 m
Contour height 0 m

Wind

Release

- 1.5 Flux (kW/m²)
- 2.5 Flux (kW/m²)
- 6.3 Flux (kW/m²)
- 16 Flux (kW/m²)

No contours >= 32.0 kW/m2

259

Impingement

Flame probability of occurrence - side view

Wind velocity	17.5 m/s
Mass flow rate	2.25 kg/s
Hole diameter	0.06706 m
Frustrum length	11.91 m
Cone width end	2.031 m

100 %	
50 %	
10 %	
5 %	
2.5 %	
1 %	
0.1 %	

Lazo 12: Fuga de líquido a presión por sobrepresión en tambor K.O. del mechurrio 0002-V-1801

Process conditions

Temperature = 65.55 °C

Pressure = 4.461 bara

Release summary

Mass flow rate = 4.998 kg/s

Flux = 12738.0 kg/m²/s

Static exit pressure = 3.22 bara

Exit temperature = 65.55 °C

Exit density = 653.6 kg/m³

Exit velocity = 19.49 m/s

Residence time = 0 s

Vapour fraction at exit = 0 mol/mol

Expanded exit velocity = 36.81 m/s

Air equivalent source diameter = 0.3796 m

Jet Fire Summary

Flame length (of frustum) = 25.86 m

Cone width of flame base = 2.631 m

Cone width of flame end = 12.48 m

Flame lift-off = 0.6053 m

Flame angle from vertical = 86.38 deg
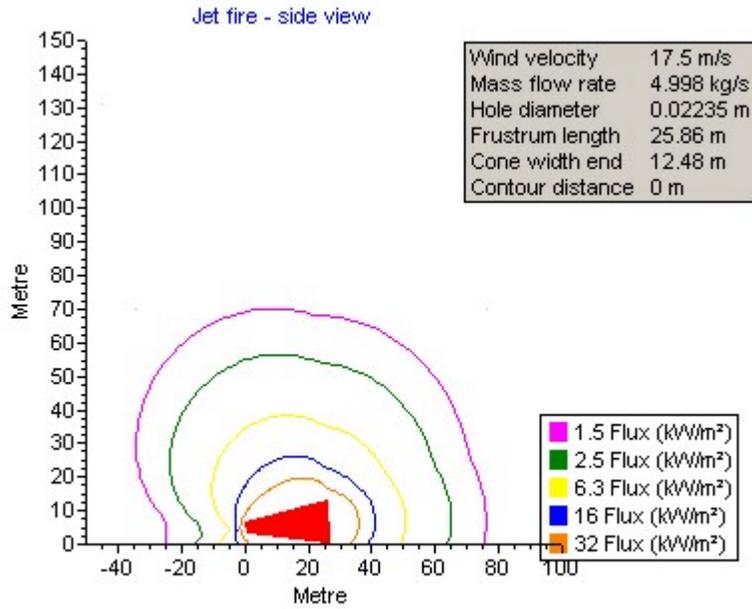
Flame angle, clockwise from North = 42.25 deg

Surface emissive power = 144.2 kW/m²
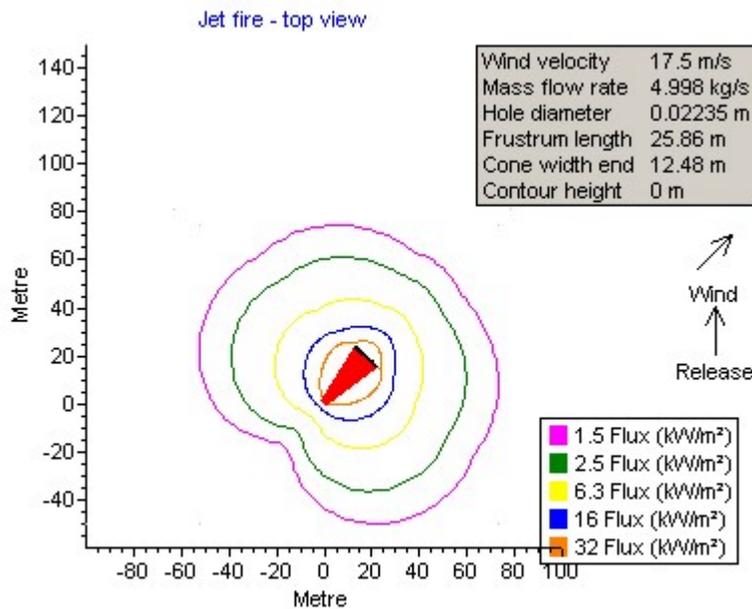
Fraction of heat radiated = 0.4885

Total combustion power = 222.2 MW
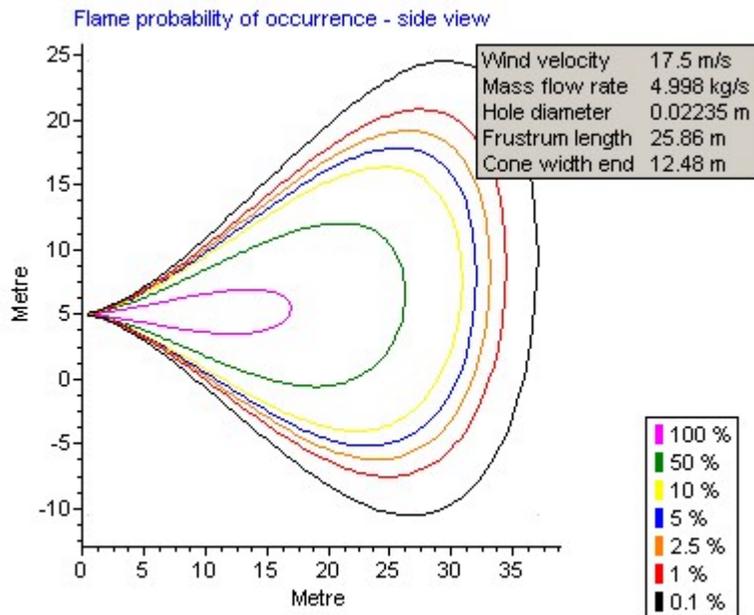
Heat of combustion = 44449.2 kJ/kg

Side view

Top view

Impingement

Flame probability of occurrence - side view

Wind velocity	17.5 m/s
Mass flow rate	4.998 kg/s
Hole diameter	0.02235 m
Frustrum length	25.86 m
Cone width end	12.48 m

- 100 %
- 50 %
- 10 %
- 5 %
- 2.5 %
- 1 %
- 0.1 %

Model Versions

(Produced by Shell FRED 4.0.0.0 using Fortran.dll 4.0.0.7, VLEOS.dll 4.0.0.0, VesselBurst.dll 4.0.0.0, GenericBleve.dll 4.0.0.0, TrenchFire.dll 4.0.0.0, HEATUP.dll 4.0.0.0, TwoPhaseBlowdown.dll 4.0.0.0, BubblePlume.dll 4.0.0.0, GasMix.dll 2.0.0.4, HGsystem.dll 1.2.4.0, APMAIN.exe 2.2.3.2, HSMAIN.exe 3.4.3.2, PGMAIN.exe 2.2.0.1)