Softbits consultants

Flaresim

Flare Radiation Analysis

Flaresim Overview

Used in the Design of Flare Systems for

- Offshore oil platforms
- Gas plants
- Refineries
- Chemical plants

Assist professional engineers to

- Evaluate thermal radiation & noise from flares
- Evaluate temperatures of exposed surfaces
- Evaluate flare gas dispersion

Flaresim can analyse complex flare systems

Flaresim Overview

A user friendly interface

- Data entry in a mixture of units
- Program driven by menu & toolbar
- Context sensitive help

Flaresim output is highly customisable

- Summary or detailed output
- Graphical output where appropriate
- Standard format exports for further use (html, xls, csv)

Licensing is either standalone or network

Flaresim Features

Global calculation options

Fluids, Environments, Stacks

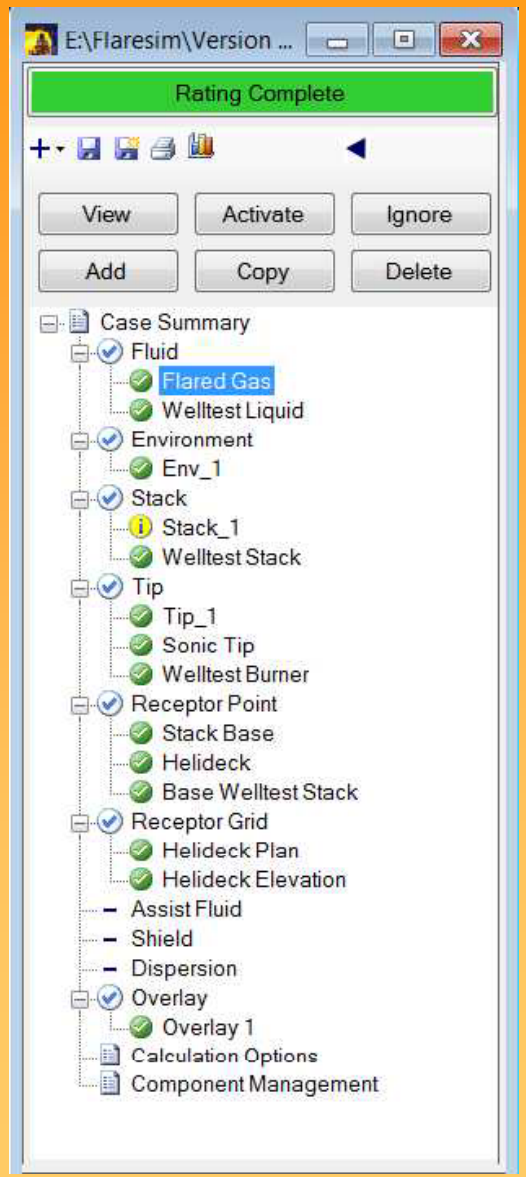
Flare Tips

Receptor Points

Receptor Grids

Assist fluids

- User creates as many instances of each as required
- Copy option for Fluids and other objects



Fluids

Defined from Properties - Composition

Component library with most common components

- User extendable

Environments

Wind → Single direction or wind rose

Atmosphere → Radiation and Noise Attenuation

Background → Solar Radiation and Noise

Stacks

Orientation and dimensions

Tips

Selection of types

- Pipe – Sonic - Liquid burner - Combined HP/LP

Seal Types

- Fluidic - Molecular

Methods for F factor

- User defined – Natural Gas – Kent – Tan – Cook – High Efficiency – Generic Pipe – Modified Chamberlain

Combustion noise methods

- Acoustic efficiency – Low Noise reference
- Standard reference – User reference

Location and dimension definition

References a Stack and a Fluid

Receptor Points

Location

Properties

- Emissivity - Absorbtivity
- Area Ratio – Mass / Unit Area
- Mass Cp – Initial Temperature

Define constraints for sizing

- Max Radiation
- Max Noise
- MaxTemperature

Radiation Calculation

8 methods to calculate incident radiation

- Strict API
- Flaresim API
- Integrated Point Source
- Integrated Diffuse Source
- Integrated Mixed Source
- Brzustowski
- Multipoint Brzustowski
- Chamberlain

Noise Calculation

Two basic sources

- Combustion noise
- Jet noise

Each source has a frequency distribution

Overall noise is the combination of the sources

Temperature Calculation

Exposed surface heat balance between

- The thermal radiation incident at the specified point
- Heat losses by radiation and convection

Temperature profile

- Net heat received
- Heat capacity of the material at the specified point

Calculation modes

System Rating

- Known stack length
- Calculated radiation, noise and temperature

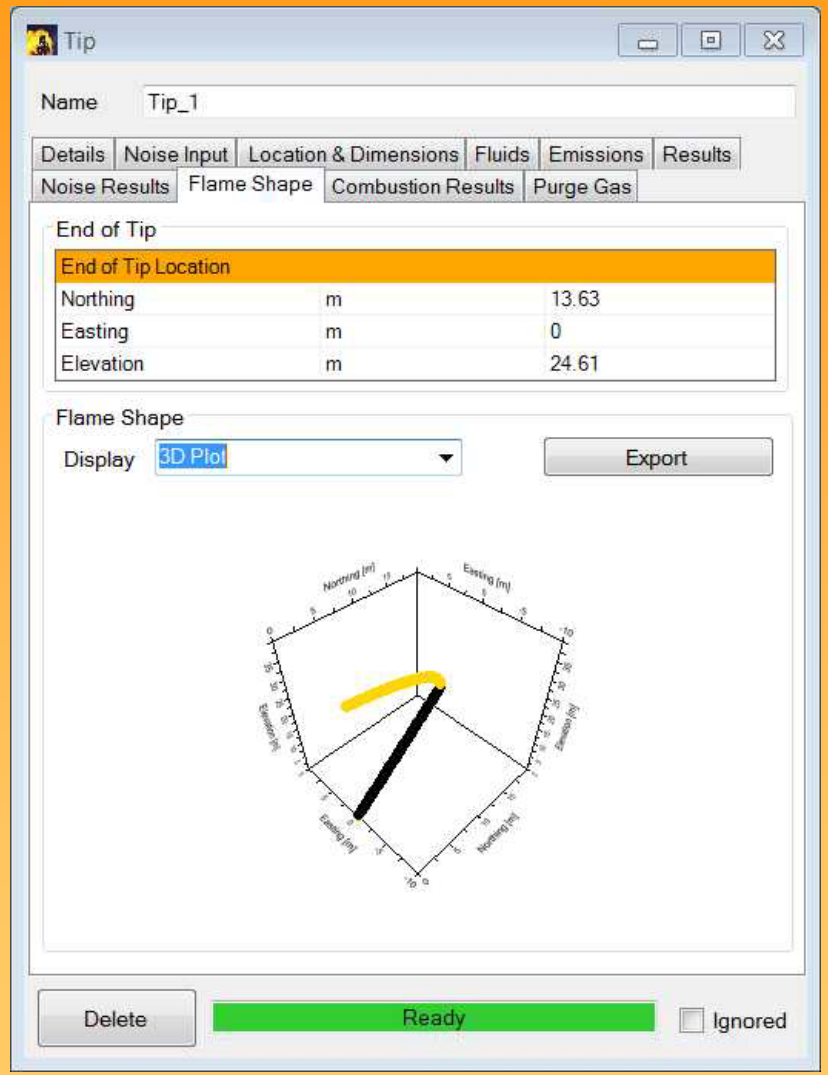
Stack Sizing

- Sizing to meet radiation, noise and temperature constraints
- Constraints defined at receptor points
- Minimum and maximum stack length user defined

Tip Results

- Gas exit velocity and Heat release
- Stack and tip pressure drop
- Purge gas requirements
- Combustion gas composition
- Table & graphs of
  - Noise spectrum
  - 2D/3D flame shape

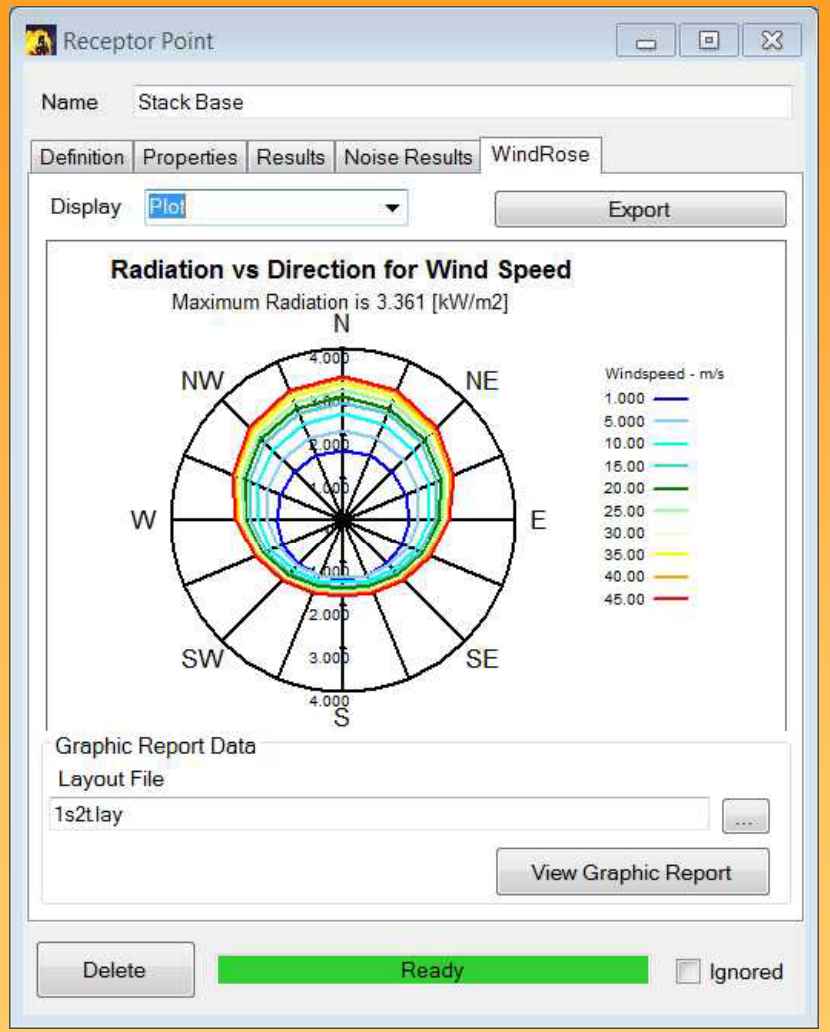
Tables & graphs (JPG, PNG, WMF, BMP or EMF) can be exported individually



Receptor Point Results

Thermal results

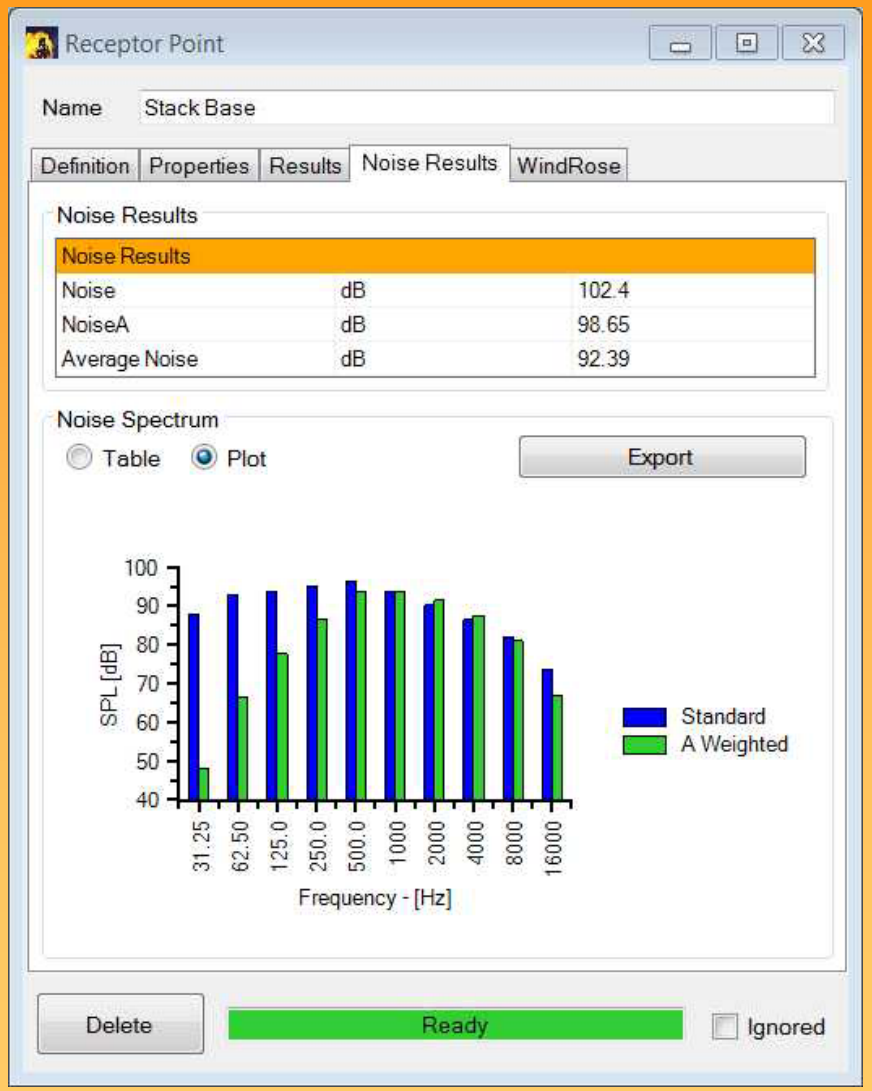
- Incident radiation
- Final temperature
- Temperature profile
  - table and graphic
- Wind rose



Receptor Points Results

Noise results

- Total and Average value
- Frequency distribution
- Spectrum
  - table and graphic



Receptor Grids

Defines a rectangular area with multiple receptors

Thermal results

- Radiation Isopleths
- Temperature Isopleths

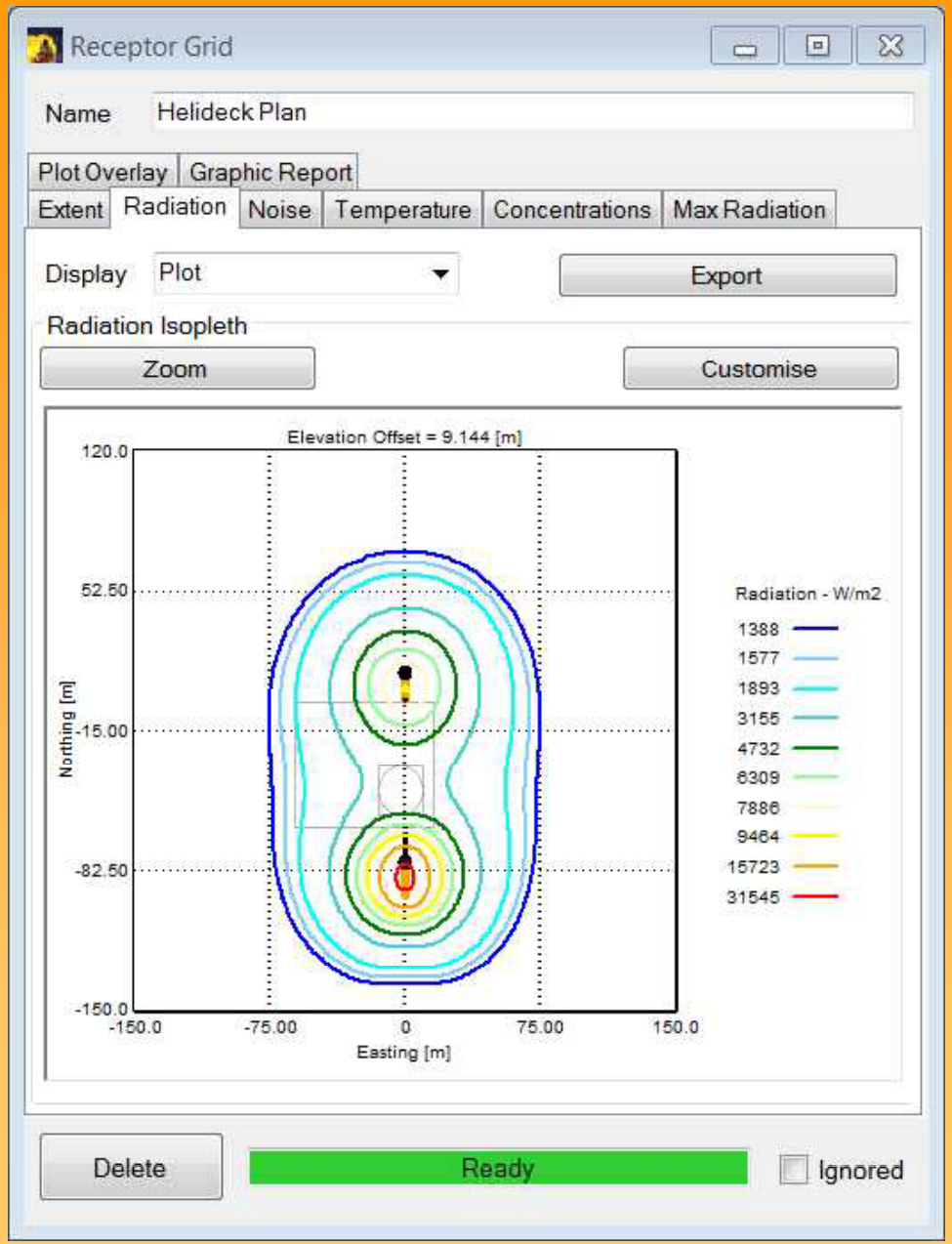
Noise results

- Average or A-weighted value Isopleths

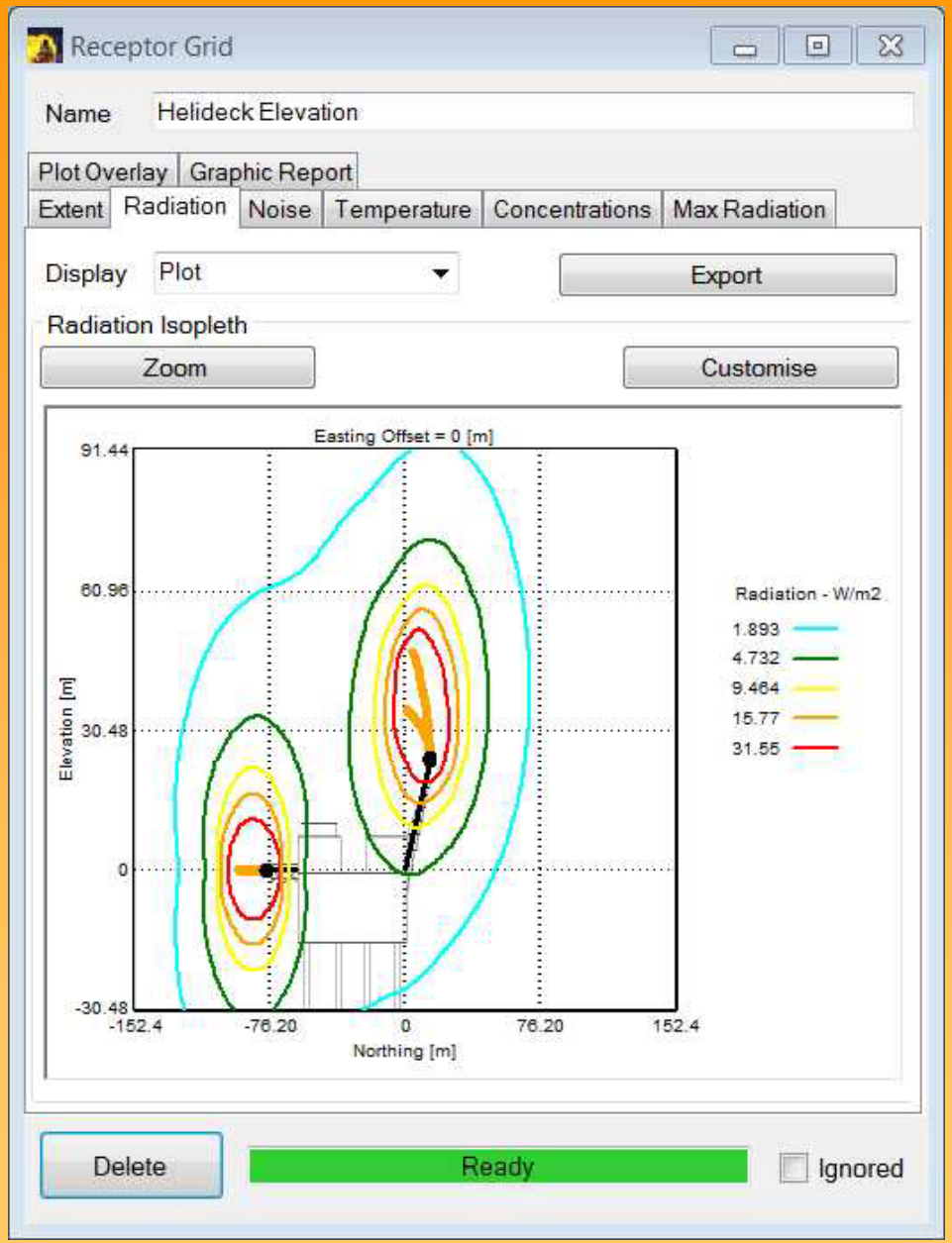
A plot overlay can be defined

- Multiple graphical formats (DXF, JPG, PNG, BMP, WMF)

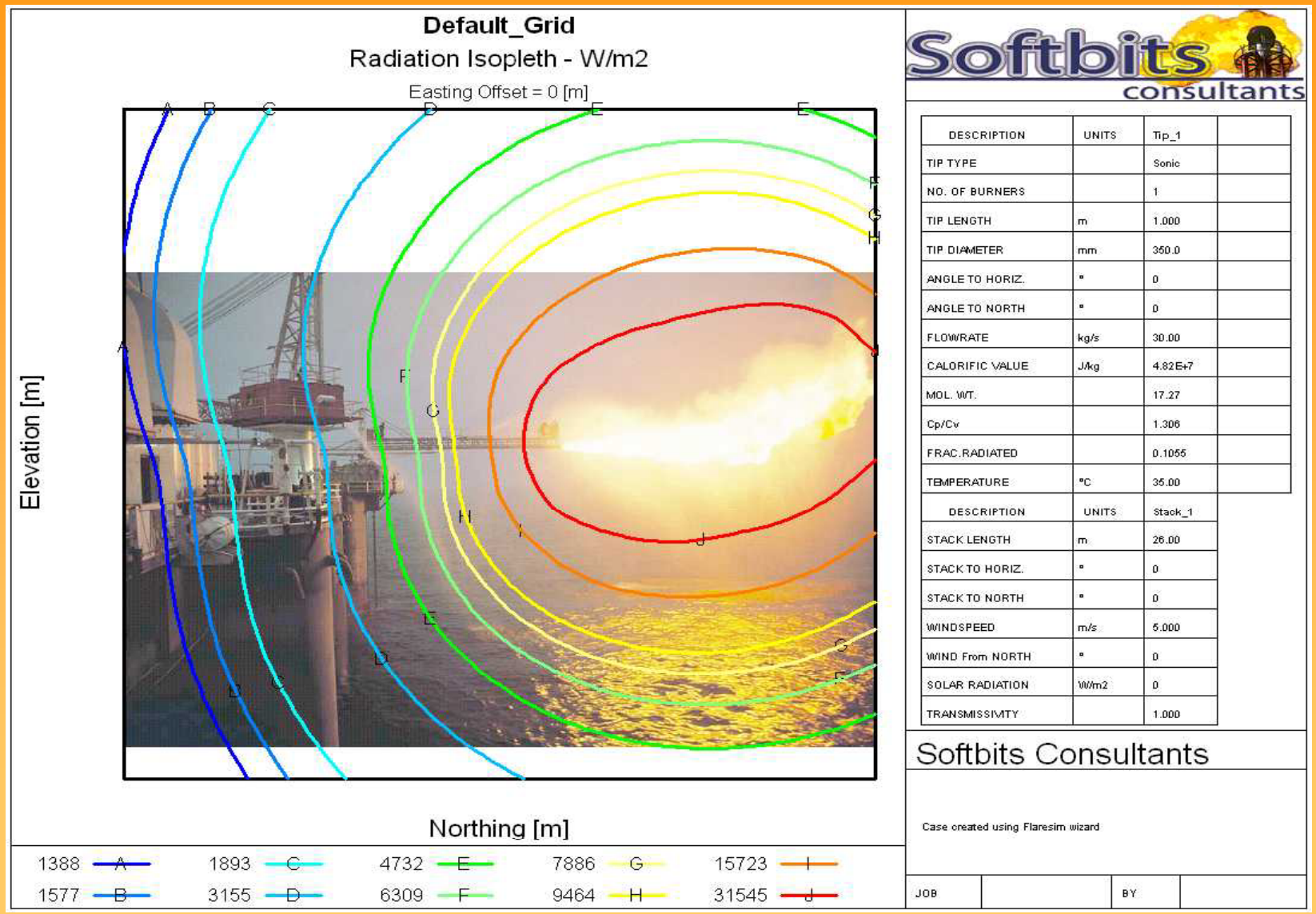
A graphical report can be customised



Receptor Grid Results



Receptor Grid Results


Default_Grid
Radiation Isopleth - W/m2
Easting Offset = 0 [m]
Elevation [m]
Northing [m]
1388 A
1577 B
1893 C
3155 D
4732 E
6309 F
7886 G
9464 H
15723 I
31545 J
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DESCRIPTION | UNITS | Tip_1
TIP TYPE | | Sonic
NO. OF BURNERS | | 1
TIP LENGTH | m | 1.000
TIP DIAMETER | mm | 350.0
ANGLE TO HORIZ. | ° | 0
ANGLE TO NORTH | ° | 0
FLOWRATE | kg/s | 30.00
CALORIFIC VALUE | J/kg | 4.82E+7
MOL. WT. | | 17.27
Cp/Cv | | 1.306
FRAC.RADIATED | | 0.1055
TEMPERATURE | °C | 35.00
DESCRIPTION | UNITS | Stack_1
STACK LENGTH | m | 26.00
STACK TO HORIZ. | ° | 0
STACK TO NORTH | ° | 0
WINDSPEED | m/s | 5.000
WIND From NORTH | ° | 0
SOLAR RADIATION | W/m2 | 0
TRANSMISSIVITY | | 1.000
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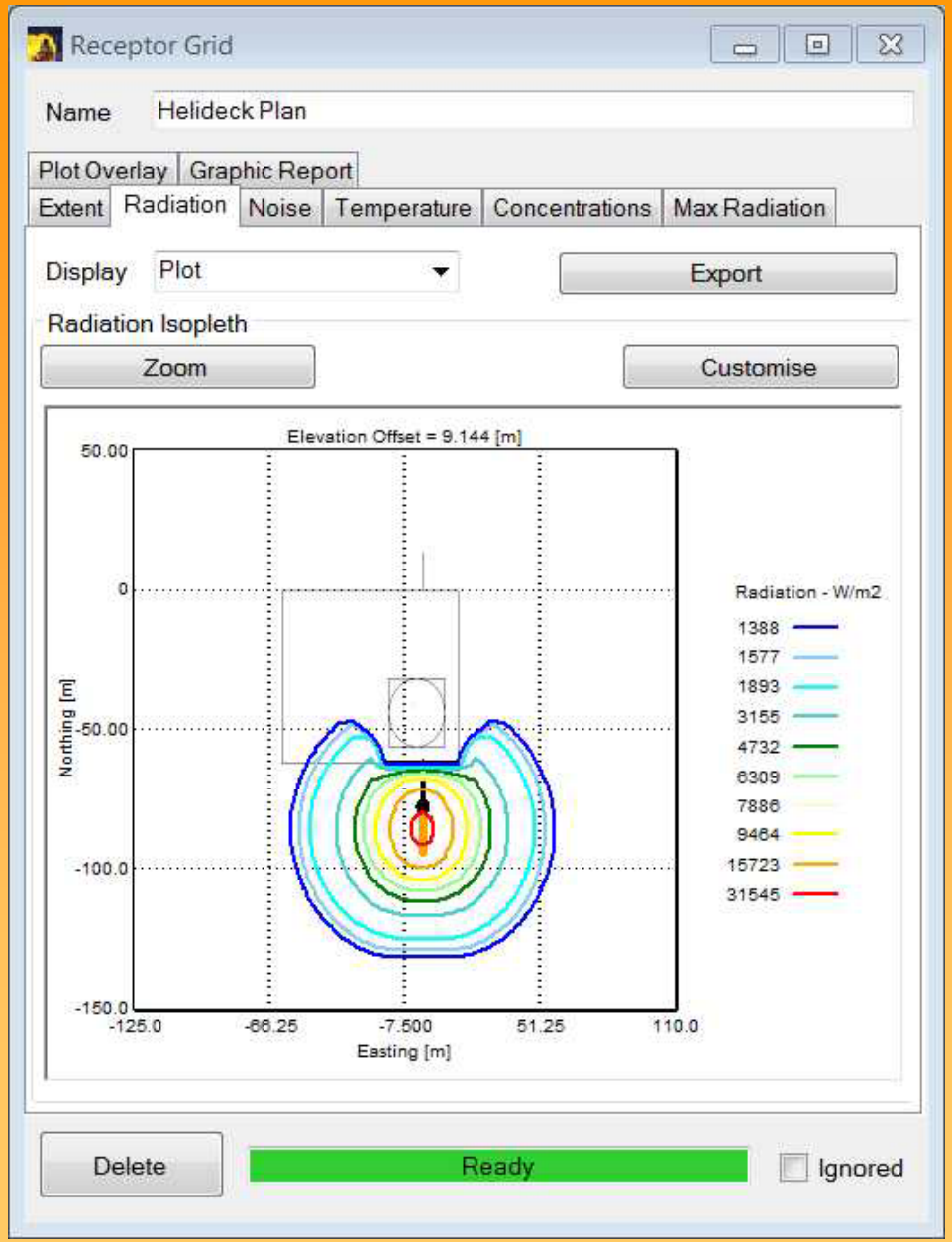
Case created using Flaresim wizard
JOB
BY

Shields

Reduce the radiation at the receptor points

Types according to transmissivity:

- Solid
- Water screen
- User defined



Shield Effects

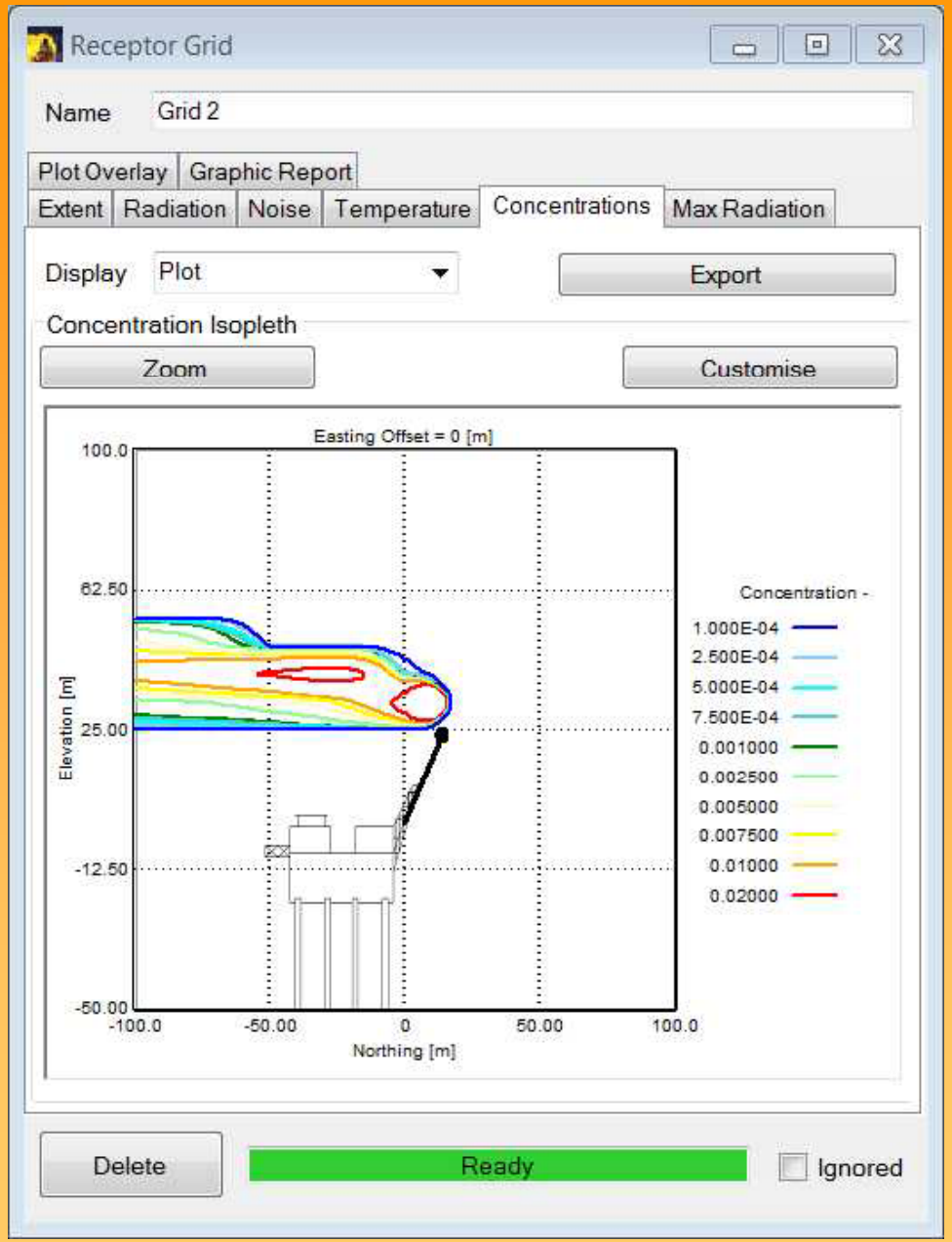
Gas Dispersion Calculation

Jet Dispersion Model

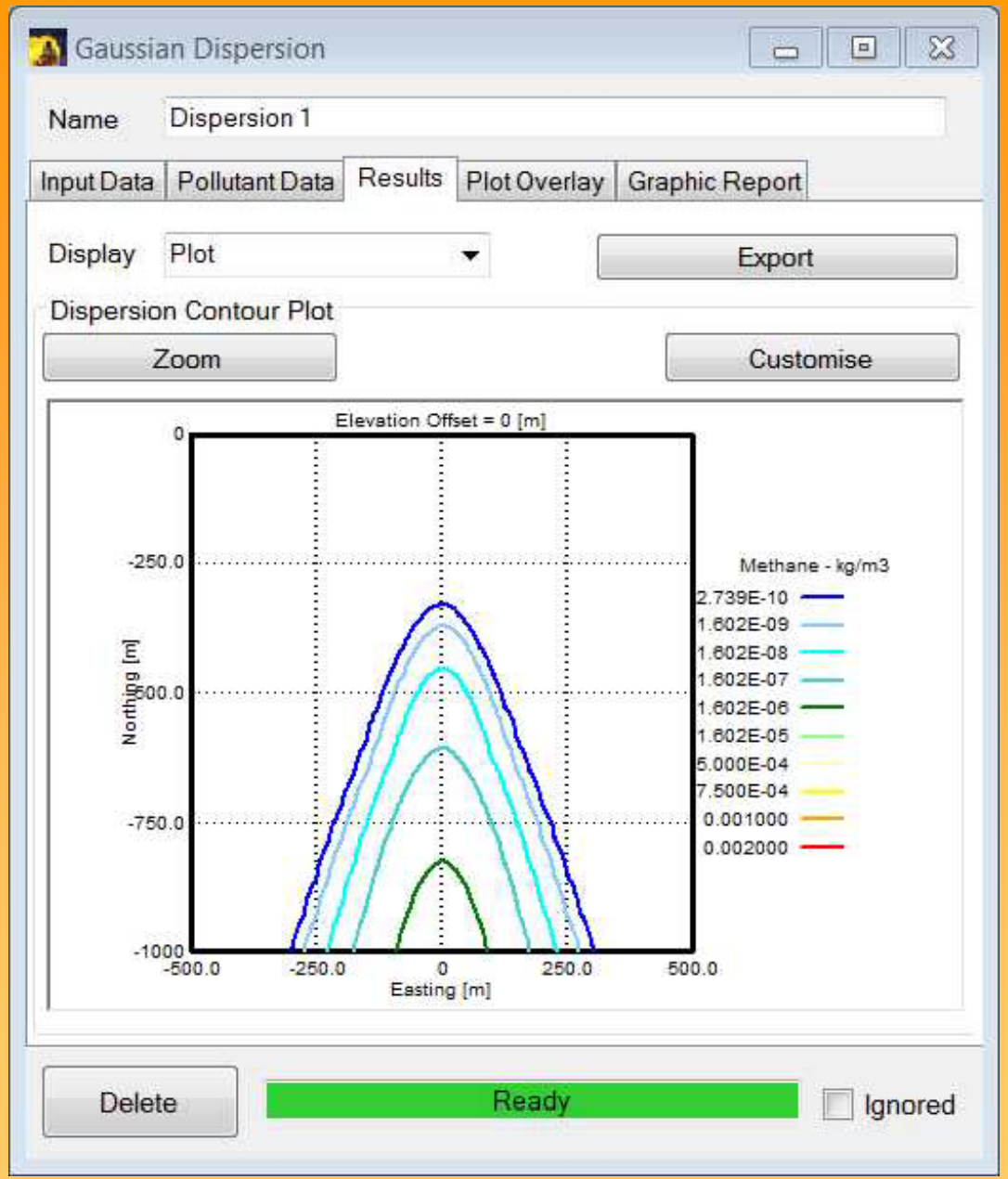
- Flame out conditions
- Prediction close to the flame
- Concentration of flammable gas

Gaussian Gas Dispersion Model

- Flared gas or combustion products
- Prediction at greater distance from flare
- Concentration of uncombusted gas or pollutants



Jet Dispersion Results



Gaussian Dispersion Results

References

Over 100 companies worldwide are using Flaresim. These are just a few of them...

Engineering Companies

Aker
Bechtel
Brown & Root
Chiyoda
Foster Wheeler
Fluor Daniel
Kvaerner John Brown
M.W. Kellogg
Snamprogetti
Technip
Worley

Oil and Gas Companies

Abu Dhabi Gas Liquefaction
BP Amoco
British Gas
QGPC
Occidental
Mobil
Total

Flare System Vendors

Airoil Flaregas
Argo Flare Services
GBA
Halliburton
Hamworthy
Mactronic
National Airoil
Optima Solutions
Samia srl

FLARESIM

The reference in flare radiation analysis