

Performance-based fire & gas detector design as defined in ISA TR84.00.07

[Kenexis® Fire & Gas Mapping](#) (formerly Effigy®) is the fire and gas system (FGS) detector-mapping software module in the Kenexis Integrated Safety Suite, designed for performance-based fire and gas detector design as defined in ISA TR84.00.07. It answers the three questions every fire and gas engineer has to defend — where the detectors go, why those locations, and how many are actually needed — by verifying an array of fire and/or gas detectors against the scenarios (consequences) and the geography of the area to validate that the chosen locations and characteristics deliver the coverage required.

Fire and Gas Systems (FGS) are important tools for safeguarding process plants and production facilities that handle flammable and toxic materials. All such facilities carry inherent risk, which in some cases requires the installation of an FGS to mitigate hazards. Kenexis performs the design engineering of Fire and Gas Mapping (FGM) to determine where detectors should sit to sense the consequences and how the FGS should function. Continuing engineering and research have shown that the accuracy and repeatability of coverage analysis depend on quality tools like Kenexis® Fire & Gas Mapping (formerly Effigy®).

Kenexis® Fire & Gas Mapping was developed internally by engineers who perform FGM, risk assessments, and design-basis engineering. That combination of engineering and software development produces a rigorous analysis tool — and the result is a safer plant at lower cost through optimized detector placement.

Features

- Geographic and scenario coverage — ***the only major FGM tool that does both***
- Fire, flammable gas, toxic gas, gas cloud imaging and ultrasonic detection
- Patented plume modeling (U.S. Pat. No. 10,600,057)
- Finite-element radiant heat transfer analysis — ***not ray tracing alone***
- ISA-TR84.00.07 compliant
- 3D CAD import & 3D analysis
- Secure, reliable project-team information sharing

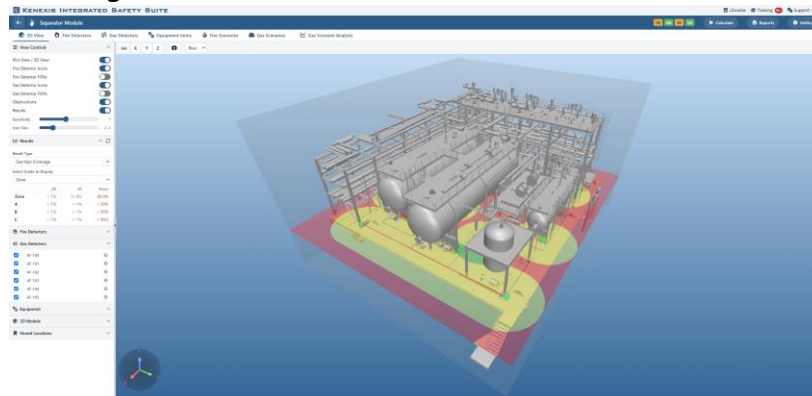
Geographic & Scenario Analysis

Analyzes detector location and characteristics using both geographic coverage and scenario coverage — and Kenexis® Fire & Gas Mapping is the only major FGM tool that performs both. Geographic coverage measures the fraction of an area or volume where a release would be detectable; scenario coverage measures the fraction of the credible loss-of-containment hazards that the array actually detects — the question an auditor is most likely to ask. The

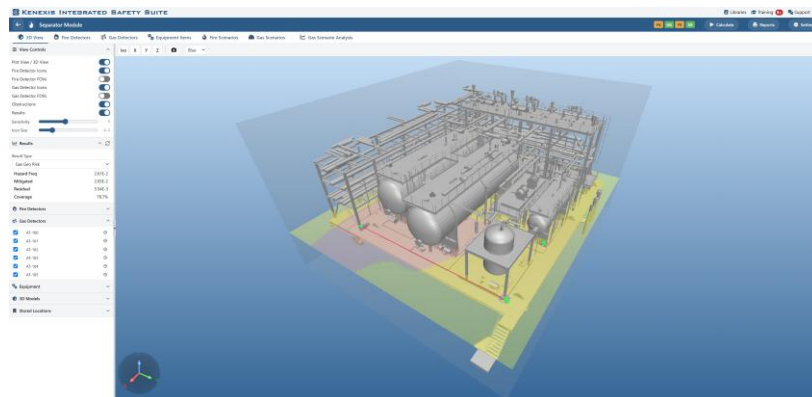


analysis considers the obstructions, consequences, detector equipment, and settings used in the facility under study, producing a geographic risk profile that combines the thousands of consequences possible in a zone, calculates detector coverage by zone, and maps the scenarios detected and not detected.

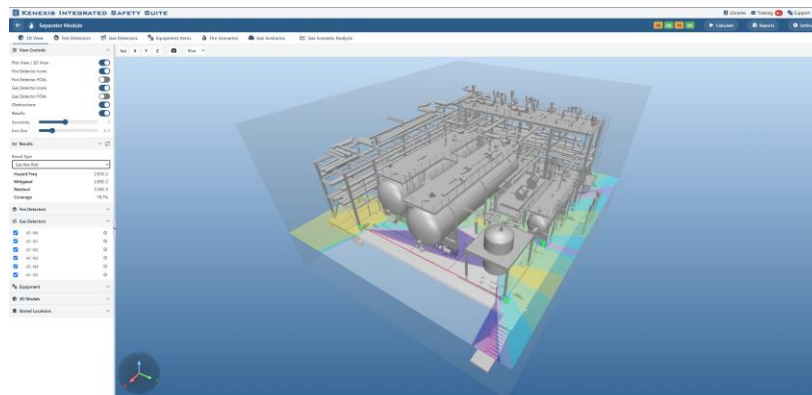
Gas Geographic Coverage



Gas Geographic Risk



Gas Residual Risk



Fire, Flammable Gas, Toxic Gas, Gas Cloud Imaging & Ultrasonic

Kenexis® Fire & Gas Mapping supports generic detectors so a design can progress through engineering before specific detectors are chosen, and it models any brand of fire, flammable gas, toxic gas, gas-cloud-imaging, and ultrasonic detector, separately assessing all documented sensitivity settings. The software ships with a database of the most common detection equipment and its performance metrics. Fire detection accurately models cone-of-vision projections as detectors move away from the elevation of interest and rotate away from parallel, using FM3260-certified data.

Gas Detector

Edit Gas Detector

Name

AT-100

Detector Type

Generic Catalytic Bead Comb. Gas Detector

Location

Location

X (m)

Y (m)

Z (m)

26

22

6

Detection Parameters

Detectable Concentration

5000

ppm

Critical Cloud Diameter

8

m

Gas Detector Type

Edit Gas Detector

Name

AT-100

Detector Type

Generic Catalytic Bead Comb. Gas Detector

Net Safety - ST340 (Oxygen)

Net Safety - ST360 (CO)

Rebellion Photonics - Mini-GCI

Rebellion Photonics - Standard GCI - Long Range

Rebellion Photonics - Standard GCI - Wide Field

Rosemount - 628 Electrochemical Gas Sensor

Rosemount - 928 Wireless Gas Monitor

Rosemount - 935 Open Path Combustible Gas Detector

Rosemount - 936 Open Path Toxic Gas Detector

Senscient ELDS Series 2000

Simtronics GD1

Simtronics/Teledyne DG7

Spectrex SafEye 200 Series

Spectrex SafEye Quasar 900

Spectrex SafEye Quasar 950

Spectrex SafEye Quasar 960

Spectrex SafEye300 Series

Spectrex SafEye700 Series

United Electric Vanguard (HC)

United Electric Vanguard (Toxic)



Fire Detector

Edit Fire Detector

✕

Name

FD-01

Detector Type

Manufacturer

Generic

Model

MSIR

Hazard

Hydrocarbon

Sensitivity

High

Location & Orientation

Loc X (m)

10.5

Loc Y (m)

14.2

Loc Z (m)

9

Declination (°)

-30

Rotation (°)

0

RHO (kW)

100

kW

Fire Detector Type

Edit Fire Detector

Name

FD-01

Detector Type

Manufacturer

Generic

-- Select --

Alutal

Chub

Det-Tronics

Drager

FGD

General Monitors

Generic

Honeywell

Micropack

MSA

MSA / General Monitors

Net Safety

Rebellion Photonics

Rosemount

Sierra Monitors

Simtronics

Spectrex

Talentum

Tyco

Real Engineering, Not Ray Tracing

Real engineering, not CAD graphics. Most fire and gas mapping tools calculate coverage with ray tracing alone: a fixed geometric cone of vision around each detector, with rays cast outward until they hit equipment or run out — with no calculation of the thermal radiation that actually reaches the detector. Kenexis® Fire & Gas Mapping instead performs a finite-element radiant heat transfer calculation with reverse ray traversal, computing the actual radiant flux at the detector from the fire's size, material, distance, and obstructions. The result is a physically meaningful detection envelope that adapts to the intensity of the fire — small fires produce small envelopes, large fires produce larger ones — rather than a one-size cone, so the coverage numbers hold up in front of a reviewer who understands fire-detection physics.

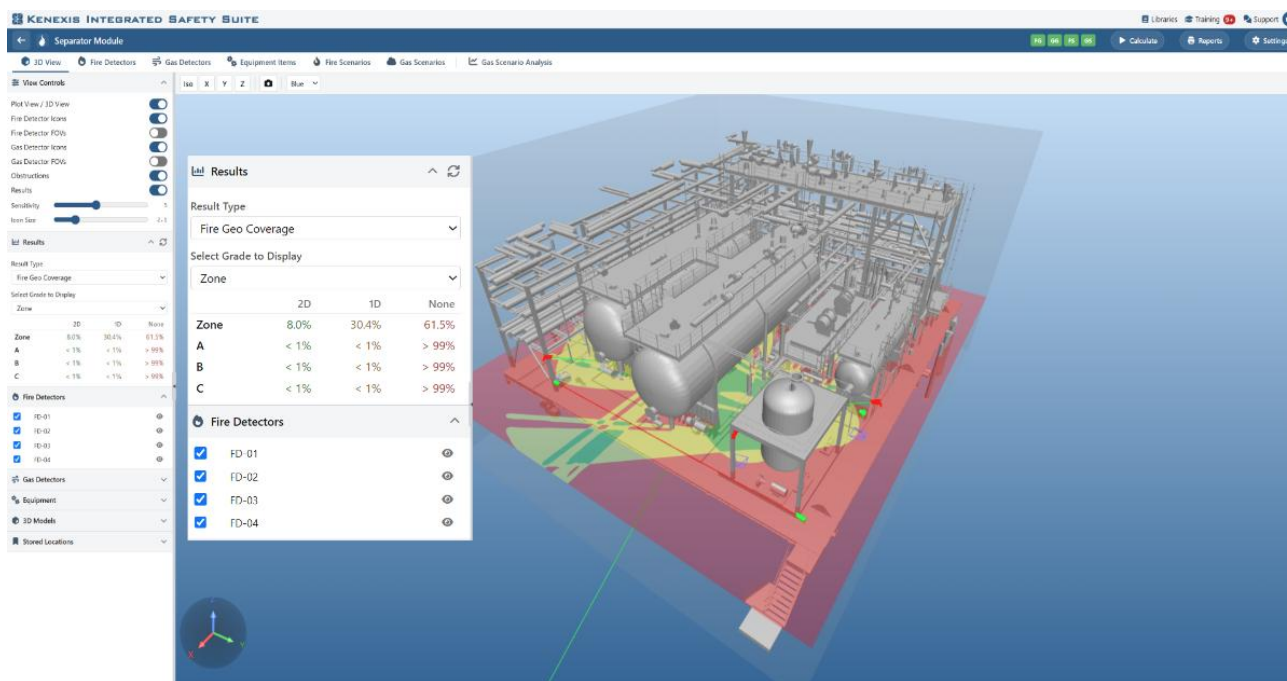
Our **patented plume model** accurately models different fire sizes and materials of interest for each detector as required (for example, methane, hexane, methanol). This substantially increases the accuracy of the detection-capability calculation. (U.S. Patent No. 10,600,057.)



Credentials

ISA-TR84.00.07, Guidance on the Evaluation of Fire, Combustible Gas, and Toxic Gas System Effectiveness, provides guidance on risk- and performance-based FGS design. After years of research, validation, and projects, Kenexis® Fire & Gas Mapping was built to perform sophisticated, accurate coverage calculations based on either geography or consequence modeling — standardizing the path to quantitative coverage targets within your fire and gas design process.

Kenexis holds **U.S. Patent No. 10,600,057** for the plume model at the core of this product, authored the ISA Performance-based Fire and Gas Systems Engineering Handbook, teaches the ISA EC56P performance-based fire and gas course, and is active on the ISA TR84.00.07 committee — the very standard the software implements. The fire-detection analysis uses FM3260-certified detector data, and Kenexis maintains a research collaboration with the Purdue Process Safety & Assurance Center (P2SAC).





3D CAD Import & 3D Analysis

Supports importing 3D STL files (compatible with most 3D CAD software), lets you build 3D models from basic shapes, and includes 3D analysis features such as the detector's cone of vision, obstructions, and the orientation of obstruction shadows. If you don't have a 3D CAD model, you can construct one in Kenexis Fire and Gas Mapping using geometric shapes based on your plot plan. The software analyzes obstruction geometries in all orientations, and results are displayed in color-coded graphical coverage maps and coverage tables

Optimized Coverage, Fewer Detectors

The payoff is an optimized array — the required coverage achieved with fewer detectors, each one justified. On a recent project Kenexis analyzed an existing 27-detector array and recommended removing 13: coverage in a grade-B area (80% target) moved only from 91% to 86%, while the operator eliminated the lifetime maintenance, proof-test, and calibration cost of 13 detectors that contributed only about 5% of coverage. Rigorous analysis lets you spend on the detectors that matter and stop spending on the ones that don't.

Functional Safety Assessment

New to fire and gas mapping projects? For a reasonable fee, our engineers will perform a Functional Safety Assessment (FGM-FSA) to confirm your project's scope of work complies with the ISA TR84.00.07 technical report. [Contact us for more information.](#)

