



# TECHNICAL SAFETY ENGINEERING SERVICES



## **Trusted Experts in Process Safety**

Kenexis is a globally recognized engineering consultancy specializing in safety instrumented system design basis, fire and gas mapping, process hazards analysis, and focused quantitative risk analysis. With cutting-edge software solutions and expert consulting services, we empower companies to achieve operational excellence while ensuring compliance with safety regulations.

## **Our Core Services**

Ensuring safety in the process industries is critical to preventing catastrophic incidents that could result in severe injuries, loss of life, environmental damage, and significant financial consequences. Technical safety services are essential for identifying and mitigating potential hazards before they lead to accidents. Through thorough risk assessments and engineered safeguards, organizations can proactively address vulnerabilities, enhance operational reliability, and comply with industry regulations.

Effective safety engineering involves designing and implementing well-structured safeguards such as safety instrumented systems, fire and gas detection solutions, and robust risk assessment methodologies. By leveraging industry best practices and regulatory standards, Kenexis provides solutions that not only mitigate risk but also optimize safety performance and operational efficiency.

## **Process Hazards Analysis (PHA)**

Process Hazards Analysis (PHA) is a systematic approach to identifying and evaluating potential risks associated with industrial processes. It is a fundamental component of process safety management, aimed at preventing accidents, minimizing operational risks, and ensuring regulatory compliance. PHA methodologies help organizations assess potential hazards, understand their consequences, and implement appropriate mitigation strategies to protect personnel, assets, and the environment. It also results in recommendations for the use of engineered safeguards such as safety instrumented systems, along with setting the design requirements of those safeguards.

Through various analytical techniques, PHA facilitates proactive decision-making by highlighting weaknesses in system design, operational procedures, and safety barriers. By conducting a thorough risk assessment, organizations can improve process reliability and enhance overall safety performance, reducing the likelihood of incidents that could lead to costly downtime, environmental damage, or harm to workers.

## Kenexis: Engineering Safer Processes

- HAZOP (Hazard and Operability Studies)
- LOPA (Layer of Protection Analysis)
- Hazard Identification (HAZID) / Preliminary Hazards Assessment
- Bowtie Analysis
- Quantitative Risk Assessments (QRA)

## **Safety Instrumented System Lifecycle Services**

The Safety Instrumented System (SIS) lifecycle is a structured approach to the design, implementation, operation, and maintenance of safety-critical systems used in the process industries. It is governed by international standards such as IEC 61511 and IEC 61508, which provide a framework for ensuring that SIS functions meet rigorous performance and reliability requirements. The lifecycle approach ensures that SIS components are properly designed, tested, and maintained to prevent hazardous events from escalating into catastrophic failures.

A well-executed SIS lifecycle reduces the likelihood of process incidents by providing independent layers of protection that automatically intervene when unsafe conditions arise. This includes safety instrumented functions (SIFs) that detect process deviations and initiate corrective actions to bring the system back to a safe state. By following the lifecycle methodology, organizations can systematically assess risks, define safety integrity levels (SILs), and establish performance metrics that ensure long-term reliability.

Adhering to the SIS lifecycle is essential for achieving compliance with regulatory standards and industry best practices. It enhances operational safety, minimizes downtime, and protects personnel, assets, and the environment. Properly designed and maintained SIS solutions not only mitigate risk but also optimize efficiency by ensuring that protective systems function as intended throughout their operational life.

- Safety Instrumented Function (SIF) Definition and Development
- Safety Integrity Level (SIL) Target Selection
- Conceptual Design Development / SIL Verification Calculations
- Safety Requirements Specification Development
- SIS Test Plan Development
- SIL Verification & Validation - Site Acceptance Testing
- Functional Safety Assessments

## Fire & Gas Mapping

Fire and gas mapping is a critical component of industrial safety, ensuring that detection systems are optimally placed to identify and mitigate hazardous events. By systematically analyzing facility layouts, potential gas release points, and fire hazards, fire and gas mapping helps industries design robust detection coverage that minimizes the risk of undetected fires or gas leaks. Properly executed fire and gas mapping studies enhance situational awareness, providing operators with early warning systems that enable rapid response to hazardous conditions.

The results of fire and gas mapping studies include optimized placement of detectors, identification of coverage gaps, and validation of existing safety measures. By using advanced computational tools and industry best practices, these studies help ensure compliance with relevant safety practices such as ISA 84.00.07. They also improve system reliability by reducing false alarms and ensuring that detection technology is deployed effectively in high-risk areas.

The benefits of fire and gas mapping extend beyond regulatory compliance. Implementing a well-designed fire and gas detection system reduces the potential for catastrophic incidents, protecting personnel, assets, and the environment. Organizations that invest in fire and gas mapping not only enhance safety but also improve operational efficiency by minimizing downtime and preventing costly damage caused by undetected hazards.

- Identification of Equipment and Hazards Requiring Detection
- Risk Analysis (Grading) for Coverage Performance Targets
- Gas Dispersion Modeling
- Computational Fluid Dynamics
- Fire and Gas Detection Coverage Assessment
- Detection Technology Assessment
- Fire and Gas Detector Layout Development
- Fire and Gas System Requirements Specifications

## Focused Quantitative Risk Analysis

Focused Quantitative Risk Analysis (QRA) extends simpler process hazards analysis methods by providing a more detailed and precise evaluation of potential risks. While techniques like HAZOP and LOPA identify hazards and assign protective layers, QRA

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applies advanced probabilistic and consequence modeling to quantify risk more accurately. This approach enables decision-makers to determine the likelihood and severity of hazardous scenarios, ensuring that safeguards are appropriately designed and optimized, with less resulting over-design than more simple risk analysis methods.

By employing methods such as fault tree analysis (FTA) and event tree analysis (ETA), QRA systematically examines the chain of events that can lead to hazardous outcomes. These techniques allow for a granular breakdown of failure probabilities and provide a structured means of evaluating multiple potential consequences. Additionally, dispersion modeling is used to predict the behavior of gas releases, while fire and explosion modeling assesses the impact of ignitable events, helping organizations understand worst-case scenarios and design effective mitigation strategies.

The benefits of focused QRA go beyond regulatory compliance—it enhances risk-based decision-making by enabling more precise assessments of safety measures.

Organizations that leverage QRA can optimize risk reduction investments, justify design modifications, and ensure that protective systems align with risk tolerance criteria. By applying these advanced techniques, companies can proactively manage safety risks and create a more resilient operational environment.

- Fault Tree Analysis
- Event Tree Analysis
- Human Reliability Assessment
- Gas Dispersion Modeling
- Explosion Modeling
- Fire Modeling
- Quantitative Risk Reduction Strategies

## Why Choose Kenexis?

- **Unmatched Expertise** – Our engineers have decades of experience in process safety.
- **Comprehensive Solutions** – We offer both consulting and software solutions, providing seamless integration into your safety programs.

## Kenexis: Engineering Safer Processes

- **Global Reach** – Supporting clients across oil & gas, petrochemical, chemical, power, and manufacturing industries worldwide.
- **Regulatory Compliance** – Ensuring alignment with OSHA PSM, IEC 61511, NFPA, and ISA 84.

## Get in Touch

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**Your Partner in Process Safety Excellence**