MERCURY

Risk Assessment in Industrial and Refinery Environments

21 – 25 December 2026
Amsterdam (Netherlands)



Dubai - UAE: +971 4 450 5697
Istanbul - Türkiye: +90 539 599 1206
Amman - Jordan: +962 79 712 3347

Risk Assessment in Industrial and Refinery Environments

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Introduction

The Risk Assessment in Industrial and Refinery Environments course provides an understanding of how risks are systematically identified, analyzed, and controlled in complex industrial and oil-refinery operations. It addresses the increasing operational, technical, and environmental challenges faced by high-risk industries operating under strict regulatory and safety requirements. The course explains internationally recognized risk assessment methodologies and their practical relevance to real industrial settings. It emphasizes proactive hazard identification and prevention of accident scenarios before they escalate into major incidents. The program also demonstrates how risk assessment supports effective HSE management and sound operational decision-making. Participants will apply structured risk-based thinking within their organizations.

Targeted Groups

This Risk Assessment in Industrial and Refinery Environments training targets professionals seeking specialized knowledge and skills:

- HSE engineers and safety officers in industrial facilities.
- Refinery operations and process engineers.
- Maintenance, inspection, and reliability professionals.
- Technical supervisors and shift leaders.
- Project and commissioning engineers.
- Quality, risk, and compliance specialists.
- Managers are responsible for operational safety decisions.
- Professionals involved in audits and regulatory compliance.

Course Objectives

Participants will achieve the following objectives by completing the Risk Assessment in Industrial and Refinery Environments course:

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- Understand the principles of international risk assessment used in industrial safety management.
- Identify hazards across operational, technical, and human factor domains.
- Apply structured methodologies to assess and prioritize risks.
- Evaluate likelihood and consequences effectively using risk matrices.
- Apply ALARP principles in industrial risk decision-making.
- Select appropriate control measures using the hierarchy of controls.
- Integrate risk assessment into HSE and operational planning.
- Prepare professional risk assessment documentation and registers.
- Align risk processes with ISO 45001 and ISO 14001 frameworks.
- Support the Management of Change activities with risk-based analysis.
- Analyze incidents to extract lessons learned for improvement.
- Strengthen proactive risk awareness and safety culture practices.

Targeted Competencies

Participants will gain the following competencies during the program:

- Systematic hazard identification in refinery and industrial operations.
- Risk evaluation using qualitative and semi-quantitative techniques.
- Practical application of HAZOP, JSA, and What-if analysis.
- Effective use of Bow-Tie and LOPA methodologies.
- Prioritization of risks based on severity and likelihood.
- Selection of engineering and administrative risk controls.
- Preparation of compliant risk assessment documentation.
- Integration of risk assessment into operational decision-making.
- Application of risk-based thinking in daily work activities.

Studying Scenarios

In this training, participants will develop their skills through the analysis of the following scenarios:

- Process deviations in crude distillation units.
- Maintenance activities in confined and hazardous areas.
- Startup and shutdown operations in refineries.
- Equipment failures and loss-of-containment events.
- Human error during routine operational tasks.
- Management of technical changes in operating plants.
- Incident investigation and root cause identification.

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Course Content

Unit 1: Fundamentals of Risk Assessment in Industrial and Refinery Environments

- Definition of risk, hazard, and exposure in industrial safety contexts.
- Characteristics of high-risk industrial and refinery operations.
- Overview of international risk assessment standards and guidelines.
- Relationship between risk assessment and HSE management systems.
- Legal and regulatory drivers influencing industrial risk practices.
- Role of leadership and accountability in risk management.
- Importance of proactive risk identification in accident prevention.

Unit 2: Hazard Identification Techniques for Industrial Operations

- Principles of systematic hazard identification in complex facilities.
- Application of HAZID for early-stage risk identification.
- Job Safety Analysis for routine and non-routine tasks.
- What-if analysis for operational and process deviations.
- Identification of human factors and organizational risks.
- Process safety hazards in oil and gas refining operations.
- Documentation and validation of identified hazards.

Unit 3: Risk Analysis and Evaluation Methodologies

- Risk matrices and qualitative risk ranking techniques.
- Likelihood and severity estimation in industrial environments.
- Application of the ALARP principle in risk acceptance.
- Introduction to HAZOP studies for process safety analysis.
- Use of Failure Modes and Effects Analysis in equipment reliability.
- Bow-Tie methodology for visualizing risk pathways and controls.
- Layer of Protection Analysis for high-consequence scenarios.
- Prioritization of risks for effective resource allocation.

Unit 4: Risk Control, Documentation, and Compliance

- Hierarchy of controls in industrial risk management.
- Engineering controls for process and equipment hazards.
- Administrative controls and safe work procedures.
- Personal protective equipment selection and limitations.
- Development of risk registers and assessment reports.
- Integration of risk assessment into ISO 45001 requirements.
- Environmental risk considerations aligned with ISO 14001.
- Audit readiness and continuous monitoring of risk controls.

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Unit 5: Risk Integration, Change Management, and Continuous Improvement

- Role of risk assessment in the Management of Change processes.
- Assessing risks during design modifications and upgrades.
- Operational changes and temporary risk evaluation.
- Incident investigation and root cause analysis techniques.
- Learning from near-misses and historical incidents.
- Continuous improvement of risk assessment systems.
- Building a proactive risk-based safety culture.
- Strengthening decision-making through risk-based thinking.

Final Insights & Key Takeaways

This course equips participants with the knowledge and structure required to apply internationally recognized risk assessment methodologies in industrial and refinery environments. The training reinforces proactive risk thinking, enabling safer operations, informed decisions, and sustainable safety performance across high-risk facilities.