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COURSE BROCHURE

# Advanced Process Hazard Analysis and LOPA Training Course

17 – 28 May 2027
Milan

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Registered in the United Kingdom and Saudi Arabia

# Advanced Process Hazard Analysis and LOPA Training Course

**Ref:** 308_10339 **Date:** 17 – 28 May 2027 **Location:** Milan **Fees:** 11100 GBP

Process Hazard Analysis and LOPA at advanced level is a 2-week training course for process safety engineers, HSE managers and plant operations leads in oil, gas and chemical facilities who lead hazard studies and judge whether safeguards are enough, and it ends with a Unit Process Hazard and LOPA Dossier. Ageing assets, leaner crews and frequent modifications raise the chance that a deviation escalates into a fire, explosion or toxic release. Jupiter Prime Training runs this course on process hazard analysis and LOPA for technical leaders.

## Why Process Hazard Analysis and LOPA Matters Now

Three pressures are reshaping process safety studies. Many plants are running beyond original design life, so corrosion, obsolete instruments and undocumented changes erode safeguards. Experienced engineers are retiring, leaving younger teams to lead hazard reviews. Insurers, investors and neighbouring communities expect evidence that major accident risk is understood and reduced as far as reasonably practicable. Facilities that run rigorous studies and test their protection layers avoid catastrophic loss and unplanned shutdowns; those that treat studies as paperwork leave credible scenarios unprotected. The course follows Hazard and Operability Studies HAZOP as described in IEC 61882 and Layer of Protection Analysis LOPA practice.

## Who Gains Most from Process Hazard Analysis and LOPA

- Process safety leads who chair hazard studies and own study action closure
- HSE managers who set risk tolerability criteria and report major accident exposure
- Operations and production leads who apply findings to procedures and alarm response
- Instrument and control leads who specify and test safety instrumented functions
- Technical integrity leads who maintain relief systems, interlocks and critical equipment

A site that sends its process safety, operations and instrument leads together gains most, because scenarios, safeguards and test regimes are then agreed by the people who own them.

## Process Hazard Analysis and LOPA Capabilities

Participants move from listing hazards to quantifying how independent protection layers reduce each scenario and deciding where more protection is justified.

- Apply HAZOP guidewords and nodes to identify credible deviations — study teams and process owners
- Select the hazard identification method that fits each design stage — project and engineering managers
- Calculate scenario frequency with initiating events and protection layer credits — safety integrity decisions
- Assess whether a safeguard qualifies as an independent protection layer — instrument and integrity leads
- Weigh risk reduction options against tolerability and ALARP arguments — site leadership and HSE committee
- Design management of change reviews that keep studies current — operations and maintenance planners

## Key Process Hazard Analysis and LOPA Terms

- HAZOP — a structured team study that applies guidewords to process parameters to find deviations from design intent and their consequences.
- LOPA — a semi-quantitative method that estimates scenario frequency by crediting independent safeguards against an initiating event.
- Independent protection layer — a safeguard that can prevent a scenario on its own, regardless of the initiating event or other layers.
- Initiating event frequency — the expected rate at which a failure or error starts a hazardous scenario.
- ALARP — reducing risk as low as reasonably practicable, where further reduction would be grossly disproportionate to its benefit.
- Safety instrumented function — an automated loop of sensor, logic and final element that brings a process to a safe state.

## Process Hazard Analysis and LOPA Day by Day

## Day 1: Major Accident Hazards in Process Plants

- Major Accident Case Studies — Refinery Fires And Chemical Releases Compared
- Hazard Types — Flammable, Toxic, Reactive And Pressure Energy
- Process Safety Information Packs — P&IDs, Data Sheets And Operating Limits
- Risk Tolerability Criteria — Individual And Societal Risk Targets
- Study Lifecycle Planning — Matching Methods To Design And Operation Stages

## Day 2: Hazard Identification Methods

- HAZID Workshops — Early Screening Of Site And Concept Hazards
- What-If And Checklist Reviews — Fast Studies For Simple Systems
- FMEA For Rotating Equipment — Component-Level Failure Effects
- Method Selection Matrix — Choosing Depth Versus Effort
- Gas Processing And Petrochemical Examples — Comparing Hazard Profiles

## Day 3: HAZOP Study Technique

- IEC 61882 Study Structure — Nodes, Design Intent And Guidewords
- Deviation Brainstorming — Flow, Pressure, Temperature, Level And Composition
- Cause And Consequence Recording — Avoiding Vague Worksheet Entries
- Safeguard Identification — Separating Prevention From Mitigation
- Recommendation Writing — Clear, Owned And Verifiable Actions

## Day 4: Leading HAZOP Teams

- Chairperson Skills — Pacing, Challenge And Avoiding Groupthink
- Scribe Discipline — Worksheet Software And Traceability
- Procedural HAZOP — Start-Up, Shutdown And Batch Operations
- Revalidation Studies — Updating Ageing Facility Records
- Study Quality Review — Checking Completeness Before Sign-Off

## Day 5: Risk Ranking and Consequence Estimation

- Risk Matrix Calibration — Severity And Likelihood Bands
- Consequence Modelling Basics — Jet Fire, Pool Fire And Dispersion
- Scenario Selection For LOPA — Screening HAZOP Outputs
- Target Mitigated Event Likelihood — Setting Frequency Goals
- Matrix Pitfalls — Inconsistent Ratings Across Study Teams

## Day 6: Layer of Protection Analysis

- LOPA Worksheet Construction — Initiating Event To Mitigated Frequency
- Initiating Event Frequencies — Equipment Failure And Human Error Data
- Conditional Modifiers — Occupancy, Ignition And Probability Of Exposure
- Risk Gap Calculation — Comparing Mitigated And Target Frequency
- LOPA Consistency Rules — Avoiding Double Credit And Optimism

## Day 7: Independent Protection Layers

- IPL Qualification Criteria — Independence, Effectiveness And Auditability
- Basic Process Control And Alarms — When They Earn Credit
- Relief Devices And Mechanical Safeguards — Sizing And Inspection Evidence
- Safety Instrumented Functions — Allocating Required Integrity Levels
- Bow-Tie Presentation — Showing Barriers To Operators And Managers

## Day 8: ALARP and Risk Reduction Decisions

- ALARP Demonstration — Options, Costs And Gross Disproportion
- Inherent Safety Principles — Minimise, Substitute, Moderate And Simplify
- Cost-Benefit For Safeguards — Comparing Risk Reduction Options
- Residual Risk Acceptance — Who Signs And On What Evidence
- Facility Siting And Occupied Buildings — Protecting People From Escalation

## Day 9: Safeguard Integrity and Change Control

- Safety Critical Element Registers — Linking Safeguards To Scenarios
- Proof Testing And Bypass Control — Keeping Protection Layers Available
- Management Of Change Reviews — Screening Modifications For Hazards
- Process Risk Register — Tracking Scenarios, Gaps And Actions
- Leading And Lagging Process Safety Indicators — Monitoring Barrier Health

## Day 10: Practising the Unit Process Hazard and LOPA Dossier

- Applying HAZOP — Studying A Case Distillation Unit Node
- Applying LOPA — Calculating Risk Gaps For Selected Scenarios
- Applying IPL Criteria — Challenging Claimed Safeguards
- Peer Review Panel — Defending ALARP Conclusions Before Colleagues
- Unit Process Hazard And LOPA Dossier — Scenarios, Layers, Gaps And Actions

## Applying Process Hazard Analysis and LOPA After the Course

- Review the last HAZOP of a high-consequence unit against IPL criteria and list safeguards that were credited without test evidence.
- Run a LOPA session on the three highest-ranked scenarios and present any risk gaps with proposed safeguards to the site HSE committee.

## Process Hazard Analysis and LOPA Questions FAQ

### What is process hazard analysis and LOPA and why does it matter now?

Process hazard analysis and LOPA are methods for finding how a plant can deviate into a major accident and checking whether safeguards reduce the risk enough. They matter now because ageing assets and leaner teams make unprotected scenarios more likely.

### Which roles gain most from process hazard analysis and LOPA training?

Process safety engineers, HSE managers and plant operations leads gain most, together with instrument and integrity leads who maintain the protection layers that studies rely on.

### How does process hazard analysis and LOPA differ from enterprise risk quantification?

Process hazard analysis and LOPA focuses on physical scenarios in hazardous plants, such as fires and toxic releases, and the engineered layers that prevent them. Enterprise risk quantification models financial and strategic exposures across a whole organisation.

### What do you bring back from process hazard analysis and LOPA training?

You bring back a dossier for one process unit with scenarios, credited protection layers, calculated risk gaps and actions. You also return with worksheet templates for HAZOP, LOPA and management of change screening.

## Process Hazard Analysis and LOPA: The Way Forward

The Unit Process Hazard and LOPA Dossier first informs which risk gaps receive engineering investment or new safety instrumented functions. Process safety leads own it with operations and instrument teams, and the HSE committee tracks its actions. After its first use, revisit initiating event frequencies, as site incident history often differs from generic data.