CONCEPT

Inherently Safer Process Design: Plant Layout, Overpressure Basis and Materials

15 – 19 March 2027
London - Central London four-star

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Introduction:

Inherently safer process design is cheapest at concept and FEED, yet many projects freeze the flowsheet, plot plan and metallurgy before anyone asks whether a hazardous inventory could be smaller, a solvent replaced or a pressure lowered. Later studies then bolt on trips, relief and fireproofing to fix choices that could have been designed out. This Core Concept course equips process and design engineers to apply the minimise, substitute, moderate and simplify strategies to flowsheet, layout, overpressure basis, materials and isolation decisions, and to defend them at design stage gates. Participants produce an Inherently Safer Design Decision Register for one project unit.

Course Objectives:

- Apply the minimise, substitute, moderate and simplify strategies to reaction routes, inventories, operating conditions and flowsheet configuration
- Lead a concept-stage HAZID and turn its findings into design basis requirements before FEED is frozen
- Develop a plot plan that sets equipment spacing, occupied building siting and escalation barriers from credible release, fire and explosion cases
- Define the relief and blowdown design basis, including overpressure scenarios, design pressure margins and depressuring philosophy, for each equipment system
- Select construction materials, isolation arrangements and maintenance access that suit hazardous service across the plant life
- Prepare design decisions and their evidence for review at concept, FEED and detailed design stage gates

Target Audience:

- Process and chemical engineers who set flowsheets, heat and material balances and operating envelopes on new projects
- Plant layout and piping engineers who develop plot plans, equipment arrangements and 3D model reviews
- Mechanical and static equipment engineers who fix design pressure, temperature and vessel specifications
- Materials and corrosion engineers who select metallurgy for toxic, flammable, sour or corrosive service
- Technical safety and loss prevention engineers who advise project teams during concept and FEED
- Project and design coordinators who prepare engineering packages for stage-gate approval

Course Outline:

Day 1: Inherent Safety Foundations and the Project Design Baseline

- Kletz Principle: What You Do Not Have Cannot Leak
- Inherent, Passive, Active and Procedural Safeguard Hierarchy
- Cost of Design Change Curve From Research to Detailed Engineering
- Loss of Containment Pathways Traced to Early Design Choices
- Project Design Baseline Review: Flowsheet, Inventories and Plot Plan

Day 2: Inherently Safer Design Strategies and Concept-Stage Hazard Identification

- Minimise and Intensify: Hold-Up Reduction, Smaller Batches and Continuous Reactors
- Substitute: Alternative Reagents, Solvents and Heat Transfer Media
- Moderate and Attenuate: Dilution, Refrigerated Storage and Lower Operating Pressure
- Simplify and Error Tolerance: Fewer Connections, Robust Equipment and Clear Line-Up
- Concept HAZID Worksheet and Design Basis Requirement Capture

Day 3: Plant Layout, Overpressure Basis and Relief Philosophy

- Plot Plan Hazard Zoning and Equipment Spacing Rationale
- Occupied Building Siting, Prevailing Wind and Escape Route Planning
- Domino Escalation Control: Separation, Blast Walls, Bunds and Drainage
- Overpressure Scenario Matrix and Design Pressure Margin Selection
- Relief, Blowdown and Depressuring Design Basis Memorandum

Day 4: Materials, Isolation, Maintainability and Design Pitfalls

- Material Selection for Sour, Cryogenic, Corrosive and High-Temperature Service
- Corrosion Allowance, Brittle Fracture Screening and Materials Selection Diagram
- Positive Isolation Design: Double Block and Bleed, Spectacle Blinds and Spool Access
- Maintainability and Access Review Using the 3D Model
- Design Pitfalls: Hidden Inventories, Dead Legs, Small-Bore Connections and Common-Cause Utilities

Day 5: Design Case Work and the Inherently Safer Design Decision Register

- Chemical Reactor Case: Inventory Reduction and Solvent Substitution Options
- Gas Processing Case: Plot Plan Spacing and Blowdown Philosophy Challenge
- Storage Terminal Case: Refrigerated Versus Pressurised Storage Trade-Off
- Stage-Gate Design Review Pack and Action Close-Out Log
- Inherently Safer Design Decision Register Presentation and Peer Challenge

Skills You Will Gain:

- Inherently Safer Design Option Analysis
- Concept Hazard Identification
- Plot Plan Development
- Overpressure Design Basis Definition
- Hazardous Service Material Selection
- Isolation and Maintainability Design
- Design Stage-Gate Review
- Engineering Trade-Off Justification

Why Attend This Course:

- Return with an Inherently Safer Design Decision Register for a unit on your own project
- Challenge a flowsheet or plot plan while changes still cost little, instead of adding protection layers later
- Explain to project managers why a smaller inventory, lower pressure or simpler line-up saves cost and risk over the plant life
- Compare design practice with engineers from chemicals, gas processing, refining and storage terminal projects

Conclusion:

Hazards removed at the drawing board never need a trip, a relief valve or an emergency plan. The course moves from inherent safety principles and the project baseline, through the minimise, substitute, moderate and simplify strategies and concept HAZID, to plot plans, spacing, overpressure basis and relief philosophy, then metallurgy, isolation, maintainability and common design pitfalls. The final day applies this to project cases and produces an Inherently Safer Design Decision Register ready for the next stage-gate review.