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COURSE BROCHURE

Flare and Relief System Design and Simulation Training Course

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Registered in the United Kingdom and Saudi Arabia

Flare and Relief System Design and Simulation Training Course

Flare and Relief System Design and Simulation is a 1-week training course for process safety engineers, process designers and operations engineers who size relief devices, check flare networks and test them with dynamic models, and it ends with a flare and relief system design review. Expansions and tie-ins often load existing flare headers beyond their design. Jupiter Prime Training runs this course for process and safety teams.

Why Flare and Relief System Design and Simulation Matters Now

Three pressures keep relief systems under scrutiny. Debottlenecking and new units add relief loads to headers sized decades ago. Insurers and process safety auditors ask for documented relief scenarios and up-to-date sizing files after every modification. Flaring reduction targets push operators to recover gas and cut routine flaring without weakening emergency capacity. Teams that design and simulate relief systems well avoid overpressure incidents and costly late rework. Teams relying on old calculations face chattering valves and unsafe radiation at grade.

Who Gains Most from Flare and Relief System Design and Simulation

- Process safety engineers responsible for relief scenario registers and overpressure protection reviews
- Process designers responsible for relief valve sizing and flare load summaries
- Operations engineers responsible for flare performance, purge gas and flaring records
- Mechanical and piping engineers responsible for header supports, acoustic fatigue and thermal stress
- Project engineers responsible for tie-ins that add new relief loads to existing networks

Process engineering departments that send a safety engineer, a designer and an operations engineer together gain most.

Flare and Relief System Design and Simulation Capabilities

The capabilities below connect each overpressure cause to a sized device, a checked header and a safe flare tip.

- Assess credible relief scenarios — overpressure protection reviews
- Calculate relief valve orifice size for vapour, liquid and two-phase flow — device specification
- Test flare header hydraulics for back pressure, velocity and Mach number limits — network adequacy
- Apply dynamic simulation to blowdown and staggered relief loads — peak load reduction
- Specify radiation and dispersion checks for flare stack height and sterile areas — layout and personnel safety
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Weigh flare gas recovery and purge reduction against emergency capacity — environmental targets

Key Flare and Relief System Design and Simulation Terms

- Relief scenario — A credible cause of overpressure, such as fire or blocked outlet, that sets the required relief rate.
- Pressure relief valve PRV — A spring or pilot-operated valve that opens at set pressure to discharge fluid and protect equipment.
- Built-up back pressure — Pressure at a relief valve outlet caused by flow through the discharge piping and header.
- Flare header — The collection pipework that carries relief and blowdown flows from many sources to the flare.
- Depressurisation blowdown — Controlled release of inventory to reduce vessel pressure.
- Thermal radiation limit — The maximum heat flux allowed at grade or platforms from a burning flare.

Flare and Relief System Design and Simulation Day by Day

Day 1: Overpressure Causes and Relief Scenarios

- Overpressure Cause Checklist — Blocked Outlet, Fire, Utility and Control Failure
- Relief Scenario Register — Governing Case Selection per Device
- Fire Case Heat Input — Wetted Area and Insulation Credit
- Tube Rupture and Two-Phase Scenarios — Exchanger and Separator Protection
- Global Power Failure Loads — Simultaneous Relief Assessment

Day 2: Relief Device Sizing and Selection

- Vapour, Liquid and Two-Phase Sizing Methods — Orifice Area Calculation
- Conventional, Balanced Bellows and Pilot Valves — Back Pressure Tolerance
- Rupture Discs and Combination Devices — Corrosive and Fouling Service
- Inlet Pressure Loss and Outlet Piping — Chatter and Stability Prevention
- Relief Device Datasheets and Records — Change Management Traceability

Day 3: Flare Header Hydraulics and Networks

- Flare Load Summary and Header Network Modelling — Back Pressure Profile
- Velocity, Mach Number and Momentum Checks — Noise and Vibration Limits
- Knockout Drum Sizing and Liquid Seals — Liquid Carryover Prevention
- Low-Temperature Flows and Material Selection — Brittle Fracture Risk
- Tie-In Assessment for New Units — Spare Capacity Verification

Day 4: Dynamic Simulation, Radiation and Dispersion

- Dynamic Blowdown Simulation — Minimum Metal Temperature and Peak Flow
- Staggered Depressurisation and Load Sharing — Header Capacity Relief
- Flare Tip Selection and Smokeless Operation — Steam and Air Assist
- Thermal Radiation Contours — Stack Height and Sterile Area Sizing
- Gas Dispersion for Flame-Out and Cold Venting — Toxic and Flammable Exposure

Day 5: Practising the Flare and Relief System Design Review

- Scenario Register Check — Applying Day 1 Methods to a Case Unit
- Device Sizing Verification — Applying Day 2 Calculations
- Header Back Pressure Run — Applying Day 3 Network Model
- Blowdown and Radiation Assessment — Applying Day 4 Simulation Results
- Flare and Relief System Design Review — Findings, Actions and Owners

Applying Flare and Relief System Design and Simulation After the Course

- Audit the relief scenario register of one unit against recent modifications and flag devices whose governing case may have changed.
- Re-run the flare header back pressure model with planned tie-ins and record spare capacity at each sub-header.

Flare and Relief System Design and Simulation Questions FAQ

What is flare and relief system design and simulation and why does it matter now?

Flare and relief system design and simulation covers identifying overpressure cases, sizing relief devices, checking flare networks and modelling transient loads. It matters now because expansions and tie-ins keep adding load to ageing headers while flaring and safety scrutiny grows.

Which roles gain most from flare and relief system design and simulation training?

Process safety engineers, process designers and operations engineers gain most, with piping and project engineers.

How does flare and relief system design and simulation differ from HAZOP facilitation training?

Flare and relief system design and simulation calculates relief rates, device sizes and network performance. HAZOP facilitation training teaches how to run structured hazard reviews.

What do you bring back from flare and relief system design and simulation training?

You bring back a design review for one unit with prioritised actions and owners.

Flare and Relief System Design and Simulation: The Way Forward

The flare and relief system design review first informs whether the next tie-in can connect to the existing header or needs new capacity. Process safety, design and operations engineers use it to prioritise corrections. After the first modification, revisit the scenario register and header model against as-built data before the next change.