CONCEPT

Pressure Relief and Flare Systems: Relief Loads, PRV Selection and Flare Operation

22 – 26 March 2027
London - Central London four-star



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Introduction:

Pressure relief and flare systems are the last protection against vessel rupture, yet many plants run with relief studies that no longer match the process, valves overdue for testing, headers checked against outdated loads and flares that smoke or burn gas that could be recovered. This Core Concept course takes engineers and supervisors through overpressure scenarios, relief device selection, relief load estimation, header and knock-out drum checks, flare radiation and gas recovery, and PRV inspection and testing, drawing on API 520 and API 521. Participants build a Relief and Flare System Review Workbook for one process unit.

Course Objectives:

- Identify credible overpressure scenarios for vessels, exchangers and piping and define the relief requirement for each
- Select spring-loaded, balanced bellows, pilot-operated or rupture disc devices to suit service fluid, backpressure and leak tightness needs
- Estimate relief loads for gas, liquid, two-phase and fire cases and confirm the governing case for each device
- Check inlet pressure loss, built-up backpressure, header capacity and knock-out drum performance against the relief load summary
- Evaluate flare type, thermal radiation, dispersion on flame-out and flare gas recovery options for a disposal system
- Plan PRV inspection, bench testing and maintenance intervals and set safe operating limits for the flare system

Target Audience:

- Process engineers who define overpressure scenarios and relief loads for plant equipment
- Mechanical and static equipment engineers who specify and install pressure relief devices
- Technical safety engineers who review disposal system capacity, radiation and flare siting
- Operations supervisors who run blowdown, flaring and flare gas recovery on shift
- Maintenance and inspection staff who remove, test, overhaul and reinstall relief valves
- Environmental and energy engineers who track flaring volumes and minimisation plans

Course Outline:

Day 1: Overpressure Foundations and the Relief System Current State

- Relief Terminology: Set Pressure, Overpressure, Accumulation and Blowdown
- Design Pressure and Maximum Allowable Working Pressure Relationship
- Overpressure Cause Checklist: Blocked Outlet, Utility Failure, Tube Rupture and Fire Exposure
- Relief, Depressuring and Flare Disposal System Architecture Map
- Relief Documentation Audit: PRV Register, Datasheets and Relief Study Status

Day 2: API 520 and API 521 Guidance, Relief Devices and Flare Components

- API 520 Scope: Sizing, Selection and Installation of Pressure-Relieving Devices
- API 521 Scope: Pressure-Relieving and Depressuring Systems
- Conventional Spring-Loaded, Balanced Bellows and Pilot-Operated Valve Comparison
- Rupture Disc Types and Rupture Disc With Relief Valve Combinations
- Elevated, Ground and Enclosed Flares: Tip, Molecular Seal, Purge Gas and Pilot Ignition

Day 3: Relief Load Calculation Concepts and Disposal System Hydraulics

- Relief Load Estimation for Gas, Vapour, Liquid and Two-Phase Flow
- Fire Case Wetted Area and Heat Input Method
- Governing Case Selection and Relief Load Summary Table
- Inlet Pressure Loss and Built-Up Backpressure Checks for Each Device
- Flare Header Velocity Checks and Knock-Out Drum Liquid Separation Sizing

Day 4: Flare Radiation, Gas Recovery, PRV Integrity and Operating Problems

- Thermal Radiation Contours, Sterile Zones and Dispersion on Flame-Out
- Flare Gas Recovery Compressors, Liquid Seal Drums and Flaring Minimisation Plans
- PRV Inspection Intervals, Bench Set Pressure Testing and In-Situ Testing
- PRV Failure Modes: Chatter, Simmer, Seat Leakage, Fouling and Isolation Valve Errors
- Safe Flare Operation: Purge Loss, Air Ingress, Flashback, Liquid Carryover and Smokeless Assist

Day 5: Modelling Build and the Relief and Flare System Review Workbook

- High-Pressure Separator Case: Scenario Screening and Relief Load Model
- Refinery Header Case: Backpressure and Knock-Out Drum Capacity Model
- Flare Radiation Distance Check for Personnel Access Areas
- PRV Test and Maintenance Plan With Defect Tracking Log
- Relief and Flare System Review Workbook Peer Challenge

Skills You Will Gain:

- Overpressure Scenario Analysis
- Relief Device Selection
- Relief Load Estimation
- Disposal System Hydraulic Checks
- Flare Radiation Assessment
- Flare Gas Recovery Planning
- PRV Testing and Maintenance Planning

Why Attend This Course:

- Return with a Relief and Flare System Review Workbook for a process unit from your own plant
- Spot relief devices whose governing case, backpressure or inlet loss no longer matches current operation
- Reduce routine flaring by knowing where recovery, purge and seal settings make a measurable difference
- Compare relief and flare practice with engineers from refining, gas processing, petrochemicals and power

Conclusion:

A relief system protects equipment only when its scenarios, devices, loads, headers and flare agree with the plant as it runs today. The course moves from overpressure causes and relief terminology, through device and flare technology and relief load concepts, to radiation, gas recovery, PRV integrity and flare operating problems. The final day turns this into a Relief and Flare System Review Workbook that engineers can use at their next relief study revalidation or turnaround.