MERCURY

Process Equipment & Piping Design for Oil and Gas Conference

23 August – 3 September 2027
Kigali (Rwanda)



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Process Equipment & Piping Design for Oil and Gas Conference

Ref: 8140_1059819 **Date:** 23 August – 3 September 2027 **Location:** Kigali (Rwanda) **Fees:** 9500 Euro

Process Equipment & Piping Design for Oil and Gas Conference is a 2-week technical forum on structural sizing, fluid conduit routing, and safety-by-design principles for production facilities. It is designed for discipline engineers, facility superintendents, and project coordinators seeking capital efficiency through Business-Focused Facilities methodology. You will complete and take back the Oil and Gas Equipment and Piping Design Dossier. The conference is delivered by Mercury Training Center.

About This Course

Hydrocarbon production assets face intense thermal loads, multiphase flow challenges, and hazardous containment demands that require precise mechanical configuration. To follow this conference, you should already calculate basic pipe friction losses and read process flow diagrams. You practice by sizing hydrocarbon vessels, evaluating high-pressure manifold layouts, and balancing lowest life-cycle cost against operational safety envelope boundaries.

Who It Is For

- Discipline leads responsible for upstream separation trains, gas treatment systems, and production fluid manifolds
- Facility engineers responsible for reviewing vendor mechanical calculations, line lists, and equipment datasheets
- Project managers responsible for balancing initial fabrication capital against life-cycle operating risk in field developments
- Integrity coordinators responsible for verifying that piping layouts and pressure containment vessels meet project safety mandates
- Operations superintendents responsible for maintaining process operating windows across separators, thermal units, and transfer lines

This course is not for entry-level draftsmen seeking basic computer-aided drafting tutorials, who are better served by a foundational CAD drafting workshop, nor for plant maintenance technicians requiring hands-on mechanical overhaul practice, who are better served by a field rotating machinery repair clinic.

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Competencies You Will Build

- Hydrocarbon Vessel Sizing: you determine shell wall thicknesses, head configurations, and nozzle reinforcement according to ASME Section VIII mandates
- Process Flowline Routing: you design piping layouts, thermal expansion loops, and support arrangements in accordance with ASME B31.3 codes
- Thermal Apparatus Integration: you specify fired heaters, heat exchangers, and boilers using API 560, API 660, and TEMA standards
- Fluid Transfer System Sizing: you match centrifugal pumps, gas compressors, and drivers to field production curves using API 610 and API 617 criteria
- Relief and Flare Safeguarding: you determine emergency relief valve orifices and disposal manifold ratings based on API 520 and API 521 sizing rules
- Business-Focused Facility Optimization: you balance initial capital outlay against life-cycle operational reliability using structured cost-benefit models

What You Will Be Able to Do

By the end of the course you will be able to:

- From a wellhead production stream specification, calculate shell dimensions and wall thicknesses for two-phase and three-phase separators under ASME Section VIII
- Using process simulation heat and mass balances, establish hydraulic gradients, schedule requirements, and expansion loop dimensions under ASME B31.3
- Given operating duties and fouling rates, select exchanger configurations and heater tube ratings following API 660 and API 560 design practices
- From field flow curves and gas-oil ratios, specify head requirements, net positive suction head margins, and power ratings for API 610 pumps and compressors
- Using credible emergency overpressure relief scenarios, size pressure safety valves and flare headers according to API 520 and API 521 methodologies
- From field development parameters, compile a facility design report that justifies piping choices, equipment selections, and safety margins against life-cycle expenditure limits

Course Content

Day 1: Upstream Facility Architecture and Business-Focused Design

- Business-Focused Facilities Principles for Hydrocarbon Processing Plants
- Design Life-Cycle Costing Versus Initial Capital Outlay in Field Developments
- Safety by Design Philosophy and Credible Worst-Case Scenario Safeguarding
- Statutory Compliance and Global Industry Codes in Hydrocarbon Production
- Integrity Operating Windows Definition Across Upstream Processing Trains

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Day 2: Pressure Containment Vessels and Storage Structures

- Separator Sizing and Internal Configuration under ASME Section VIII Division 1
- Shell and Ellipsoidal Head Wall Thickness Calculations for Sour Service
- Atmospheric Hydrocarbon Storage Tanks Selection and Sizing under API 650
- Floating Roof Versus Fixed Cone Roof Selection for Crude Condensates
- Nozzle Reinforcement and Flange Rating Selection for Wellhead Manifolds

Day 3: Process Piping Network Hydraulics and Mechanical Layout

- Hydrocarbon Piping Sizing and Wall Thickness Equations under ASME B31.3
- Multiphase Flow Regimes and Hydraulic Loss Calculations in Flowlines
- Thermal Expansion Flexibility Analysis and Expansion Loop Placement
- Pipe Support, Guide, and Restraint Optimization for Elevated Lines
- Valving Selection, Fitting Pressure Classes, and Flange Face Ratings

Day 4: Thermal Transfer Systems and Fired Heaters

- Direct-Fired Process Heaters Configuration under API 560 and API 530
- Tube Wall Temperature Limits and Coil Stress Analysis in Crude Heaters
- Shell and Tube Exchanger Specification Following TEMA and API 660 Standards
- Air-Cooled Heat Exchangers and Fin-Fan Sizing Principles under API 661
- Industrial Steam Boilers and Waste Heat Recovery Units under ASME Section I

Day 5: Fluid Machinery and Rotating Equipment

- Centrifugal Pumps Sizing and Net Positive Suction Head Margins under API 610
- Positive Displacement Pumps Application in Glycol and Chemical Injection
- Centrifugal and Reciprocating Process Gas Compressors under API 617
- Electric Motor and Gas Turbine Driver Selection for Fluid Machinery
- Machinery Condition Monitoring Provisions and Vibration Baseline Layout

Day 6: Overpressure Protection, Flare Headers, and Safeguarding

- Identification of Foreseeable Overpressure Scenarios Across Facility Units
- Pressure Safety Valve Orifice Sizing Calculations Following API 520
- Flare Header Sizing, Knockout Drums, and Disposal Manifolds under API 521
- Depressuring Valves and Emergency De-Inventorying System Integration
- Pressure Relief Device Inspection and Operational Testing under API 576

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Day 7: Oilfield Materials Selection and Degradation Mitigation

- Metallurgical Selection for Sour Service Environments and H2S Exposure
- Corrosion Allowance Allocation for High-CO2 and Produced Water Lines
- Non-Metallic Piping Applications, Linings, and Claddings in Brine Systems
- Brittle Fracture, Creep, and Stress Corrosion Cracking Prevention by Design
- Life-Cycle Economic Evaluation of Corrosion-Resistant Alloys Versus Carbon Steel

Day 8: Flow-Induced Dynamics and Structural Piping Integrity

- Piping System Vibration Screening and Acoustic-Induced Fatigue Checks
- Mechanical and Flow-Induced Resonance Mitigation in Compressor Manifolds
- Slug Flow Dynamics, Liquid Hammer, and Transient Surge Protection
- Wind, Seismic, and Environmental Load Combinations on Tall Distillation Columns
- Piping Stress Analysis Software Input Modeling and Code Compliance Checks

Day 9: Facility Integration, Inspection Access, and Constructability

- Constructability Reviews and Modular Skid Layout Optimization in Offshore Fields
- Inspection Access, Non-Destructive Testing Provisions, and Pig Launching Design
- Intelligent Pigging Requirements and Trap Design for Gathering Pipelines
- Management of Change Workflow for Facility Engineering Revisions
- Rerating Existing Piping and Vessels for Changing Well Reservoir Compositions

Day 10: Applied Facility Engineering Dossier Finalization

- Exercise Sizing High-Pressure Separator Shell and Relief Manifold for Sour Wells
- Exercise Modeling Piping Thermal Flexibility and Restraints for Hot Export Lines
- Exercise Configuring Crude Charge Heater and Shell-and-Tube Heat Exchanger
- Exercise Validating Flare Header Capacity Under Facility Power Loss Scenario
- Completing and Presenting the Oil and Gas Equipment and Piping Design Dossier

Case Studies and Exercises

The following are suggested activities used during the course.

- Case study: an offshore production platform adding high-gas-ratio satellite wells; you analyze separator fluid residence times, resize mist extractors, and re-verify vessel nozzle loads under modified flow conditions.
- Case study: an onshore gas sweetening plant experiencing thermal expansion binding; you evaluate piping flexibility, reposition spring hangers, and verify flange leakage criteria under ASME B31.3 rules.
- Exercise: an oil gathering center relief modernization; you calculate required relief capacity across blocked discharge scenarios, size relief valves under API 520, and check flare sub-header backpressures.
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Exercise: a sour condensate stabilization facility development; you determine alloy selection for heat exchangers and piping spools, balancing initial metallurgy costs against life-cycle chemical inhibition expenses.

What You Take Back

You return with the Oil and Gas Equipment and Piping Design Dossier to direct engineering evaluations and design audits across your organization. In your first month back, you use it to benchmark proposed equipment specifications, verify piping wall calculations, and establish safety-by-design thresholds for new projects or plant modifications.

- Upstream vessel and flowline mechanical sizing calculation workbooks
- API relief valve scenario screening worksheets and flare sizing guidelines
- Business-Focused Facility life-cycle cost comparison evaluation tool
- Facility constructability and piping stress compliance verification checklist

Quick Answers FAQ

What should I know before Process Equipment & Piping Design for Oil and Gas Conference?

You should understand basic fluid mechanics, engineering thermodynamics, and reading process flow diagrams. Experience with basic equipment datasheets or plant line lists will help you engage with the calculation workshops and code guidelines throughout the conference.

How does this conference differ from general piping and equipment engineering courses?

General courses cover generic industrial machinery and water or steam utilities across diverse manufacturing sectors. This conference concentrates exclusively on hydrocarbon processing facilities, sour service containment, API safety codes, multiphase fluids, and Business-Focused Facility economics.

Why do upstream oil and gas operators apply Business-Focused Facility principles?

Upstream operators apply Business-Focused Facility methods to eliminate over-specification while safeguarding technical integrity. This practice balances upfront capital expenditure against long-term maintenance costs, matching equipment design margins directly to reservoir production profiles and credible facility operating envelopes.

What work product do I take back from the conference?

You take back the Oil and Gas Equipment and Piping Design Dossier, containing vessel wall thickness formulas, piping schedule selection guides, relief valve sizing spreadsheets, and design review checklists ready for immediate application on plant projects.

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For Your Manager

This conference provides your team member with practical expertise in mechanical sizing, code-compliant piping layouts, and safety-by-design standards tailored specifically to oil and gas operations. The participant completes the Oil and Gas Equipment and Piping Design Dossier during the sessions, bringing back calculation models and design review checklists to audit contractor deliverables and optimize facility capital expenditures.