MERCURY

Gas Network Analysis: Design, Piping system, Application and Operation Analysis

7 – 18 November 2027
Sharm El-Sheikh (Egypt)



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Ref: 15279_257777 **Date:** 7 – 18 November 2027 **Location:** Sharm El-Sheikh (Egypt) **Fees:** 9000 Euro

Introduction:

This gas network analysis, design, simulation, and operation program is designed to review piping design, the effects on overall configuration on preliminary piping design, initial layout, the total system, introduction to pipe stress analysis, detailed piping design, and how all of this influences pipe support and pipe hanger design.

This gas network analysis, design, simulation, and operation course provides the appropriate mix of fundamentals, methodologies, best industry practices, and practical tools to enhance the competencies and improve the performance of design, operation, and maintenance technical professionals individually and collectively to add value to the organization and improve the safety and reliability.

Simulation and Analysis of Gas Networks:

In today's sophisticated gas network operations, simulation, and analysis play a critical role in optimizing network performance and safety. Utilizing advanced software tools, gas network operators, and designers can model complex natural gas network behavior to predict how changes in demand or supply can affect system integrity.

Simulation techniques allow for detailed analysis of gas flows, pressure levels, and other parameters crucial to the reliable design and operation of robust natural networks. Throughout this gas network analysis, design, simulation, and operation course, participants will not only explore the fundamental aspects of gas network simulation but will also have the opportunity to engage with case studies where these principles are applied in real-world scenarios.

Targeted Groups:

- Process, Mechanical, and Chemical Engineers.
- Operation and Maintenance Engineers.
- Project Engineers.
- Supervisors and Managers.
- Technical Personnel involved in inspection.

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Course Objectives:

At the end of this gas network analysis, design, simulation, and operation course, the participants will be able to:

- Increasing the awareness and understanding of the mechanical integrity of process equipment and piping systems depends jointly on the proper design, operation, condition assessment, and maintenance of the equipment, underscoring their vital individual and team roles in managing change.
- Get practical and sound methods and tools to enable them to carry out basic design calculations for pressure equipment following applicable industrial codes, standards, and best practices.
- Get a clear understanding of the degradation mechanisms that process equipment could be subjected to over their operating life, how to identify them, predict and determine their impact, and what appropriate measures can be taken to prevent and control the resultant damage.
- Gain the knowledge and failure analysis skills they need to conduct damage and failure analysis to prevent similar failures from happening.
- Enhance the knowledge and skills in hazard identification and analysis, and risk assessment and management.

Targeted Competencies:

By the end of this gas network analysis, design, simulation, and operation training, the participants will be able to:

- The inter-dependence of design, operation, and maintenance for achieving mechanical integrity of pressure equipment and piping systems.
- Piping materials information, including Pipe support details, including Fluid characteristics,
- As-exists conditions, including the following: If warranted, to perform safety valve discharge analysis, the following are required.
- Important principles of flow-metering including accuracy and repeatability.
- Main types and applications of Flowmeters with emphasis on custody transfer.
- Flowmeter proving and calibration techniques.

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Course Content:

Unit 1: Introductory Overview of Piping System Design:

- Typical Gas Pipeline System.
- Role of Operator.
- Process Equipment - An Overview.
- Safety by Design.
- Effects of operating conditions, including flow rate, design pressure, and temperature on piping design.
- Impact of internal and external forces on the design.
- Influences that the different modes of failure and the applicable codes have on the entire system.
- Piping layout, an overview of the general support classifications.

Unit 2: Piping Stress Analysis:

- Pipe support type and locations.
- Spring type supports load capacities.
- Spring type supports load adjustments.
- Component bills of materials.

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Unit 3: Primary Flow Measurement Instrumentation and Accuracy:

- The Flowmeter.
- Meter Tubes and Other Fittings.
- Removals/Replacement Procedure.
- Flow Measurement Uncertainty.
- Rangeability and Calibration.
- Calculating Uncertainty.
- Traceability.

Unit 4: Pipe Support Details:

- Pipe support type and locations.
- Spring type supports load capacities.
- Spring type supports load adjustments.
- Component bills of materials.

Unit 5: Fluid Characteristics:

- Design temperature.
- Design pressure.
- Operating temperature.
- Operating pressure.

Unit 6: As-exists Conditions:

- Pipe hanger hot and cold walk-down data, such as actual spring settings, hanger condition, interferences, etc.
- Pipe system hot and cold walk-down data, such as insulation damage, interferences, pipe distortion, movements, etc.

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Unit 7: Design and Operation of Pressure Equipment:

- Pressure Vessels and Reactors.
- Materials of construction and standards.
- Basic Design Methodology.
- ASME Boiler and Pressure Vessel Code Sections.
- Storage Tanks.
- Types and application cone roof tanks, and floating roof tanks.
- Basic design methodology.
- Overview of API 650.
- Piping Systems.
- Basic Design Methodology - hydraulic design, pressure integrity, mechanical integrity.
- ASME B31.1 and B31.3.
- Piping flexibility and support.
- Piping system components - valves and fittings classes, ratings.
- Worked Examples.
- Overpressure Protection.
- Types and applications of pressure-relieving devices.
- Code requirements.
- Sizing methodology: API 520 and 521.
- Specific operation and maintenance requirements: API 576.

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Unit 8: Preliminary Piping Design - Piping System Components:

- Concepts used in developing an initial piping layout.
- Design principles including fluid properties, flow rate, and physical laws which influence the complete piping system layout.
- Understand the effect of different piping system components, such as tanks, vessels, valves, and pumps, on the overall configuration.

Unit 9: Preliminary Piping Design - The Total System:

- The total piping system.
- The different types of equipment and components that define various types of piping systems.
- Differences between series piping, parallel piping, and branch piping as well as their specialized applications.
- The piping system conditions such as static and dynamic head loss.
- Influences on the selection and distribution of piping components throughout the entire system.

Unit 10: Basic Concepts of Stress Analysis - Flexibility Analysis:

- Historical perspective of how earlier analysis techniques were developed in the absence of today's computer technology
- Review how earlier techniques have evolved ultimately leading to today's finite element practices
- The basic concepts of stress analysis will be covered, including failure theories, stress intensification factors, and the overall purpose of stress analysis

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Unit 11: Basic Concepts of Stress Analysis - Design Bases and Rigid Supports:

- The design bases that form the foundation of all our analyses, including physical attributes, loading conditions, and joint design.
- Development of a Stress Model.
- Rudimentary stress analysis assembly procedure.
- How vibration affects the piping system.
- Rigid Pipe Supports.
- Support elements ranging from stock catalog items to completely customized parts.
- Factors of the piping stress analysis that have an impact on the overall support design and feasibility.
- How can adjustability be incorporated into the design to accommodate for on-site discrepancies?

Unit 12: Influences on Pipe Support Design - Spring Supports:

- Resilient support elements including variable, constant, and big ton springs.
- The operating conditions that define the ideal pipe support per application.
- Uses of standard pipe support hardware in conjunction with stock spring components to design entire pipe support assemblies.
- Modification of standard spring elements to fit unusual configurations in a piping system.

Unit 13: Influences on Pipe Support Design - Restraints:

- Restraint devices used for transient loading conditions.
- Types of components and their particular functions, including hydraulic snubbers, mechanical snubbers, and sway struts.
- Design parameters to consider when selecting the most appropriate restraint device.
- General guidelines focused on standardization and versatility of pipe supports throughout the piping system.

Unit 14: Meeting The Legal Framework:

- Gas Safety Management Regulations 1996 Pipeline Safety Regulations.
- Design of gas service IGE/TD/4: Sizing Method of installation Entry into buildings, Valves Pressure testing, Commissioning.
- Design of gas mains IGE/TD/3 and IGE/GL/7: Demand, Pressure, Velocity, Routing, Materials.
- Network analysis Safety assessment, Construction planning, Connections, testing, purging, commissioning, and preparation of a safety case for the HSE IGE/GL/7.