CONCEPT

Gas Transmission and Distribution Networks: Hydraulics, Pressure Regulation and Gas Control

20 – 24 December 2026
Riyadh - KAFD district five-star



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Ref: 742_19414 **Date:** 20 – 24 December 2026 **Location:** Riyadh - KAFD district five-star **Fees:** 20000 SAR

Introduction:

Gas transmission and distribution networks lose delivery pressure at the far end of a supply area, run out of line pack on a cold morning or send off-specification gas to burners when mains are sized by rule of thumb and regulator settings are never checked against peak demand. This Core Concept course gives utility and grid engineers the tools to calculate flows and pressures in meshed gas networks, set city gate and district regulator cascades, manage odorant dosing and gas quality, and run gas control and dispatch. Participants build a Network Sizing and Pressure Regulation Study for a case supply area.

Course Objectives:

- Calculate pressure drop and throughput in gas mains with the Weymouth, Panhandle and Polyflo equations, choosing the equation that fits the pressure tier and flow regime
- Solve a meshed low and medium pressure network with the nodal or loop method and identify the node with the lowest delivery pressure at peak hour
- Estimate line pack and its intraday swing on a transmission grid and relate compressor station output to storage in the pipe
- Specify city gate and district pressure regulating installations with active and monitor regulators, slam-shut valves, relief and metering, and set their pressure cascade
- Plan odorant injection, Wobbe index and interchangeability checks and gas control dispatch rules that keep supply within quality and pressure limits
- Prepare a gas escape response and reinforcement plan for a distribution supply area based on modelled pressures and demand growth

Target Audience:

- Distribution network planners responsible for sizing steel and polyethylene mains and service connections for new supply areas
- Transmission grid engineers responsible for flow capacity, compressor operation and line pack on high pressure systems
- Gas control room and dispatch staff responsible for nominations, pressure setpoints and daily balancing
- Regulator and metering station engineers responsible for commissioning and setting city gate and district installations
- Gas quality and odorisation technicians responsible for odorant dosing and calorific value records
- Emergency service field supervisors responsible for first response to reported gas escapes

Course Outline:

Day 1: Natural Gas Properties and the Transmission-to-Distribution Chain

- Supply Chain Map: Entry Point, Compressor Station, City Gate, District Regulator and Consumer Meter
- Gas Composition, Relative Density, Viscosity and Compressibility Factor for Flow Work
- Gross and Net Calorific Value and Energy Flow Conversion from Volume Measurements
- Pressure Tier Hierarchy: High, Intermediate, Medium and Low Pressure Systems
- Current-State Review of a Supply Area: Demand Categories, Peak Hour Load and Diversity Factors

Day 2: Steady-State Flow Equations and Meshed Network Hydraulics

- General Flow Equation, Transmission Factor and Pipe Efficiency Allowance
- Weymouth, Panhandle A and B and Polyflo Equations: Range of Applicability by Pressure Tier
- Low Pressure Mains Flow and Velocity Limits for Noise and Dust Carry-Over
- Nodal Method, Loop Method and Newton Loop-Node Solution for Meshed Grids
- Reference Nodes, Load Nodes and Convergence Checks in Network Analysis Software

Day 3: Transient Flow, Line Pack, Compression and Regulating Installations

- Unsteady Flow Behaviour and Pressure Wave Travel in Long High Pressure Lines
- Line Pack Calculation and Intraday Swing Against a Daily Demand Profile
- Compressor Station Role in the Grid: Compression Ratio, Station Throughput and Fuel Gas Use
- City Gate Station Layout: Filtration, Preheating, Active and Monitor Regulators and Slam-Shut Valves
- District Regulator Pressure Cascade, Relief Valve Setting and Fiscal Metering Skids

Day 4: City Gas Distribution Design, Odorisation, Gas Quality and Gas Control

- Steel and Polyethylene Mains Selection, Service Line Sizing and Isolation Valve Placement
- Odorant Types and Injection Methods: Wick, Absorption Bypass and Flow-Proportional Pumps
- Wobbe Index, Gas Families and Interchangeability Limits for Appliance Safety
- Gas Control and Dispatch: Nominations, Setpoint Changes and Daily Balancing on SCADA
- Gas Escape Response: Call Handling, Make-Safe Sequence, Isolation and Supply Restoration

Day 5: Case Supply Area Modelling: Network Sizing and Pressure Regulation Study

- Case Supply Area Data Pack: Street Layout, Load Forecast and Offtake Pressure
- Network Model Build and Peak Hour Pressure Check for the Case Area
- Regulator Station Setpoint Schedule and Relief Philosophy for the Case Area
- Reinforcement Options: Mains Upsizing, Looping and an Additional District Regulator
- Study Presentation and Technical Challenge Panel

Skills You Will Gain:

- Gas Flow Equation Selection
- Meshed Network Analysis
- Line Pack Estimation
- Regulator Cascade Design
- Distribution Mains Sizing
- Odorant Dosing Control
- Gas Interchangeability Assessment
- Gas Dispatch and Balancing

Why Attend This Course:

- Leave with a Network Sizing and Pressure Regulation Study for a case supply area that mirrors your own network
- Replace rule-of-thumb main sizes with calculated pressures you can defend to planners and asset owners
- See how compressor output, line pack and regulator settings interact from the transmission grid down to the street main
- Compare network practice with engineers from transmission operators, city gas distributors and industrial gas users

Conclusion:

Gas reaches every burner at the right pressure and quality when flow equations, network models, regulator cascades, odorant dosing and gas control rules are set together rather than by separate teams. The course moves from gas properties and pressure tiers to steady-state equations and meshed network solution, then to transient flow, line pack, compression and regulating installations, and on to distribution design, odorisation, interchangeability, dispatch and gas escape response. The final day produces a Network Sizing and Pressure Regulation Study ready for use on a live supply area.