CONCEPT

Pipeline Integrity Management, Engineering and Operations for Oil and Gas

15 – 26 August 2027
Jeddah - Corniche four-star



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Introduction:

Pipeline integrity management fails when hydraulics, station control, leak detection, pigging and inspection data are handled by separate teams that never build one picture of the line. Ruptures, product losses and forced derating often follow. This Core Concept course covers oil and gas pipeline engineering, operations and integrity management for transmission lines: codes and design basis, liquid and gas hydraulics, pump and compressor stations, SCADA and leak detection, pigging and in-line inspection, threat and risk assessment, defect assessment, repair and emergency response. Participants produce a Pipeline Integrity Management Plan for a segment of their own network.

Course Objectives:

- Verify the design basis, maximum allowable operating pressure and station setpoints of a liquid or gas transmission pipeline against its code and operating envelope
- Calculate pressure profiles, line pack and surge conditions and use them to set pump and compressor station operation
- Configure SCADA alarms, computational leak detection and pigging programmes that keep a pipeline within its operating limits
- Interpret in-line inspection and direct assessment results to classify anomalies and decide response and reassessment intervals
- Assess metal loss, dent and crack-like defects and select a repair method or pressure reduction with a documented change record
- Build a Pipeline Integrity Management Plan that links threats, risk ranking, inspection, maintenance, emergency response and performance indicators

Target Audience:

- Pipeline engineers responsible for design basis, pressure limits and hydraulic performance of transmission lines
- Integrity engineers responsible for threat assessment, in-line inspection programmes and defect disposition
- Operations supervisors responsible for pump and compressor station running and pipeline control
- Control room and SCADA specialists responsible for alarm handling and leak detection performance
- Maintenance supervisors responsible for pigging, valve maintenance, right-of-way patrol and repair execution
- Emergency response coordinators responsible for pipeline incident plans and drills

Course Outline:

Day 1: Pipeline Systems, Codes and the Network Baseline

- Transmission System Anatomy: Injection, Pump, Compressor, Block Valve and Delivery Stations
- Gathering, Transmission and Distribution Line Classes and Custody Boundaries
- ASME B31.4 Liquid and ASME B31.8 Gas Pipeline Code Scope Comparison
- Pipeline Operator Roles: Design Authority, Control Room, Integrity and Field Maintenance
- Network Baseline Review: Alignment Sheets, As-Built Records and Operating History

Day 2: Route Selection, Design Basis and Pressure Limits

- Route Selection Matrix: Terrain, Crossings, Population Density and Construction Access
- Location Class and Design Factor Concepts for Gas Transmission Lines
- Wall Thickness, Maximum Allowable Operating Pressure and Hydrotest Pressure Worksheet
- Line Pipe Grade, Seam Type and Fracture Control Considerations
- Block Valve Spacing, Road and River Crossing Design and Depth of Cover Checks

Day 3: Liquid and Gas Pipeline Hydraulics

- Liquid Line Pressure Profile: Friction Loss, Elevation Head and Hydraulic Gradient Plot
- Darcy-Weisbach Friction Factor and Moody Diagram Calculation Exercise
- Gas Flow Equations, Compressibility Factor and Line Pack Calculation
- Batch Scheduling, Interface Tracking and Slack Line Conditions in Product Lines
- Surge and Pressure Transient Analysis With Relief and Shutdown Protection

Day 4: Pump and Compressor Stations, SCADA and Leak Detection

- Pump Station Series and Parallel Operation Against the System Curve
- Compressor Station Configuration: Centrifugal Units, Anti-Surge Control and Station Recycle
- SCADA Architecture: Main Control Room, RTUs, Telemetry and Alarm Rationalisation
- Computational Pipeline Monitoring per API RP 1130: Mass Balance, RTTM and Pressure Point Analysis
- External Leak Detection: Fibre-Optic DTS and DAS and Acoustic Sensing Coverage

Day 5: Pigging Operations and Week-One Guided Case Study

- Utility Pig Selection: Foam, Brush, Cup and Disc Pigs for Cleaning, Dewatering and Batching
- Launcher and Receiver Procedures With Valve Interlocks, Venting and Pig Tracking
- Guided Case Study: Crude Oil Trunkline Hydraulic Profile and Pump Station Setpoints
- Guided Case Study: Gas Transmission Line Pack Swing and Leak Alarm Response
- Operating Limits Register Review for the Week-One Case Pipelines

Day 6: In-Line Inspection and Direct Assessment

- Intelligent Pig Technologies: MFL, Ultrasonic, EMAT and Caliper Tools
- Piggability Assessment and ILI Run Preparation: Gauging, Cleaning and Tool Selection
- ILI Feature List Interpretation and Run-to-Run Comparison Using the Pipeline Open Data Standard
- External Corrosion Direct Assessment: Pre-Assessment, Indirect Survey, Direct Examination and Post-Assessment
- Cathodic Protection and Coating Overview: Close Interval and Coating Defect Surveys

Day 7: Integrity Management Programme, Threats and Risk

- Integrity Management Programme Framework per ASME B31.8S
- Threat Identification: Corrosion, Manufacturing, Construction, Third-Party Damage and Geohazards
- Potential Impact Area and High Consequence Segment Identification
- Relative Index Scoring and Quantitative Probability-Consequence Risk Models
- Integrity Assessment Method Selection and Reassessment Interval Setting

Day 8: Defect Assessment, Repair and Management of Change

- Remaining Strength Methods for Corroded Pipe and Safe Operating Pressure Calculation
- Dent, Gouge and Crack-Like Feature Assessment and Response Timeframes
- Repair Methods: Full-Encirclement Sleeves, Composite Wraps, Hot Tapping and Cut-Out Replacement
- Pressure Reduction Decisions and Management of Change Records for Temporary Derating
- Dig Package Preparation, Landowner Liaison and Third-Party Crossing Agreements

Day 9: Maintenance, Emergency Response and Integrity Performance

- Right-of-Way Patrol, Aerial Surveillance and Third-Party Damage Prevention Programme
- Mainline Valve Maintenance and Planned Shutdown Coordination With Shippers
- Pipeline Emergency Response Plan: Rupture Scenarios, Isolation Sequencing and Mutual Aid
- Emergency Drill Design and Public Awareness Communication With Emergency Services
- Integrity KPIs: Leak Frequency, Anomaly Repair Backlog, ILI Coverage and CP Survey Results

Day 10: Capstone: Pipeline Integrity Management Plan

- Capstone Brief: Segment Data Pack With ILI Results, CP Readings and Operating History
- Threat and Risk Register Build for the Capstone Segment
- Assessment, Repair and Mitigation Schedule With Reassessment Intervals
- Maintenance and Emergency Response Interfaces Written Into the Plan
- Pipeline Integrity Management Plan Presentation and Technical Review Panel

Skills You Will Gain:

- Pipeline Hydraulic Analysis
- MAOP Verification
- Leak Detection System Tuning
- Pigging Programme Planning
- In-Line Inspection Data Interpretation
- Pipeline Threat and Risk Ranking
- Pipeline Defect Disposition
- Pipeline Emergency Preparedness

Why Attend This Course:

- Return with a Pipeline Integrity Management Plan for a segment of your own network, ready for technical review
- Move in week two from running the line to proving it is fit for service: inspection results, risk ranking, defect disposition and repair
- Tighten leak detection, pigging and station control so small anomalies are caught before they become ruptures or product losses
- Compare pipeline practice with engineers from crude, refined products, natural gas and water transmission operators

Conclusion:

Transmission pipelines stay safe and available when design limits, hydraulics, station control, inspection data and emergency plans point to the same operating envelope. Week one covers codes, route and design basis, liquid and gas hydraulics, pump and compressor stations, SCADA, leak detection and pigging, closing with a guided case. Week two adds in-line inspection, direct assessment, threat and risk assessment, defect assessment, repair, maintenance, emergency response and integrity KPIs. Participants leave with a Pipeline Integrity Management Plan ready to present to their asset owner.