



FE044: Piping Systems - Mechanical Design and Specification

Training Description:

This five-day course for engineers and piping system designers reviews the key areas associated with the design of piping systems for oil and gas facilities. The course is focused on four areas: codes and standards, pipe materials and manufacture, piping components, and piping layout and design. Applicable piping codes for oil and gas facilities (ISO, B31.3, B31.4, B31.8, etc.), pipe sizing calculations, pipe installation, and materials selection are an integral part of the course. The emphasis is on proper material selection and specification of piping systems.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Apply piping system codes and standards
- ✓ Determine line sizing and layout of piping systems in various types of facilities
- ✓ Specify proper components for process and utility applications
- ✓ Compare alternative materials of construction
- ✓ Illustrate the process of steelmaking, pipe manufacturing and material specifications
- ✓ Use joining methods and inspection techniques
- ✓ Identify key considerations for flare and vent systems, including PSV sizing

Training Designed for:

This course is intended for all Mechanical, Facilities, Plant or Pipeline Engineers and Piping System Designers who are involved in the design of in-plant piping systems for oil and gas facilities.

Training Requirement:

“Hand’s on practical sessions, equipment and software will be applied during the course if required and as per the client’s request.”

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client’s learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ Basics of Pipeline Engineering
 - The Oil & Gas Industry
 - Introduction to Pipelines
 - History of Pipelines
 - Basic pipeline and material parameters
 - Pipeline Safety
- ❖ Basics of Pipeline Engineering
 - Steels used for Line pipe
 - Mechanical Properties, Grades and Chemical Composition of materials
 - Material Properties for FFS assessment
 - Strength Parameters

- Yield and Tensile strength
- Flow Stress
- Stress-Strain relationship
- Physical properties
- Elastic Modulus
- Poisson's Ratio
- Coefficient of Thermal expansion
- Fatigue Toughness
- Fracture Toughness Parameters
- Low bound fracture Toughness
- Charpy V-Notch data
- Fracture Toughness for in-service materials
- Temper Embrittlement
- Pipeline Welding and Manufacturing Techniques - Seamless, Longitudinal Welded, RW, Spiral
- Methods for Improving Corrosion Resistance
- Internally Clad Pipe
- Latest Materials Developments

❖ Pipeline Design

- Pipeline Codes and Standards
- Legislation and Regulations
- Design Process
- Detailed design:
- Product categorization
- Locating pipelines
- Design pressures, factors, and stressing
- Pipeline Crossings
- Pipeline Valves
- Surges/overpressures
- Bends
- Pipe protection
- Fracture control
- Fluids and Hydraulics

DAY TWO:

❖ Pipeline Route Alignment Considerations

- Basics of routing
- Classification schemes
- Easements and rights of way
- Legislation and permits
- Routing methodologies 2

❖ Pipeline Welding

- Basics of Welding

- Types of Welding Processes
- Effects on Line pipe of the Welding Process
- Welding Procedures
- Inspection of Welds
- Local Thin area assessment / Material Loss calculations
- ❖ **Exercise Part 1**
 - Material selection, wall thickness, corrosion allowance
 - Coating and field joints
 - Stability and weight coating
- ❖ **Internal Pipeline Corrosion**
 - Why Pipes Corrode
 - Sweet Corrosion, Sour Corrosion, Microbiological Corrosion
 - Cracking Mechanisms
 - Calculating Corrosion Rates
 - Effect of Flow on Corrosion
 - Water Injection Pipelines

DAY THREE:

- ❖ **Monitoring of Internal Pipeline Corrosion**
 - Corrosion and Internal Failure Mechanism
 - Inhibition of Corrosion
 - Biocide Treatment of Pipelines
 - Monitoring Internal Corrosion
 - Supplementary Inspection Techniques
- ❖ **Pipeline Testing, Operation, Inspection**
 - Pressure Testing
 - Batching
 - Incorrect operation
 - Control Systems, Leak Detection
 - Inspection and monitoring of operational pipelines
- ❖ **External Pipeline Corrosion and its Prevention**
 - External Corrosion in Soils
 - Coatings and their Application
 - Field Joints
 - Interaction of Coatings and Cathodic Protection
- ❖ **Exercise Part 2**
 - Thickness, MAWP and Membrane Stress Equation for a FFS Assessment
 - Calculation of Minimum Thickness
 - Calculation of MAWP (MFH)
 - Calculation of Membrane Stress

DAY FOUR:

- ❖ **Cathodic Protection**
 - How Cathodic Protection Works
 - Monitoring of CP at Test Points

- Full Line Surveys with CIPS and Instant Off Surveys
- Coating Surveys using Pearson and DCVG Techniques
- Interference from Third Party Lines and DC/AC systems
- ❖ **Metal Loss**
 - General Metal Loss due to Corrosion and/or Erosion
 - Localized Metal Loss due to Corrosion and/or Erosion
 - Surface Connected Cracking
 - Subsurface Cracking and Microfissuring/Microvoid Formation
 - Metallurgical Changes
 - In-Service deterioration and damage
- ❖ **Crack Growth**
 - Categories of Crack Growth
 - Crack Initiation
 - Creep Crack Growth
 - Creep Rupture
 - Creep Strain-Rate Data
 - Exercise 3: Fatigue Crack Growth Calculation
- ❖ **Utility and Intelligent (Smart) Pig Inspection**
 - The History of Internal Inspection
 - Why 'Pig'?
 - Types of Pig
 - The History of Internal Inspection
 - Why 'Pig'?
 - Types of Pig
 - Intelligent (Smart) Pigs:
 - Metal loss (MFL, UT)
 - Geometry
 - Mapping
 - Crack detection
 - What do they find and how accurate are they?
- ❖ **Case Studies**
 - AFCM
 - Subsea MPI
 - Reporting of Subsea inspection

DAY FIVE:

- ❖ **Leak detection**
- ❖ **Pipeline Integrity Management**
 - Risk and risk analysis
 - Integrity management methods:
 - API 1160
 - ASME B31.8S
 - Types of pipelines with respect to their functions (purposes)
 - The transportation of natural gas

- Pipeline components
- Pipes and pipe supports
- Pipe specifications
- Pipe end connections
- Pipeline supports
- Steel pipe specifications
- Pipeline valves
- The pipeline design steps
- Selection of pipeline route
- Pipeline sizing (diameter of the pipeline for certain capacity/flow rate)
- Pipeline supports
- Pipeline pumping/compression stations
- Pipeline components: The required technical specification for vendors
- Pipeline construction
- Pipeline pressure test and commissioning
- Pipeline coating & Cathodic protection system
- Pipeline preservation
- Pipeline start-up/operational problems
- Pigging process: Why & how?

❖ Course Conclusion

❖ POST-ASSESSMENT and EVALUATION

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

Aisha Relativo - Training & Career Development Manager

aisha@cmc-me.com / training@cmc-me.com

Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615