Onshore Pipeline Design & Engineering

Course Introduction

This course provides a comprehensive overview of the fundamentals of oil and gas pipeline systems including codes and standards, mechanical design, materials selection, construction, operations & maintenance. Practical examples are used throughout and the lectures are supplemented by video presentations.

Who should attend

Pipeline Engineers, Pipeline Construction Engineers, Project Managers, Maintenance Engineers, Contractors, Supervisors, Inspectors, Operators, Equipment Suppliers, Inspection and Quality Engineers, Pipeline Design Engineers.

Engineers who need a wider appreciation of onshore pipeline engineering

Learning Objectives

• The objective throughout is to provide a sound understanding of the underlying engineering Principles in each area of Pipeline Engineering.

• To provide methodologies for the mechanical design of pipelines in accordance with industry codes ASME B31.4 and B31.8 and best practices

• To discuss the key elements of pipeline integrity management based on best industry practices and standards (ASME B31.8S, API 1160); in-line inspection using smart pigs (API 1163), fitness-for-service assessment (ASME B31G, RSTRENG, etc), and repair/rehabilitation options.

• Attendees will receive a comprehensive set of notes

Workshop Contents

1. Introduction to Pipelines
   - Introduction to Oil and Gas Pipelines
   - Pipeline & Pipeline Products
   - Gathering, Transmission and Distribution
   - Pipeline Engineers – Responsibilities and Duties
   - Introduction to Stages of Pipeline Project
   - Introduction to Pipeline design, Construction and Installation

2. Pipeline Codes and Standards
   - Major Codes and Standards governing Design, operation and maintenance of Pipelines
   - Common Features of Pipeline Codes and Standards
   - Features of ASME B31.4 and ASME B31.8
   - API Standards
   - Standards and Guidelines for Pipeline Operation and Maintenance
3. Pipeline Materials
   - Steels Used for Line Pipe
   - Compositional Limitations, Mechanical Properties and Grades
   - Fabrication of Line Pipe – Seamless, ERW, Longitudinal, Spiral
   - Introduction to Pipeline Material Selection Requirements, including Code requirements

4. Mechanical Design of Pipelines
   - Introduction
   - Forces and Stresses In Pipelines
   - Mechanical Design Criteria
   - SMYS of Pipeline Materials
   - Pipeline Design Factors
   - Mechanical Design of Pipelines (Maximum Allowable Pressure and Min. Required Wall thickness of Pipelines)
     ASME B 31.4 and ASME B 31.8
   - Sustained Loads in Pipelines
   - Stresses due to Thermal Expansion and Contraction
   - Estimating Weight of Pipelines
   - Estimating Maximum Span of Unsupported Pipe
   - Case Study

5. Pipeline Routing
   - Introduction to Routing
   - Factors Affecting Pipeline Routing
   - Easements and ROW
   - Pipeline Routing Thumb Rules
   - Tools & Data Used in Pipeline Routing
   - Case Study

6. Pipeline Welding
   - Basics of Welding
   - Types of Welding Processes
   - Welding Procedures
   - Inspection of Welds

7. Pipeline Construction
   - Introduction
   - Sequence of Construction Activities
   - Construction Equipment
   - ROW (Right of Way) of Pipeline
   - Stringing the Pipeline
   - Bending
   - Welding and Post Welding Qualification
   - Lowering
   - Tie-in Assembly
   - Testing and Inspection
   - Back filling of Trench
   - Water Crossing
   - Commissioning the Pipeline
   - Cleaning & Restoration
   - Case Study

8. Pipeline Testing
   - Hydrostatic Testing
   - Pipeline Construction Video
9. Pipeline Design Consideration
- Valves
- Bends
- Crossings
- Leak Detection

10. Pipeline Protection & Maintenance
- Causes of Pipeline Damage
- Consequences of Pipeline Damage
- Prevention of Pipeline Damage
- Characteristics and Properties of Pipeline Damage
- Corrosion Fundamentals
- Cathodic Protection
- Internal Corrosion
- Stress Corrosion Cracking
- Pipeline Integrity Programs
- Case Study

11. Internal Pipeline Corrosion & Coatings
- Why Pipes Corrode
- Sweet Corrosion, Sour Corrosion etc.
- Local and Generalized Corrosion
- Soils and Microbiologically Induced Corrosion
- Cracking Mechanics
- Calculating Corrosion Rates
- Coating on Pipes
- Application, Refurbishment and Repair of Coatings

12. Pipeline Corrosion Prevention
- Internal Pipeline Corrosion
  - Inhibition of Corrosion
  - Biocide Treatment of Pipelines
  - Monitoring Internal Corrosion
- External Pipeline Corrosion
  - External Corrosion in Soils
  - Coating & their Applications

13. Pipeline Repair
- Pipeline Defects
- Pipeline Repairs (Grinding, Weld Deposition, Sleeves, Clamps, Hot Tapping, Composite Wraps).
- Dressing, Shell Repairs, Fibre Wraps

14. Pipeline Pigging
- Why PIG
- Types of PIGS
- Intelligent Smart PIGS- Metal Loss (MFL, UT)
- Geometry, Mapping, Crack Detection
15. Pipeline Cathodic Protection
- How Cathodic protection works
- Monitoring of CP at Test Points

16. Pipeline Economics & Asset Management
- Introduction to Pipeline Economics
- Terminology Used in Pipeline Economics
- Case Study
- Pipeline Performance – Key Performance Indicators
- KPI’s for Monitoring and Assessing Pipeline Assessment
- Economic Analysis
- Capital Costs
- Operating Costs
  Feasibility Studies and Economic Pipe Size

About the Course Instructor

MOHAMMED KAMAL UDDIN AHMED
Bachelor of Engineering in Mechanical Engineering from Osmania University, Hyderabad, India in the year 1998.
- Piping Specialist since 1998, administered many courses in Piping Engineering, Onshore Pipeline Design & Construction, Pipe Stress Analysis, ASME B31.3, and API 570 Piping Inspection Examination Training & HVAC.

Piping & Pipeline Engineering Specialist
Profile at a glance:
Fourteen years of Progressive experience in projects management, design & maintenance engineering including piping material specifications, pipe stress analysis, mechanical systems, pipe support design, valves specifications and piping specialty items. It includes Design, evaluation, testing, fabrication interpretation, & modification of piping systems. Lead major projects for piping discipline with the world’s most recognized design and owner companies.

- Currently engaged as Engineering Manager - Piping for M/S IPEBS, an engineering firm, based in Hyderabad, India into design and stress analysis of piping and pipeline systems and leading provider of technical trainings globally.
- Special interests include projects management for detailed engineering and mechanical integrity of piping and pipeline systems and Technical Trainings.

M/S IPEBS, Hyderabad, India Engineering Manager- Piping (July 2007 - Present)
Currently engaged as Engineering Manager of M/S IPEBS, an engineering firm based in Hyderabad, India into engineering design of piping and pipeline systems and technical trainings.
M/S IPEBS was founded and incorporated in 2007, in Hyderabad, India. Today, the company consists of twenty-five executive, managerial, technical and administrative employees who manage, coordinate and execute projects successfully.