Onshore Pipeline Design Fundamentals

Course Price

£2750

Course Description

This onshore pipeline design course delivers the basic requirements involved in engineering designing onshore pipelines for all relevant industry sector technical and non-technical professionals.

Course Objectives

• APPRECIATE the fundamentals of onshore Pipeline design
• BE MADE AWARE of innovative pipeline technologies.
• UNDERSTAND what is required to Engineer and design Pipelines.
• CONSIDER the construction and operation of pipelines and the impact on the design.
• ADDRESS the decisions to be made to arrive at a design for construction and operation.
• EVALUATE the Pipeline design variables.
• COMPARE the various Pipeline design codes and standards.
• LEARN the major elements of Pipeline Design.

Who Should Attend

This training is highly recommended for Managers and Engineers involved in the following capacities:
• Oil, Gas, Refined Products, LPGs, CO2 and other products Pipelines
• Operations and maintenance of pipelines
• Health, Safety and Environment
• Inspection
• Loss Prevention
• Technical i.e. Mechanical and Piping Design
• Production and Process
• Project Planning
• Pipeline facilities (Fuel Storage/ Pumping/ Gas Compression)
• Regulatory approval and planning of pipelines
• Environmental protection
• It is also crucial for personnel to have at least 3-5 years’ technical experience
within these industries:
• Oil and Gas
• Refining
• Chemical and Petrochemical
• Industrial Assets

Course Content

Day 1
SESSION 1 – PIPELINE DESIGN CODES AND STANDARDS
  • Design Codes and Standards: ASME B31.4 and
    B31.8. ISO 13623, EN, IGE/TD/1, DNV, comparison
    and overview
  • Setting the Pipeline Design Basis: data required for
designing the pipeline… factors to be considered
  pressure, temperature, yield strength, MAOP.

SESSION 2 – PIPELINE ROUTING
  • Fundamentals in Pipeline Routing: optimising
routings, assessing pinch points, factors that
influence routing, understanding impact on
construction.
  • Pipeline Location Classification: impact of
location, population and selection of design
factor.
  • Techniques: mapping and use of GIS
  • Defining Survey Requirements: what to specify

SESSION 3 – PIPELINE MECHANICAL DESIGN Part 1
  • Design Factors: meaning of design factors,
selection, 0.72 Design Factor, inherent Safety
factors.
  • Calculating Hoop (circumferential) and
  Longitudinal Stresses in Pipelines: basic formulae
  and limiting stresses and basic wall thickness
calculations, equivalent stress: Von Misses.
  • Pipeline Material Plastic deformation; Failure
pressures, upheaval buckling, span calculations.
  • Pipeline Material; Sizes, thicknesses, material
  grades, longitudinal seamed and seamless piping.

SESSION 4 – PIPELINE MECHANICAL DESIGN Part 2
  • Restricting the expansion; restraint by burial.
  • Coatings; factory applied coatings, site
  coatings, types, applications, testing.
  • River / Road Crossings; Directional drilling,
Boring, open cut, typical crossing engineering details.
• Pipeline Testing and Pre-Commissioning: basics for hydrotesting, gauging, swabbing, and handover; intelligent PIG surveying, As-builts.

CASE STUDIES:
West Africa – Engineering and Design conceptual study for a gas pipeline network.

Day 2

SESSION 5 – OPTIMIZING PIPELINE SIZING & CONFIGURATION
• Basics on Hydraulic Design
• Impact of Overpressure and Surge
• Location of Block Valves and AGI Facilities
• Optimizing Pipeline Sizing: impact of diameter (and wall thickness) v cost effective pumping / gas compression and use of basic NPV model to arrive at optimum design.

SESSION 6 – PIPELINE DESIGN GROUND – GEOTECHNICAL INFORMATION.
• Buoyancy forces and control (ground with high water table).
• Static, Live, Earthquake and Thermal Loads
• Pipe Soil interaction; structural assessment. Longitudinal ground movements, vertical uplift and downward bearing …
• Burial types
• Protection of Pipelines from Geotechnical hazards.

SESSION 7 – PIPELINE DESIGN CONSTRUCTABILITY
Part 1
• Pipeline RoW (Right of Way) Design; types of construction plant machinery and working width
• Pipeline Welding; Manual welding techniques, Semi-Automatic welding techniques.
• Trench Excavation and Backfill: practical issues, equipment, what to do with poor ground,
• Pipeline Coatings: coating systems, field joint coating techniques

SESSION 8 – PIPELINE DESIGN CONSTRUCTABILITY
Part 2
• Pipeline Crossings: basics for road, rail and waterway crossings and construction techniques, open cut/HDD/Auger Bore
• Pipeline Testing and Pre-Commissioning: basics for hydrotesting, gauging, swabbing, and handover; intelligent PIG surveying, As-builds.

CASE STUDIES: Based on an actual pipeline project: engineering papers of intent, evaluations for

Day 3
SESSION 9 – CATHODIC PROTECTION Part 1
• Principles of Cathodic Protection: electric current, Anode, Cathode, materials.
• Application of Cathodic Protection: factors to be considered – coatings, electrical continuity, isolation.
• Practical Applications of Cathodic Protection: identification of factors governing the corrosion process, criteria for Cathodic protection of steel, current density, determining Cathodic Protection system type.

SESSION 10 – CATHODIC PROTECTION Part 2
• Galvanic Anode System Design: determining anode parameters of type, weight and location.
• Impressed Current Anode System Design: soil resistivity, power supply, remoteness, ease of construction, land acquisition, ground bed type, anode type, backfill. Design calculations, current attenuation, transformer rectifiers, test posts, special considerations.

SESSION 11 – RELATED STANDARDS SPECIFICATIONS AND DESIGNS
- Material Selection; importance of specifying appropriate material, manufacturing requirements and coatings.
- Component Specifications; specification of valves, traps, barred tees, fittings and flanges, bends etc.
- Design Drawings; standard details, crossing schedules and alignment sheets.
- QRA and EIA; safety and environmental studies and impact on design.
- Tender Packages; what is required for a Concept/ FEED or EPC / Construction type contract, contracting approaches.

CLOSE OUT
Summary of Design Methods
Key Aspects for Design Consideration

CPD Unit
Continuing Professional Development

21 HOURS CPD