TETRA TECH RPS ENERGY | TRAINING

N733: Subsea Pipeline Engineering

Instructor(s): Prof. David Newman

Format and Duration
Classroom - 3 Days

Summary

Subsea pipelines have made a tremendous impact in industry as a safe and reliable 'transport' system for the delivery of liquids, gases and product. Statistically, pipelines have proven to be safer in terms of incidents than surface transport.

This course will provide delegates with a detailed and comprehensive insight into Subsea Pipelines Mechanical Engineering Design, together with the supporting requirements to ensure Pipeline Safety, Integrity And Reliability over their lifetime. Importantly, the course will also present how risks, which pipelines are exposed to, are managed in order to maintain pipeline integrity and safety while complying with legislative and regulatory requirements.

Learning Outcomes

Participants will learn how to:

1. Understand the principles of subsea pipeline design, including material selection and engineering considerations for functionality and durability.
2. Gain proficiency in various subsea pipeline construction and installation methods (S-, J-, and reel lay) and understand their specific applications.
3. Develop strategies for effective pipeline protection and pipeline integrity management, including inspection, maintenance, and repair protocols to ensure operational safety and compliance.
4. Acquire an understanding of the legal and environmental regulations that impact pipeline operations.
5. Analyse real-world case studies to identify best practices and lessons learned in subsea pipeline projects.

Training Method

This is a classroom course consisting of lectures, videos, discussions sessions, case studies and course assessments.

Who Should Attend

The course is intended for graduate engineers, pipeline, materials and corrosion, integrity, facilities, operations & maintenance, and construction & installation engineers, health and safety personnel and project managers.

Course Content

Part 1 Introduction to Subsea Pipelines

- Overview of pipelines and their importance in industry
- Historical development and future trends

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- Types of subsea pipelines: flowlines, export lines, risers, umbilicals
- Industry codes and standards and regulatory frameworks (API, DNV, ISO, etc.)

Pipeline Design Principles

- Pipeline route selection and seabed surveys
- Wall thickness design: pressure containment, collapse, and buckling criteria
- Thermal design and insulation systems
- Flow Assurance Design
- Pipeline materials design and selection
- Pipeline protection - mechanical and corrosion protection

Case Studies & Exercises

Part 2

Structural and Mechanical Design

- Stress analysis: axial, hoop, and bending stresses
- Expansion and thermal buckling
- Pipeline end terminations (PLETs) and inline structures
- Environmental loads: waves, currents, and tides
- Hydrodynamic forces: drag, lift, and inertia
- Free spanning pipelines: vortex-induced vibrations (VIV)
- Seabed interaction and trenching considerations

Pipeline Construction and Installation

- Pipeline laying techniques: S-lay, J-lay, reel-lay
- Installation vessels and equipment
- Pre-commissioning and commissioning activities: flooding, cleaning, and gauging (FCG)
- Riser installation and tie-in procedures

Case Studies & Exercises

Part 3

Subsea Pipeline Integrity Management, Inspection Maintenance and Repair

- Pipeline integrity management systems (PIMS)
- Inspection methods: intelligent pigging (IP/ILI), ROV surveys
- Regulatory framework and industry standards (API 1160, ASME B31.8S, ISO 55000).
- Repair strategies: clamps, spool pieces, subsea welding

- Pipeline ageing – cause and consequences
- Leak detection systems
- Pipeline abandonment and decommissioning

Risk Assessment and Safety

- Hazard identification (HAZID) and risk assessment (QRA)
- Pipeline failure modes: corrosion, fatigue, geohazards
- Emergency response planning
- Case studies on pipeline incidents

Case Studies & Exercises