

Course Title: Subsea Pipeline Engineering

Duration: 5 Days

Course Description:

This comprehensive “Subsea Pipeline Engineering” course comprises of lectures, photos and video presentations, some case studies and workshops providing an overview of subsea pipelines engineering. This course provides an insight to fundamental issues for a robust, safe, and economical design of subsea pipeline systems. The topics of the course are carefully selected to cover pipeline engineering aspects from conceptual to detailed design, installation and pre-commissioning. The principal code followed in this course is DNV-OS-F101 “Submarine Pipeline Systems” together with other DNV recommended practices such as DNV-RP-F105, DNV-RP-F109, DNV-RP-F110 and DNV-RP-F112. However, alternative codes such as ASME, API and PD8010 will be mentioned for comparison.

The attendees will receive a certificate from Z-Subsea by completion of the training course.

This training course helps to gain understanding on:

- Steps involved in engineering and design of subsea pipeline systems from route selection to pre-commissioning;
- Key topics related to engineering of subsea pipeline systems;
- Physical concept behind pipeline design philosophy;
- Criteria for robust and safe design of pipelines.

Who should attend:

- Pipeline engineers;
- Marine engineers;
- Naval architects;
- Subsea and offshore engineers;
- Project engineers and managers;
- Engineers from other sectors of the Oil and Gas industry who wish to gain understanding of subsea pipeline engineering.

Course Contents:

Day - 1:

1. Subsea Field Components

- Flowlines & Pipelines
- Tie-in Spools & Jumpers
- Risers
- Xmas Trees
- Umbilicals
- Deep Water Manifolds and Templates
- Flanges & Diverless Connectors
- Subsea Structures
- Case Study, Video and Photo Presentation
- Photo Presentation

2. Field Layout and Pipeline Route Selection

- Development Options
- Field Architecture
- Subsea Features and Obstructions
- Geophysical Survey
- Geotechnical Survey
- Pipeline Route Selection
- Case Study, Video and Photo Presentation

3. Pipeline On-Seabed Configuration

- Safety Considerations
- Protection Requirement
- Specific Design Considerations for Exposed Pipeline and
- Specific Design Considerations for Buried Pipelines
- Specific Design Considerations for Mattressed Pipelines

4. Flow Assurance

- Multiphase Flow
- Operational Issues
- Pressure Loss in System
- Temperature Change in System
- Multiphase in Oil and Gas Pipelines
- Solids
- Hydrates
- Wax
- Slug Flow
- Path on Phase Envelope

5. Pipeline & Riser Systems

- Single Pipelines
- Piggybacked Pipelines
- Pipe-In-Pipe Pipelines
- Bundles & Riser Systems
- Case Study, Video and Photo Presentation

Day - 2:

6. Design Codes

- Main Standards for Subsea Pipelines
- Battery Limits
- Design Format
- Material and NDT

7. Material selection

- Cost and Safety
- Suitability for Process Conditions
- Operational Reliability
- Design for Integrity
- Optimization of Life Cycle Costs
- Mechanical Properties
- Corrosion Resistance
- Ease of Fabrication
- Coatings
- Design Life

8. Wall Thickness Design

- Safety Classification
- Limit States Design
- Burst Criterion
- External Collapse Criterion
- Alternative Design Codes and Standards
- Mill, Leak and Strength Pressure Tests
- Wall Thickness Selection Workshop

9. Local Buckling for Stress/Strain Based Design

- Load Controlled Condition
- Displacement Controlled Condition
- Axial Strain Checks
- Strain Limits and ECA
- Alternative Design Codes and Standards

Day - 3:

10. Expansion and Tie-in Spools

- Expansion of Pipelines
- Calculating Expansion
- Code Requirements for Tie-in Spools
- Expansion Calculation Workshop

11. Flange Connections

- Flange Connections
- Flange Types
- Flange Components
- Bolt Tightening Methods
- Video Presentation

12. Design of Components

- Pipeline Components
- Component Design Target
- Pipeline and Component Code Break
- Elastic Stress Analysis Method
- Limit-Load Method
- Elastic-Plastic Stress Analysis Method
- Plastic Collapse
- Local Failure
- Plastic Ratcheting

13. Pipeline Global Buckling (Lateral and Upheaval)

- Global Buckling Standards
- Reasons for Global Buckling
- Types of Global Buckling
- Effective Axial Force and its Distribution
- Hobbs Method
- SAR for Lateral Buckling
- Soil Axial and Lateral Resistance
- Design against Lateral Buckling (Buckle Initiators)
- Out-of-Straightness (OoS)
- Case Study and Photo Presentation

Day - 4

14. Design Against Hydrogen Induced Stress Cracking (HISC)

- What is HISC
- Material Load Conditions
- Design Criteria Against HISC
- Principal Stresses
- Stress Linearisation
- Linear Elastic Stress Acceptance Criteria
- Non-linear Strain Acceptance Criteria
- Photo Presentation

15. On-bottom stability

- Factors Influencing On-Bottom Stability
- Current and wave Forces
- Absolute Stability Method
- Generalizes Stability Method
- Remedial Actions for Stability
- On-Bottom Stability Calculation Workshop

16. Pipeline Spanning & VIV Assessment

- Free Span Characteristics
- In-line and Cross flow VIV
- Parameters Affecting Free Spans
- Assessment Flowchart
- Screening Criteria
- Detailed Assessment of Free Spans
- In-Line VIV Response Model
- Cross-Flow VIV Response Model
- Direct Wave Fatigue
- Free span Workshop

17. Pipeline Design and Construction Based on API 1111

- Design for Internal and External Pressure
- Load Categories
- Pressure Level Relationship
- Burst Design
- Longitudinal Load Design
- Combined Load Design
- Collapse due to External Pressure
- Propagating Buckles

Day - 5

18. Construction and Design of Crossings

- Crossing Function
- Crossing Agreement
- Crossing Buried Pipelines
- Small Bore Pipelines Crossing Exposed Pipelines
- Large Bore Pipelines Crossing Exposed Pipelines
- Rockdumping Considerations
- Crossing in Combination with Lateral Buckling
- Video Presentation

19. Pipeline Installation

- Pre-Pipelay Work
- Pipelay
- S-Lay
- J-Lay
- Reel Lay
- Towing
- Trenching / Backfilling
- Rockdumping
- Post-Trenching/Backfilling Work
- Video and Photo Presentation

20. Pre-commissioning

- Testing and Pre-Commissioning Process
- Onshore Hydrotest
- Offshore Strength Test
- Tie-in of Components
- Offshore Leak Test
- Dewatering and Drying
- Nitrogen Packing
- Video and Photo Presentation

21. Pipeline Integrity Management

- Pipeline Integrity Management Overview
- Inspection Techniques
- Internal Inspection
- External Inspection
- Pipeline Monitoring Techniques
- Mitigation
- Intervention
- Repair