Course Title: Risk-Based Pipeline Integrity Management

Duration: 3 Days

Course Description:

Pipeline integrity management is part of maintenance activities required to successfully operate a pipeline over its designed life. This course will give attendance in-depth understanding of the engineering principles behind this concept.

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

This training course helps to gain understanding on:

Overview of integrity management codes and standards
Identification of pipeline typical threats/failures
Definition of Pipeline Integrity Management systems
Assessment and management of Risk (Quantitative and Qualitative)
Pipeline Inspection techniques
Pipeline monitoring techniques
Integrity assessment to BS7910, DNV OS-F101 and API 579-1/ASME-FFS-1
Direct assessment techniques (Internal/External)
Reinforce learning using case studies and worked examples

Who should attend?

- Integrity engineers
- Safety engineers
- Material Corrosion engineers
- Pipeline engineers;
- Subsea and offshore engineers;
- Project engineers and managers;
- Engineers from other sectors of the Oil and Gas industry who wish to gain understanding of pipeline integrity management.

Course Contents:

- **Overview of Integrity Management Codes and Standards**
    - ASME B31.8S "Managing System Integrity of Gas Pipelines"

    - API standard 1160 "Managing System Integrity for Hazardous Liquid pipelines"

    - DNV RP-F116 "Integrity Management Of Submarine Pipeline Systems"

    - NACE Recommended Practice 102 "Inspection of pipelines"

    - Energy Institute Guidelines for the management of integrity of subsea facilities

- **Threat/Anomaly identification**
    - Manufacturing related anomalies
      Lamination
      Lamellar tearing
      Cracking
      Geometrical anomalies
      Fabrication related anomalies
      Cracking
      Misalignment
      Welding related defects
    - In-service (operation) related anomalies:
      Corrosion (internal, external)
      Corrosion of welds
      Third party damages
      Cracking
      High temperature damage

1. **Pipeline statistics, facts and figures**
    - Pipeline incidents in the North Sea and Gulf of Mexico (GOM)
    - Summary of the failure modes

2. **Pipeline Integrity Management (PIM) Systems**
    - Company and individual policy
    - Management of change in operation (service)
    - Operational controls
    - Contingency (reserve) plans
    - Reporting/Audit and review
    - Information management (archiving)

3. **Risk Assessment**
    - Benefit of Risk assessment
    - Approaches in various codes
      UK - IGE/TD/1 Edition 4, PSR (1996), PD8010
      USA - API 1160, ASME B31.8, 49CFR 192&195, API 571/580/581
      Canada - CSA Z 662-99
      Australia – HB 105 (1998)

    - Risk modelling
      Level 1 – Qualitative Risk Ranking
      Level 2 – Semi-quantitative Assessment
      Level 3 – Quantitative Assessment

    - Risk analysis/control
    - Risk-based inspection (RBI)
    - Risk Based Inspection Tools
      API RBI (API)
      Riskwise (TWI)
      Safeti (DNV**)**

4. **Pipeline inspection and testing**
    - Preparation for inspection
      Inspection procedure preparation/approval
      Selection and qualification of personnel
      Inspection history review
      Inspection techniques

    - Inspection techniques:
      API Standard 1163: In Line Inspection Systems
      Key terms and definitions
      Types of tools
      Reporting requirements

    - Performing the inspections
    - Hydrostatic pressure testing
    - Shut-in testing
    - Gas/media testing
    - Reporting

5. Pipeline Monitoring
- Internal and external monitoring systems for oil and gas pipelines
- Flow monitoring and leak detection
- Internal/External monitoring and leak detection for Liquid Pipelines
- Internal/External monitoring and leak detection for Gas pipelines
- Corrosion control system monitoring
- Monitoring probes
- Sonar and magnetic monitoring technologies
- Fibre optic sensing
- Current and vibration monitoring

6. Integrity Assessments
- Overview of available procedures for performing integrity assessments
- Gathering, reviewing and integrating data
- Overview of integrity assessment procedures to:

  BS7910/DNV OS-F101 (Appendix A) "Assessment of crack-like defects under static and dynamic loading"

  API579-1/ASME FFS-1 (Assessment of metal loss (corrosion), Assessment of dents/gouges

  DNV RP-F101 (assessment of corroded pipelines

  ASME B31G or modified B31G (RSTRENG)

  Direct assessment according to NACE ECDA (External Corrosion Direct Assessment

  ICDA (Internal Corrosion Direct Assessment)

- Corrosion Modelling Tools
  de-Waard
  NORSOK
  Freecorp (Ohio Univ.)

Cassandra (BP)
Hydrocor (SHELL)
CORPLUS (Total)

7. Mitigation, Intervention and Repair
- Mitigation planning
  Key drivers
  Selection of the technique
- Mitigation methods
- Intervention planning
  Key drivers
  Selection of the technique
- Intervention techniques
- Repair planning
  Key drivers
  Selection of the technique
- Repair techniques
  Weld metal deposition
  Welded sleeves
  Mechanical clamping
  Coating repair
- Pipe section replacement

Z-Subsea

Excellence in Engineering