YOUR EXPERT TRAINER: DR. ALAN MURRAY

Alan Murray co-author of the text book “Pipeline Design and Construction – A Practical Approach” and author of over fifty published papers. He is currently Chief Engineer at the Canadian National Energy Board.

Pipeline Integrity Management
26 – 27 April 2010, Kuala Lumpur, Malaysia

After attending this course, you will be able to understand:
  o Codes used in developing Integrity Management Plans
  o The elements of an Integrity Management Plan
  o Critical aspects of Risk Assessment Analysis
  o Prevention and mitigation measures
  o Characteristics and limitations of different inspection methods
  o A risk based approach to maintenance

Pipeline Defect Assessment
28 – 30 April 2010, Kuala Lumpur, Malaysia

At the conclusion of this course you will be able to:
  o Identify pipeline integrity threats
  o Improve your knowledge on pipeline material properties, mechanical design and fracture mechanics
  o Benefit from learning through pipeline defect assessment worked examples
  o Understand common types of defects leading to pipeline failure
  o Assess failures for corrosion, dents and gouges, welded joints
  o Understand requirements for tool selection and performance
  o Appreciate the importance of defect detecting and sizing
  o Develop a consistent strategy for determining corrosion and fatigue crack growth rates

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Course Objectives

To provide attendees with the latest techniques used to develop a comprehensive integrity management program covering both pipelines and their associated facilities. The necessary elements of such a program are described in detail with examples of typical program content. The accompanying course notes are written in such a manner as to provide a starting point for a company in either developing its own integrity management plan or updating its current plan.

This training course provides a sound review of Pipeline Integrity Management strategies, in compliance with regulatory requirements. It is highly interactive and takes the form of lectures and case studies. On completion of the training, participants will have a solid understanding of the procedures, strengths, limitations, and applicability of the main issues that comprise a Pipeline Integrity Management Program.

Course Agenda

Introduction
- Overview of Codes Used In Developing Integrity Management Plans
- Brief History of the requirement for Integrity Management Plans
  - ASME B31.8S "Managing System Integrity of Gas Pipelines"
  - API standard 1160 "Managing System Integrity for Hazardous Liquid pipelines"
  - DOT 49 CFR 195 and 192
  - Onshore Pipeline Regulations and CSA Z662 Annex N (Canada)
  - NACE recommended Practice 102

Risk to the Environment
- Quantitative and qualitative methods of risk assessment
- Advantages / disadvantages and limitations of each approach
- Combined approaches based on the relative importance of different threats

Prevention and Mitigation Measures
- Third party damage
- Coating damage and repairs
- Cathodic Protection close interval surveys
- Pipeline patrols, aerial surveillance

Elements of an Integrity Management Plan (IMP)
- Threat Identification – ASME B31.8S Threat categories
- Baseline Assessment Plan
- Direct Assessment Plan
- Conducting an Assessment
- Gathering Reviewing and Integrating data
- Data base: types, GIS software compatibility and risk analysis
  --- Data integration: common systems of reference
- Cartographic information: Availability in S.E Asia (IGM Image Geometry Model, satellite images)
- Record Keeping Provisions and Communication Plans
- Performance Plan
- Management of Change Process
- Case studies

Inspection Methods: Characteristics And Limitations
- API Standard 1163 In Line Inspection Systems
- Key terms and definitions
- Systems Qualification Process
- In Line Inspection System Selection
- ILI - In Line Inspection
  --- Types of tools
  --- Tool accuracy and selection
- Qualification of Performance Specifications
- System operational validation
- System results verification
- Reporting requirements
- Hydrostatic Pressure testing
- Direct assessment
  --- ECDA (External Corrosion Direct Assessment)
  --- ICDA (Internal Corrosion Direct Assessment)
- Practical worked examples of Corrosion and crack growth rate
- Determination of Re - Inspection Intervals

Approaches to Risk Assessment Analysis:
- Objectives of Risk Assessment
- Understanding Pipeline Failure Causes - PRCI's 21 common causes
- Data Elements for a Prescriptive Integrity Management Plan
- Data requirements for a Goal Oriented (performance based) approach to IMP
- High Consequence Areas

Integrity Management Plans for Facilities
- Risk Based Approach to Maintenance
- Failure modes, fault trees and root cause analysis
- Use of historical data on incidents and spills
- Risk Based Inspection (RBI)
- Resource allocation
- Reliability Centered Maintenance (RCM)
3 – day Course Agenda

Background to Pipeline Failure

Threats to Pipeline Integrity

- ASME B31.8S
- Failure Modes
- Failure rates

Pipeline Material Properties

- Strength
- Ductility
- Toughness
- How they are determined

Pipeline Mechanical Design

- Pipeline Stresses
- Design factors
- Combined stresses
- Principal stresses
- Theories of failure

Introduction to Fracture Mechanics

- Linear elastic fracture mechanics
- Plastic fracture mechanics
- Stress intensity factors
- CTOA and CTOD
- Brittle and Ductile modes of failure
- Toughness dependence or plastic collapse
- Pipeline Defect Assessment (with Worked examples)

Common Types of Defects leading to Pipeline Failure

- Qualitative (workmanship) and quantitative assessment processes (engineering critical assessment)
- Fitness for purpose methods and their limitations

Failure Assessment for Corrosion and Crack like Defects:

- Part wall defects, flow stress
- Folias factor, NG18 equations
- Corrosion assessment methods B31G
- Modified B31G, RSTRENG etc
- Longitudinal and Circumferential metal loss
- Corrosion acceptance charts
- Failure pressure ratios

Failure Assessment for Dents and Gouges

- Assessing axial and circumferential gouges
- Smooth dents, spring back and re-rounding, dents with gouges, (fatigue strength assessment)

Failure Assessment for Welded Joints

- Seam and girth welds, types of defects, planar and non planar
- Fatigue crack growth
- Failure Assessment Diagrams
- Codes and Standards for assessment (e.g. EPRG, British Standard 7910, Canadian Standard Z 662 Annex K)

Fracture and Arrest of Dynamic Cracks

- Fracture propagation and crack arrest
- Setting toughness requirements
  - Defect Detection and Sizing

Tool Selection and Performance

- When and where to use MFL, ultrasonic In Line Inspection tools
- Detection and sizing performance

Surface profiling methods

- Measurement of dents, surface cracks and metal loss

Determining Growth rates

- Use of tool data and operational history to predict corrosion and fatigue crack growth rates

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Who Should Attend

Pipeline engineers, designers and service professionals who are involved with the maintenance, inspection, and repair of pipelines.

About your trainer: Dr. Alan Murray

Alan Murray is the Chief Engineer at the Canadian National Energy Board having previously held a number of senior management positions with a large pipeline operating company in North America having responsibility for system planning, construction, maintenance and contracting functions.

His thirty five years of experience spans research, design and development in pipelines and offshore structures. He was the founding chairman of the ASME Pipeline Systems Division and is the co-author of the text book "Pipeline Design and Construction – A Practical Approach" and author of over fifty published papers. Alan is an adjunct professor at the University of Calgary and has given courses on Pipeline Design and Construction throughout the world. He holds a doctorate in Civil Engineering from the Queen’s University of Belfast and is a member of the ASME and the I MechE of London.

About petroEDGE

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The core competencies of professionals in the Oil & Gas industry are constantly evolving. To meet this ever growing gap, Petroedge provides targeted up-to-date, practical and technically sound training solutions that enable engineers to be continuously relevant in industry.

What is the value of our Learning Solutions to you:

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  - Engineering Schools
  - Upstream fundamentals
  - Downstream fundamentals
  - Management Skills Accelerator for Engineers & Technical Professionals
- Accelerate and engage your local workforce to stimulate personal development and increase retention to initiate long-term commitments for global competitiveness.
- On-going research and local presence to facilitate continuous engagement and post training support

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**Pipeline Integrity Management and Defect Assessment, Malaysia**

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