



Pipeline Repair Techniques



Introduction:

The various aspects of pipeline repair using weld and non-weld methods will be covered, as will the concerns for welding onto in-service pipelines and the approaches used to address them.

Who Should Attend?

Pipeline engineers, Operations and Maintenance personnel, inspectors, and welders.

Course Notes:

All delegates will receive a detailed set of lecture notes containing more than 250 pages, providing an invaluable reference document after the course

Course Objectives:

At the end of this course, the participants will be able to:

- Explain the many prevention and detection practices to ensure pipeline safety
- Describe how the use of certain prevention and detection practices from the ASME B31.8S Standard, as well as 49CFR192 regulations, interact for improved performance and ensure maximum safety

- Specify prevention and repair solutions for each threat and improve the IMP performance for gas pipelines
- Explain the reasons why one prevention and repair solution may be better than another; or why both together can be even more effective

Course Outline:

Pipeline Repair Methods/In-Service Welding

- Introduction
- Incentives
- Primary Concerns

Defect Assessment Prior to Repair

- Reason for Assessment
- Types of pipeline defects
- Pressure Reduction Requirements
- Corrosion Measurement Methods
- Corrosion Assessment Methods

Selecting an Appropriate Repair Method

- Pipeline Repair Manual
- Detailed Selection Criteria

Burnthrough and Related Safety Concerns

- Factors Affecting Burnthrough
- Effect of Wall Thickness
- Effect of Heat Input
- Effect of Flow Rate/Pressure
- Avoiding Burnthrough

Hydrogen Cracking Concerns

- Recent Significant Incidents
- Common Factor/Recommendation
- Hydrogen Cracking Requirements
- Welding Metallurgy 101
- Prevention of Hydrogen Cracking

Full-Encirclement Repair Sleeves

- FullEncirclement Sleeve Types
- Principle of Operation
- Assuring Effective Reinforcement
- Sleeve Design
- Sleeve Fabrication

Hot Tap Branch Connections

- Branch Connection Design
- Reinforcement Types
- IntegrallyReinforced

Pipeline Repair by Weld Deposition

- Physical Concept
- History of Weld Deposition Repair
- Burnthrough Risk
- Integrity Restoration
- Practical Application

Code and Regulatory Requirements

- Recent Changes to API 1104
- Code Requirements for Weld Deposition Repair
- NonWelded Repairs

- Repair by Grinding
- Epoxy Filled Shells

Fiber-Reinforced Composite Repairs

- Background
- Examples applications
- Composite repair systems
- U.S. government regulations
- Guidelines for repair using composites
- Test program elements
- Repair of dents and gouges

Technology Demonstrations

Procedure Selection for Hot Tap and Repair Sleeve Welding

- Burnthrough Risk Summary
- Prevention of Hydrogen Cracking
- Welding Procedure Options
- Welder/Procedure Qualification
- Predicting Required Heat Input
- Selecting an appropriate procedure

Practical Aspects of Hot Tap and Repair Sleeve Welding

- Proper electrode handling
- Proper fitup
- Proper welding sequence
- Control of Heat Input Levels
- Inspection and Testing

Question and Answer Alternative Welding Processes for In-Service Welding

- Conventional processes

- Alternative processes
- Branch connection root pass welding
- Cellulosic-coated electrode limitations

A Simple Approach to Hot Tap and Repair Sleeve Welding

- Introduction
- Five General Rules of Thumb
- Prove it Yourself

Lessons to be Learned from Past Pipeline Repair Incidents

- Reported Incidents
- Previously Unreported Incidents
- Ten Commandments of In-Service Welding

Hot Tap List - A Web-Based Discussion Group

- General guidelines/ subscribing
- Start a new topic
- Search/reply to existing topics