Process Equipment and Piping Materials Selection Course

22 – 26 March 2027
Addis Ababa

AGILE LEADERS
Training Center

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Ref: 541_223759 **Date:** 22 – 26 March 2027 **Location:** Addis Ababa **Fees:** 6000 Euro

Overview

Process Equipment and Piping Materials Selection Course is a one-week intermediate course for process, mechanical, materials, corrosion, inspection, maintenance, reliability, and project engineers who leave with a material selection and in-service performance assessment. Participants compare process equipment materials and piping materials selection choices against material properties, process compatibility, temperature, pressure, fabrication and weldability, corrosion and damage mechanisms, inspection evidence, and life-cycle tradeoffs. Agile Leaders Training Center presents materials of construction as an evidence-based engineering decision.

Who Should Attend

- Teams responsible for specifying materials for process equipment and piping
- Personnel who evaluate corrosion, degradation, and material compatibility
- Functions that review fabrication, welding, and examination implications
- Staff who interpret inspection evidence and in-service performance
- Project professionals who balance reliability, availability, and life-cycle cost

The course assumes participants can interpret process conditions, equipment data, and basic material properties, and it leaves out detailed metallurgy, welding qualification, corrosion control design, and inspection certification preparation.

Departments and Industries

The course supports departments and industries that select, procure, operate, inspect, maintain, or replace process equipment and piping.

- Refining, petrochemicals, chemicals, and gas processing
- Power generation, utilities, water treatment, and desalination
- Pharmaceutical, food processing, and industrial manufacturing
- Process, mechanical, materials, corrosion, and project engineering
- Inspection, maintenance, reliability, procurement, and technical assurance

Learning Objectives

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

- Analyze service conditions and material requirements
- Compare metallic and nonmetallic material families
- Evaluate compatibility, fabrication, and weldability constraints
- Diagnose likely corrosion and damage mechanisms
- Use inspection evidence in performance assessment
- Build a traceable material selection recommendation

Course Agenda

Day 1: Service Conditions and Selection Basis

- Process Fluid and Contaminant Characterization Sheet
- Temperature and Pressure Operating Envelope
- Mechanical Property and Toughness Requirement Matrix
- Applicable Materials Requirement Register
- Material Selection Basis Document

Day 2: Material Families and Compatibility

- Carbon and Low-Alloy Steel Comparison Table
- Stainless Steel Grade Selection Map
- Nonferrous Alloy Application Screening Method
- Polymer, Lining, and Composite Suitability Checklist
- Process Environment Compatibility Matrix

Day 3: Fabrication and Damage Mechanisms

- Weldability and Heat-Affected-Zone Review
- Forming, Heat Treatment, and Fabrication Constraint Log
- General and Localized Corrosion Screening
- Temperature-Dependent Degradation Mechanism Map
- Stress-Assisted Damage Susceptibility Review

Day 4: In-Service Evidence and Life Cycle

- Inspection Finding and Material Condition Register
- Failure Mode and Consequence Analysis
- Remaining Performance Assumption Sheet
- Life-Cycle Cost and Availability Comparison
- Material Risk and Uncertainty Decision Matrix

Day 5: Material Selection Practice

- Exercise: Define an Equipment Service Envelope
- Exercise: Screen Candidate Material Families
- Exercise: Match Damage Mechanisms to Inspection Evidence
- Exercise: Compare Fabrication and Life-Cycle Tradeoffs
- Capstone Exercise: Material Selection and Performance Assessment

Practical Exercises

The course uses suggested activities to convert process and integrity evidence into documented material decisions.

- Suggested activity: define fluid, contaminant, temperature, pressure, mechanical, and fabrication requirements for equipment and piping service.
- Suggested activity: compare carbon steel, alloy steel, stainless steel, nonferrous, polymer, lining, and composite options through a compatibility matrix.
- Suggested activity: connect likely corrosion and degradation mechanisms with inspection findings, failure modes, and uncertainty.
- Suggested activity: assemble suitability, fabrication, performance, risk, and life-cycle evidence into a material selection recommendation.

FAQs

Who suits the process equipment and piping materials selection course and what does it assume?

It suits engineers responsible for equipment or piping material decisions and assumes they can interpret operating conditions, equipment data, inspection findings, and basic mechanical and corrosion behavior.

How does materials selection training differ from a corrosion-only course?

Materials selection training integrates service conditions, properties, compatibility, fabrication, inspection evidence, performance, risk, and life-cycle tradeoffs, while a corrosion-only course concentrates primarily on degradation causes, forms, monitoring, and control.

What information drives process piping materials selection?

Process piping materials selection uses fluid composition, contaminants, temperature, pressure, stress, cyclic service, corrosion allowance, fabrication route, joining method, examination needs, availability, and the requirements applicable to the system.

How do damage mechanisms affect process equipment material choices?

Damage mechanisms affect choices by showing which materials may lose thickness, crack, embrittle, soften, oxidize, or otherwise degrade under specific combinations of environment, stress, temperature, and fabrication history.

How is in-service performance evidence used in material selection?

In-service evidence tests assumptions against inspection findings, failure history, measured degradation, repairs, operating changes, and comparable service, helping engineers refine suitability, risk, and replacement decisions.

Conclusion

Participants take back a Material Selection and In-Service Performance Assessment containing the service basis, candidate materials, compatibility screening, fabrication constraints, damage-mechanism review, inspection evidence, risks, and life-cycle comparison. The assessment makes recommendations traceable across engineering and integrity functions. It supports specification, procurement, maintenance, and replacement decisions without replacing project-specific design verification.