MERCURY

Corrosion, Cathodic Protection and Integrity Management

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Corrosion, Cathodic Protection and Integrity Management is a 2-week course for professionals who keep pipelines, vessels and plant piping safe from metal loss. You learn to identify damage mechanisms, design and survey cathodic protection systems, rank assets with risk-based inspection and assess corroded sections, then assemble a Corrosion Integrity Plan for your own assets. Mercury Training Center delivers this corrosion, cathodic protection and integrity management course.

About This Course

Pipelines and plant lose wall thickness quietly until a leak forces a shutdown. This course shows you how to predict where that happens and act first. You should already take part in inspection, maintenance or design reviews. You practice on inspection records, CP survey readings and piping data drawn from production, transmission and treatment sites.

Who It Is For

- Staff responsible for planning inspection intervals and recording wall-thickness findings on pressure equipment.
- Staff who design, commission or survey cathodic protection on buried pipelines, tanks and marine structures.
- Staff accountable for selecting alloys, linings and coatings for new or modified plant.
- Staff who run chemical treatment and monitoring for produced fluids and injection systems.
- Staff who approve repair, rerating or replacement decisions on ageing assets.

This course is not for readers new to industrial plant, who are better served by an introductory course on how degradation starts and is prevented, nor for specialists seeking formal CP technician qualification, who need a dedicated certification-track course.

Competencies You Will Build

- Damage Mechanism Screening: you list the credible degradation threats for each circuit before an inspection plan is written.
- CP System Design: you size anodes or rectifiers for a buried line and justify the current demand.
- CP Survey Interpretation: you read potential, IR-free and close-interval data and flag sections at risk.
- Risk-Based Inspection: you rank equipment by likelihood and consequence and set intervals to match.
- Fitness-for-Service Judgement: you decide whether a corroded section runs, is derated or is repaired.
- Integrity Planning: you turn findings into a scheduled, owned set of mitigation actions.

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What You Will Be Able to Do

By the end of the course you will be able to:

- Given a process flow diagram and fluid analysis, build a corrosion circuit map that names the dominant threat in each loop.
- Using soil resistivity and coating data, calculate the current requirement and anode count for a pipeline section.
- From a close-interval potential survey, identify under-protected or interference-affected spans and propose corrective steps.
- Using API 580 and API 581 principles, produce a risk ranking and inspection interval for a group of vessels and lines.
- Given ultrasonic thickness readings, estimate remaining life and safe operating pressure with ASME B31G.
- From audit findings, draft integrity key performance indicators and a review cycle for a site.

Course Content

Day 1: Metal Loss Fundamentals

- Electrochemical Cell Principles Applied To Pipe And Vessel Walls
- Steel Grades To API 5L And ASME Codes For Line Pipe Selection
- Destructive Testing Results Used In Alloy Qualification
- Cost-Of-Failure Estimates For Leak And Shutdown Scenarios
- Rate Measurement Units And Conversion For Inspection Records

Day 2: Localized and Environmental Damage

- Galvanic Couples At Dissimilar Metal Joints In Process Piping
- Pitting And Crevice Attack Under Deposits And Gaskets
- Microbiologically Influenced Damage In Injection And Firewater Lines
- Wet H2S Cracking And Chloride Stress Cracking In Sour Service
- Erosion, Intergranular Attack And CO2 Metal Loss In Flowlines

Day 3: Hidden Threats and Circuit Mapping

- Corrosion Under Insulation Screening For Hot And Cyclic Piping
- Corrosion Under Pipe Supports And Clamp Inspection Points
- Stray Current And Soil Effects On Buried Assets
- Damage Mechanism Review Using API 571 Descriptions
- Corrosion Circuit Map Preparation From Process Flow Diagrams

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Day 4: Barriers, Coatings and Inhibitors

- Design Changes That Remove Water Traps And Dead Legs
- Coating System Selection And Surface Preparation Checks
- Paint And Lining Types For Tanks, Structures And Pipe
- Inhibitor Selection, Dosing And Residual Monitoring
- Corrosion-Resistant Alloys And Composite Options For Severe Duty

Day 5: Cathodic Protection Design

- Current Demand Calculation From Coating Breakdown Factors
- Sacrificial Anode Sizing For Short Lines And Marine Structures
- Impressed Current Rectifier And Groundbed Layout For Long Pipelines
- Design Criteria Under ISO 15589-1 For Onshore Pipelines
- Electrical Isolation Joints And Test Post Placement

Day 6: CP Surveys and Interference

- Pipe-To-Soil Potential Measurement And Reference Electrodes
- Close-Interval And IR-Free Survey Interpretation
- DC And AC Interference Detection Near Power Lines And Crossings
- Rectifier Output Records And Troubleshooting Low Potentials
- Coating Defect Location With DCVG Data

Day 7: Monitoring and Inspection Techniques

- Ultrasonic Thickness Grids And Data Trending
- Radiographic Profile Inspection Of Insulated Lines
- Weight-Loss Coupons And Electrical Resistance Probes In Process Streams
- Intelligent Pigging Reports And Anomaly Lists
- Wireless Sensors And Analytics For Continuous Wall Monitoring

Day 8: Risk-Based Inspection

- Likelihood And Consequence Ranking With API 580 Methods
- Quantitative Damage Factors Under API 581
- Inspection Interval Setting From Risk Matrices
- Temperature, Pressure, pH And Salinity Inputs To Risk Models
- Cost-Benefit Review Of Inspection And Mitigation Spending

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Day 9: Assessment and Failure Analysis

- Remaining Strength Of Corroded Pipe With ASME B31G
- Remaining Life And Safe Operating Pressure Estimates
- Root Cause Analysis Of Pipeline And Vessel Leaks
- Repair, Derate Or Replace Decision Records
- Lessons From Past Interventions Captured In Site Procedures

Day 10: Integrity Plan Practice

- Exercise: Circuit Map And Threat List For An Assigned Facility
- Exercise: CP Design Check And Survey Review For A Buried Line
- Exercise: Risk Ranking And Interval Setting For Selected Equipment
- Integrity Key Performance Indicators And Review Cycle Design
- Corrosion Integrity Plan Completion And Peer Review

Case Studies and Exercises

The following are suggested activities used during the course:

- Case study: a buried crude transmission line shows falling potentials near a new power line crossing; you decide the cause and the corrective steps.
- Case study: a seawater injection system at a production site develops pinhole leaks; you identify the mechanism and choose between inhibitor and alloy changes.
- Exercise: using thickness data from a refinery overhead line, you calculate remaining life and recommend repair or continued service.
- Exercise: for a desalination plant intake, you rank pumps, pipework and tanks by risk and set inspection intervals.

What You Take Back

You return with a Corrosion Integrity Plan built on your own facility data during the course. In your first month back, use it to brief your team, confirm the threat list with operations and schedule the first round of surveys, inspections and treatment checks it lists.

- A circuit map with the dominant threat for each loop.
- CP design checks and survey criteria for buried and submerged assets.
- A risk-ranked inspection schedule with intervals.
- Integrity key performance indicators and a review cycle.

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Quick Answers FAQ

What should I know before a corrosion, cathodic protection and integrity management course?

You should already work with plant or pipeline equipment in inspection, maintenance, design or operations. Basic chemistry and the ability to read piping drawings help. No prior CP design experience is needed, as the calculations are built step by step.

How does a corrosion, cathodic protection and integrity management course differ from a shorter corrosion basics course?

A shorter basics course explains why metals degrade and the main prevention methods. This course adds CP design and surveys, risk-based inspection, fitness-for-service assessment and the planning that ties them into one integrity system for a site.

When is impressed current cathodic protection chosen over sacrificial anodes?

Impressed current is chosen for long or poorly coated pipelines, large tank farms and high-resistivity soils, where current demand exceeds what anodes can supply economically. Sacrificial anodes suit short, well-coated lines and structures where no power supply is available.

What do I take back from corrosion, cathodic protection and integrity management training?

You take back a Corrosion Integrity Plan for your own assets: a circuit map of threats, CP design checks, a risk-ranked inspection schedule and integrity indicators you can use to brief your team and schedule work.

For Your Manager

After this course, the team member will be able to identify degradation threats, check cathodic protection designs and surveys, rank equipment by risk and judge whether corroded sections can stay in service. They return with a Corrosion Integrity Plan for their own facility, first used to set the next inspection and survey schedule and to support repair decisions.