

Advanced API 571 Damage Mechanisms Investigation Training Course

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Overview

Advanced API 571 Damage Mechanisms Investigation Training Course is a one-week advanced course for corrosion, inspection, materials, reliability, maintenance, and process functions who leave with a Damage Mechanism and Materials Investigation File. Participants connect service conditions, susceptible materials, damage morphology, inspection evidence, and mitigation. The course applies API RP 571 mechanism descriptions to fixed-equipment investigations while separating damage assessment from general materials selection and risk-based inspection planning. Agile Leaders Training Center presents evidence-based damage-mechanism investigation.

Who Should Attend

- Corrosion functions responsible for mechanism identification and monitoring
- Inspection functions responsible for examination evidence and condition assessment
- Materials functions responsible for metallurgy and susceptibility evaluation
- Reliability functions responsible for recurrence and mitigation actions
- Process functions responsible for operating history and exposure conditions
- Technical authorities responsible for integrity decisions and escalation

The course assumes participants interpret process conditions, equipment records, materials data, and inspection findings, and it leaves out certification-exam preparation, detailed laboratory procedures, and quantitative fitness-for-service calculations.

Departments and Industries

The course supports departments and industries that investigate degradation in fixed process equipment.

- Refining and petrochemical operations
- Gas processing and chemical manufacturing
- Power and industrial utility facilities
- Inspection, corrosion, and materials engineering
- Maintenance, reliability, and technical assurance

Learning Objectives

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

- Analyze service conditions and susceptible materials
- Classify damage morphology and credible mechanisms
- Evaluate inspection and laboratory evidence
- Compare competing damage hypotheses
- Prioritize monitoring and mitigation actions
- Build a traceable investigation file

Course Agenda

Day 1: Frame the Investigation

- API RP 571 Damage-Mechanism Classification Map
- Equipment Boundary and Service-History Sheet
- Process Condition and Excursion Timeline
- Materials-of-Construction Verification Register
- Damage Evidence Quality and Gap Matrix

Day 2: Assess Corrosion and Thinning

- Aqueous Corrosion Environment Screening Matrix
- Sulfidation and High-Temperature Corrosion Susceptibility Map
- Localized Corrosion and Under-Deposit Evidence Checklist
- Erosion, Cavitation, and Mechanical Wear Diagnostic Tree
- Corrosion Circuit and Monitoring Location Plan

Day 3: Investigate Cracking and Hydrogen Damage

- Stress-Corrosion Cracking Condition Comparator
- Wet H2S Damage Morphology Decision Guide
- High-Temperature Hydrogen Attack Evidence Map
- Hydrogen Embrittlement and Blistering Review Sheet
- Crack Detection Method and Coverage Matrix

Day 4: Evaluate Metallurgical Degradation

- Creep and Stress-Rupture Assessment Evidence Table
- Temper Embrittlement and Brittle-Fracture Screening Method
- Thermal Fatigue and Mechanical Fatigue Causal Map
- Carburization, Decarburization, and Oxidation Comparator
- Mechanism Monitoring, Mitigation, and Escalation Register

Day 5: Practice Damage Investigation

- Suggested Exercise: Reconstruct Service and Excursion History
- Suggested Exercise: Classify Morphology and Susceptible Materials
- Suggested Exercise: Test Competing Damage Mechanisms
- Suggested Exercise: Select Inspection and Mitigation Actions
- Capstone Exercise: Complete the Damage Mechanism and Materials Investigation File

Practical Exercises

The course uses suggested activities to convert field evidence into traceable integrity decisions.

- Suggested activity: assemble process, materials, inspection, and failure-history evidence.
- Suggested activity: compare morphology and operating conditions against credible mechanisms.
- Suggested activity: select examination methods and define evidence limitations.
- Suggested activity: document mitigation, monitoring, ownership, and escalation actions.

FAQs

Who suits API 571 damage mechanisms investigation training, and what does it assume?

API 571 damage mechanisms investigation training suits corrosion, inspection, materials, reliability, maintenance, process, and assurance functions. It assumes practical use of process conditions, materials data, equipment histories, and inspection evidence.

How does API 571 damage investigation differ from materials selection training?

API 571 damage investigation identifies degradation from service and evidence, while materials selection training compares candidate materials before or during design and replacement decisions.

What evidence supports an API 571 damage-mechanism decision?

The decision uses service history, process excursions, materials verification, morphology, thickness and crack data, examination coverage, laboratory findings, comparable failures, and uncertainty.

How does API 571 support risk-based inspection?

API 571 supports risk-based inspection by identifying credible damage mechanisms, susceptible materials, critical factors, morphology, examination options, and mitigation controls used as inputs to inspection planning.

How are competing fixed-equipment damage mechanisms tested?

Competing mechanisms are tested by comparing required conditions, material susceptibility, location, morphology, progression, inspection response, and contradictory evidence.

Conclusion

Participants take back a Damage Mechanism and Materials Investigation File linking service history, materials, morphology, inspection evidence, competing mechanisms, uncertainty, and actions. It changes disconnected observations into a defensible investigation path. The file supports monitoring, mitigation, inspection, escalation, and integrity decisions.

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