



Industrial Failure Diagnosis and Root Cause Failure Analysis Training Course

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Overview

The Industrial Failure Diagnosis and Root Cause Failure Analysis Training Course is a one-week training course designed for maintenance engineers, reliability specialists, and plant operations personnel seeking systematic methods to eliminate recurring asset breakdowns and improve maintenance reliability. Recurring equipment trips, unresolved component fractures, and repeat downtime erode operational safety and operational margins when teams rely on guesswork rather than evidence. Participants learn structured data collection, metallographic failure modes, logic-tree fault isolation, and corrective action verification to solve complex plant problems. Agile Leaders Training Center provides this specialized failure diagnosis training to help engineering teams embed rigorous investigation standards into daily plant operations.

Who Should Attend

- Maintenance engineers responsible for plant availability, turnaround planning, and breakdown response
- Reliability professionals tasked with asset health monitoring, defect elimination, and reliability-centered maintenance tasks
- Operations supervisors managing continuous production lines, process safety barriers, and equipment uptime
- Mechanical and electrical maintenance personnel conducting physical inspections, overhaul routines, and component replacements
- Quality and plant integrity specialists overseeing defect tracking, compliance audits, and failure reporting

Departments and Industries

- Mechanical and electrical maintenance departments in oil and gas refineries
- Reliability engineering teams in chemical processing plants
- Plant engineering divisions within discrete manufacturing facilities
- Asset management units in power generation and utility stations
- Field service operations supporting mineral processing and mining equipment

Learning Objectives

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

- Apply the Apollo root cause analysis method to model complex physical failures
- Diagnose mechanical failure mechanisms using fracture surface examination and ISO 14224 failure records
- Build fault tree analysis diagrams to isolate physical, human, and latent causes
- Analyze vibration spectra and oil condition reports to identify developing equipment defects
- Prioritize corrective actions using failure mode and effects analysis risk priority numbers
- Evaluate corrective action effectiveness using statistical mean time between failures metrics

Day 1: Failure Investigation Foundations and Evidence Preservation

- ISO 14224 equipment taxonomy and reliability data collection frameworks
- Physical evidence preservation protocols and failure scene photography checklists
- Operating log extraction and digital supervisory control data logging analysis
- Witness interview techniques and human error identification via the TapRoot methodology
- Chain-of-custody documentation and metallurgical sample tagging protocols

Day 2: Mechanical Failure Mechanisms and Defect Identification

- Ductile, brittle, and fatigue fracture surface diagnosis via visual fractography
- Rotational equipment failure diagnosis on bearings and mechanical seals using ISO 10816 standards
- Wear debris categorization and oil analysis interpretation via ASTM D7684 guidelines
- Corrosion mechanism classification covering pitting, stress cracking, and flow-accelerated degradation
- Shaft misalignment, imbalance, and mechanical looseness vibration signature mapping

Day 3: Structured Root Cause Methodologies

- Apollo Root Cause Analysis cause-and-effect charting protocols
- Ishikawa diagram development paired with the 5-Why iterative questioning method
- Fault tree analysis construction according to IEC 61025 specifications
- Distinction mapping between physical causes, human actions, and organizational latent root causes
- Evidence matrix validation and hypothesis testing sheets for competing failure theories

Day 4: Corrective Actions, Reporting, and Recurrence Prevention

- Failure Modes and Effects Analysis update processes utilizing IEC 60812 standards
- Hierarchy of controls deployment to eliminate latent management system weaknesses
- Root cause failure analysis report structuring and executive summary drafting
- Key performance indicator tracking for mean time between failures and defect elimination rates
- Corrective and preventive action log management within enterprise asset management software

Day 5: Investigation Simulation and Capstone Analysis

- Centrifugal pump catastrophic shaft seizure case study and evidence collection exercise
- Gearbox tooth breakage fault tree construction and hypothesis testing exercise
- Compressor trip event data reconciliation and five-why validation exercise
- Industrial failure analysis team review and peer challenge session
- Capstone exercise: end-to-end failure investigation and corrective action plan defense

Practical Exercises

Participants complete applied tasks to reinforce systematic troubleshooting during the course.

- Fracture surface examination and failure mode tagging suggested activity
- Cross-functional fault tree mapping for a pump trip suggested activity
- Five-why validation and evidence verification matrix build suggested activity
- Executive corrective action plan presentation and review suggested activity



FAQs

Who suits this failure diagnosis training and what prior knowledge is assumed?

The failure diagnosis training suits reliability engineers, maintenance leads, and technical inspectors. Participants must understand industrial equipment functions, work with maintenance logs, and manage physical assets. Elementary mechanical trade training and basic plant safety rules are not covered.

How does this failure analysis course differ from a general problem-solving course?

This failure analysis course focuses directly on physical asset degradation, metallurgical evidence, and engineering systems rather than generic business processes. It integrates standards such as ISO 14224 and IEC 61025 with practical engineering data analysis.

How does RCFA training prevent repeat industrial machinery breakdowns?

RCFA training provides systematic tools to identify latent organizational and technical causes instead of stopping at immediate physical component damage. Addressing procedural and design causes prevents identical failures from recurring across operating assets.

Which physical failure modes are covered in equipment failure diagnosis?

Equipment failure diagnosis covers mechanical fatigue, brittle fracture, cavitation, lubrication starvation, alignment errors, and diverse corrosion types. Analysis methods use visual fractography, fluid condition reports, and vibration data to isolate the failure sequence.

Conclusion

Participants return to their facilities equipped with a standardized root cause failure analysis investigation template and an actionable defect elimination workflow. This tangible output enables maintenance departments to replace speculative fixes with evidence-based physical failure diagnosis and structured corrective actions. The systematic approach permanently reduces repeat equipment breakdowns, increases asset reliability, and protects plant productivity.



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