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COURSE BROCHURE

Advanced Root Cause Failure Analysis Training Course

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Registered in the United Kingdom and Saudi Arabia

Advanced Root Cause Failure Analysis Training Course

Advanced Root Cause Failure Analysis is a 2-week training course for reliability engineers, maintenance engineers and investigation leads who must explain why a component broke and stop it breaking again, ending with a Full Failure Investigation Report. Repeat failures of shafts, bearings, pipework and electrical components keep consuming spares, overtime and production in plants that never trace them to their origins. Jupiter Prime Training runs this course for engineers who lead failure investigations.

Why Root Cause Failure Analysis Matters Now

Three pressures push failure investigation higher on the engineering agenda: insurers and senior leadership expect credible explanations after every significant breakdown, experienced metallurgists and machinery specialists are scarce inside most plants, and digital records now make repeat failures easy to spot but not to explain. Sites that investigate rigorously remove whole families of failures; sites that stop at the first plausible cause replace the same part again and again. The course uses EN 13306 for consistent failure, fault and cause vocabulary, so findings read the same way across mechanical, electrical and process teams.

Who Gains Most from Root Cause Failure Analysis

- Engineers who lead investigations after significant equipment breakdowns
- Specialists who examine failed parts and interpret fracture, wear and corrosion evidence
- Engineers who facilitate cross-functional investigation teams with operators and technicians
- Leads who track corrective actions through to verified closure
- Engineers who brief plant leadership and insurers on failure findings

A reliability or engineering department gains most when two or three of its investigators attend together and return with one shared investigation method and report format.

Root Cause Failure Analysis Capabilities

Participants move from guessing at a single cause to proving physical, human and latent causes with preserved evidence and tested logic.

- Specify an evidence preservation plan for parts, positions, people and paper — the first responders at a failure scene
- Assess fracture surfaces and wear patterns to classify the physical failure mechanism — the metallurgical or machinery specialist
- Build a cause-and-effect logic tree verified by evidence — the investigation team and its sponsor
- Apply 5 Whys, fishbone and change analysis at the right depth — the scale of the incident under review
- Design corrective actions that address latent organisational causes — the plant manager approving them
- Communicate findings in a structured failure investigation report — leadership, insurers and peer sites

Key Root Cause Failure Analysis Terms

- Physical root — the material mechanism that made a component fail, such as fatigue, overload, corrosion or wear.
- Human root — a decision or action, or an omission, that allowed the physical mechanism to start or progress.
- Latent root — a system weakness such as a procedure, design standard or training gap that shaped the human root.
- Logic tree — a diagram that breaks a failure event into hypotheses, each kept or discarded on evidence.
- Beach marks — curved lines on a fatigue fracture surface showing how a crack grew in stages over time.
- Corrective action effectiveness — evidence, gathered after closure, that an action actually prevented recurrence.

Root Cause Failure Analysis Day by Day

Day 1: Why Failures Repeat

- Cost of Repeat Failures Model — Choosing Which Events Deserve Investigation
- Investigation Trigger Criteria — Thresholds for Safety, Production and Cost
- EN 13306 Failure, Fault and Cause Vocabulary — Common Investigation Language
- Blame Culture Versus Learning Culture — Conditions for Honest Witness Accounts
- Investigation Charter and Sponsor Role — Scope, Authority and Deadlines

Day 2: Evidence Preservation

- Four Ps Evidence Model — Parts, Position, People and Paper
- Failure Scene Photography and Sketching — Recording Before Anything Moves
- Failed Part Handling and Labelling — Protecting Fracture Surfaces
- Operating Data Retrieval — Trends, Alarms and Control System Logs
- Chain of Custody Records — Keeping Evidence Defensible

Day 3: Interviews and Timelines

- Cognitive Interview Technique — Recovering Accurate Witness Memory
- Sequence of Events Timeline — Ordering Actions, Alarms and Conditions
- Change Analysis — Comparing Failed and Successful Runs
- Barrier Analysis — Defences That Failed or Were Missing
- Interview Notes Consolidation — Separating Fact From Opinion

Day 4: Fracture and Overload Mechanisms

- Ductile and Brittle Overload Features — Reading Fracture Surfaces
- Fatigue Crack Origins and Beach Marks — Estimating Load History
- Stress Concentrations at Keyways and Welds — Design Contributions to Failure
- Torsional and Bending Fatigue Patterns — Identifying the Loading Mode
- Laboratory Testing Requests — Hardness, Chemistry and Microscopy

Day 5: Wear, Corrosion and Electrical Mechanisms

- Adhesive, Abrasive and Erosive Wear — Surface Evidence and Causes
- Corrosion Forms and Environments — Pitting, Crevice and Galvanic Attack
- Bearing Failure Modes Catalogue — Spalling, Fretting and Electrical Fluting
- Electrical Insulation and Connection Failures — Heat and Tracking Evidence
- Lubricant Degradation Evidence — Oxidation, Contamination and Varnish

Day 6: Cause-and-Effect Logic Trees

- Logic Tree Top Event Definition — Stating the Failure Precisely
- Hypothesis Generation and Testing — Keeping or Discarding Each Branch
- Physical, Human and Latent Roots — Drilling Past the Obvious Cause
- Evidence Verification Log — Linking Every Branch to Proof
- Logic Tree Software and Templates — Consistent Investigation Records

Day 7: Supporting Analysis Methods

- 5 Whys Discipline — Where It Works and Where It Misleads
- Fishbone Diagram Categories — Structuring Team Brainstorms
- Fault Tree Basics for Complex Events — Combining Multiple Contributors
- Human Error Classification — Slips, Lapses, Mistakes and Violations
- Method Selection Matrix — Matching Depth to Incident Severity

Day 8: Corrective Actions That Last

- Hierarchy of Corrective Actions — Eliminate, Engineer, Procedure, Train
- Latent Cause Remedies — Standards, Procedures and Competence Gaps
- Action Owner and Due Date Assignment — Accountable Follow-Through
- Corrective Action Tracking Register — Status, Overdue Items and Escalation
- Effectiveness Verification — Proving Recurrence Has Stopped

Day 9: Reporting and Organisational Learning

- Investigation Report Structure — Summary, Evidence, Analysis and Actions
- Executive Briefing Note — One-Page Findings for Leadership
- Lessons Learned Distribution — Sharing Findings Across Similar Assets
- Investigation Quality Review — Peer Challenge Before Sign-Off
- RCFA Performance Measures — Investigations Closed and Repeat Events Avoided

Day 10: Practising the Full Failure Investigation Report

- Evidence and Timeline Methods Applied — Reconstructing a Real Breakdown
- Failure Mechanism Findings Applied — Confirming the Physical Root
- Logic Tree and Human Factors Applied — Identifying Human and Latent Roots
- Corrective Action Hierarchy Applied — Selecting Lasting Remedies
- Full Failure Investigation Report Completion — Ready for Sponsor Sign-Off

Applying Root Cause Failure Analysis After the Course

- Set up an evidence kit and failure scene checklist so the next significant breakdown is preserved before repairs start.
- Re-open one recent repeat failure, build a logic tree from available evidence and present the latent causes to the plant manager.

Root Cause Failure Analysis Questions FAQ

What is advanced root cause failure analysis and why does it matter now?

Root cause failure analysis is a structured investigation that proves the physical, human and latent causes of an equipment failure. It matters now because leadership and insurers expect credible explanations, and repeat failures in refineries, power stations and food plants waste spares and production.

Which roles gain most from advanced root cause failure analysis?

Reliability engineers, maintenance engineers and investigation leads gain most. They examine failed parts, run investigation teams and track actions, so evidence handling, failure mechanism recognition and logic trees directly improve the quality of their conclusions.

How does advanced root cause failure analysis differ from a general problem-solving course?

It adds physical evidence and failure mechanisms. A general problem-solving course teaches brainstorming tools; here participants read fracture surfaces, wear and corrosion evidence and test every hypothesis on a logic tree before choosing corrective actions.

What do you bring back from advanced root cause failure analysis training?

You bring back a completed investigation of a real breakdown. It includes preserved evidence, a timeline, the confirmed failure mechanism, a verified logic tree and a corrective action register ready for sponsor approval.

Root Cause Failure Analysis: The Way Forward

The Full Failure Investigation Report gives the investigation sponsor a defensible account of one breakdown and the actions that prevent it. Its first decision is which corrective actions are funded now. Reliability engineers and plant managers use it to brief leadership and peer sites. After three months, revisit the action register to verify that the failure has not returned.