



Root Cause Failure Analysis (RCFA) Course: Equipment Failure Mechanisms and Logic Trees



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Introduction:

Root cause failure analysis RCFA, covering equipment failure mechanisms and logic trees, is a 1-week course for maintenance, reliability and asset integrity specialists and their managers, ending with an RCFA Report and Corrective Action Plan for a case equipment failure. Plants lose output when the same pumps, compressors and gearboxes fail repeatedly because parts are replaced without finding the physical, human and latent causes. Nominees already handle breakdowns or reliability work; teaching is by case study on failed components and work order histories. CoreConcept Training Center delivers this root cause failure analysis course.

Course Objectives:

- Select bad actors and RCFA triggers from downtime, cost and recurrence data held in the maintenance system
- Identify fatigue, wear, corrosion and overload mechanisms from fracture surfaces and damage patterns on failed components
- Collect and preserve failure evidence with the PROACT 5P approach before parts are discarded or repaired
- Build and verify a logic tree that traces an equipment failure from the event to physical, human and latent root causes
- Choose corrective actions that remove latent causes and track their effectiveness in an action register
- Produce an RCFA Report and Corrective Action Plan for a case equipment failure

Target Audience:

- Maintenance engineers responsible for diagnosing breakdowns and repeat failures on rotating and static equipment
 - Reliability engineers responsible for bad actor lists, failure data and reliability improvement work
 - Asset integrity and inspection specialists responsible for corrosion, wear and degradation findings
 - Maintenance supervisors responsible for work execution, repair quality and failure reporting
 - Maintenance and reliability managers responsible for sponsoring analyses and approving corrective actions
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Course Outline:

Day 1: RCFA Foundations and the Failure Data Baseline

- RCFA Scope Compared With Troubleshooting and Quick Repairs
- Pareto Analysis of Downtime for Bad Actor Selection
- RCFA Trigger Criteria Based on Cost, Safety and Recurrence
- Maintenance System Work Order History Review for Repeat Failures
- Failure Cost Estimate for the Annual Loss Baseline

Day 2: Failure Modes, Mechanisms and Physical Evidence

- Fatigue Fracture Features Including Beach Marks and Ratchet Marks
- Adhesive, Abrasive and Erosive Wear Pattern Recognition
- Corrosion Mechanism Identification From Deposits and Pitting Morphology
- Ductile and Brittle Overload Fracture Surface Comparison
- Bearing, Seal and Gear Damage Pattern Interpretation

Day 3: Evidence Preservation and Structured Analysis Methods

- PROACT 5P Evidence Collection and Preservation Plan
- Analysis Team Charter With Roles and Ground Rules
- Logic Tree Construction From Failure Event to Modes
- Hypothesis Verification Using Tests, Measurements and Records
- Fishbone, 5 Whys and Fault Tree Method Selection

Day 4: Human and Latent Roots, Corrective Actions and Pitfalls

- Physical, Human and Latent Root Cause Classification
- Latent Root Exposure in Procedures, Training and Design Systems
- Interview Techniques for Human Decisions Without Assigning Blame
- Corrective Action Hierarchy From Elimination to Condition Monitoring
- RCFA Pitfalls Including Premature Conclusions and Scope Creep

Day 5: Case Study and the RCFA Report

- Case Failed Component Evidence Review and 5P Plan
 - Case Logic Tree Build and Hypothesis Verification Record
 - Case Root Cause Classification and Corrective Action Selection
 - Action Tracking Register With Owners and Effectiveness Checks
 - RCFA Report and Corrective Action Plan Completion and Presentation
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Skills You Will Gain:

- Bad Actor Prioritisation
- Fracture Surface Interpretation
- Failure Mechanism Diagnosis
- Failure Evidence Preservation
- Logic Tree Analysis
- Hypothesis Testing
- Latent Cause Identification
- Corrective Action Tracking

Why Attend This Course:

- Deliver an RCFA Report and Corrective Action Plan to the maintenance manager and the reliability review meeting
- Decide which failures justify a full RCFA and which need only a repair record
- Avoid repeat breakdowns, unplanned shutdowns and spare part spending caused by replacing parts without removing causes
- Coach technicians and supervisors on evidence preservation and failure reporting before parts are scrapped

Conclusion:

Back at work, the participant presents the RCFA Report and Corrective Action Plan to the maintenance manager, the reliability engineer and the operations lead. They use it to approve design, procedure or training changes, assign action owners and decide whether the equipment needs closer condition monitoring. Three to six months after the actions close, the unit should compare the failure frequency and downtime of the equipment with the baseline and reopen the analysis if the failure returns.

Frequently Asked Questions FAQ:

What should participants know before a root cause failure analysis RCFA course?

Participants should already maintain, inspect or improve plant equipment and read basic maintenance records. Bringing anonymised work orders, failure reports or photographs of a failed component helps them apply the case study work to their own plant.

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

This course analyses physical equipment failures: fracture surfaces, wear, corrosion and overload evidence traced through a logic tree to latent causes. General problem-solving courses apply tools such as 5 Whys to quality or process issues without reading failed parts.

Why does root cause failure analysis RCFA look beyond the physical cause of a failure?

A broken shaft or worn bearing is only the physical root. Human decisions and latent causes, such as weak procedures, training gaps or design limits, allow it to happen, and the failure returns unless those are corrected.

What do participants take back from the root cause failure analysis RCFA course?

Participants take back an RCFA Report and Corrective Action Plan with a bad actor ranking, 5P evidence plan, verified logic tree, root cause classification and an action register they can apply to failures in their own plant.