

Course No. 1299

Root Cause Analysis (RCA) for Reliability Improvement Training Course

RELIABILITY & ASSET MANAGEMENT
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Root Cause Analysis (RCA) for Reliability Improvement Training Course provides a structured and practical framework for investigating equipment failures, recurring operational problems, and reliability issues. The course enables professionals to move beyond treating symptoms and identify the underlying causes that contribute to failures, performance losses, and recurring operational disruptions. Participants develop the analytical skills required to conduct effective root cause investigations and translate findings into sustainable reliability improvements.

Root Cause Analysis is a fundamental discipline within reliability engineering, maintenance management, asset management, and operational excellence. Repeated equipment failures can increase maintenance workload, disrupt operations, reduce asset availability, and create unnecessary costs when organizations focus only on restoring equipment rather than eliminating the causes of failure. A structured RCA methodology enables organizations to understand why failures occur and develop corrective actions that address the underlying conditions responsible for them.

The course covers a comprehensive range of Root Cause Analysis tools and techniques, including the Five Whys, Fishbone and Ishikawa diagrams, Pareto Analysis, Fault Tree Analysis, Event Analysis, failure investigation, and structured cause-and-effect analysis. Participants will learn how to collect and validate evidence, analyze maintenance and operational data, distinguish between immediate and underlying causes, and determine whether proposed root causes are supported by evidence.

Through practical exercises, industrial case studies, and structured investigation workshops, participants will learn how to lead RCA investigations, prioritize recurring failures, develop effective corrective and preventive actions, and verify whether implemented solutions have successfully prevented recurrence. The course also connects Root Cause Analysis with reliability improvement programs, Failure Modes and Effects Analysis, criticality analysis, Reliability-Centered Maintenance, maintenance optimization, and asset performance management.

Objectives

- Analyze equipment failures and operational problems using a structured Root Cause Analysis methodology throughout the training.
- Develop clear cause-and-effect relationships identifying immediate, underlying, contributing, and root causes of failures.
- Apply appropriate Root Cause Analysis tools according to the nature, complexity, and significance of each problem.
- Evaluate technical, operational, maintenance, and historical evidence before validating proposed root causes.
- Analyze maintenance, failure, inspection, and operational data to identify recurring patterns and failure trends.
- Assess failures according to frequency, criticality, operational impact, and business consequences to establish investigation priorities.
- Design corrective and preventive actions that directly address identified root causes rather than recurring symptoms.
- Improve maintenance and reliability performance by converting RCA findings into practical reliability improvement initiatives.
- Strengthen the ability of engineering, maintenance, and operations teams to lead structured failure investigations.
- Implement practical methods for monitoring corrective actions and measuring their effectiveness after implementation.
- Align Root Cause Analysis findings with reliability improvement, FMEA, FMECA, criticality analysis, and Reliability-Centered Maintenance programs.
- Develop a practical framework for integrating RCA into organizational reliability and continuous improvement processes.

Who Should Attend

The Root Cause Analysis (RCA) for Reliability Improvement Training Course is designed for professionals responsible for reliability, maintenance, engineering, operations, asset performance, and technical improvement. It is particularly suitable for Reliability Engineers, Maintenance Engineers, Equipment Engineers, Mechanical Engineers, Electrical Engineers, Instrumentation and Control Engineers, Process Engineers, Failure Analysis Specialists, Asset Management Specialists, Maintenance Planners, Maintenance Supervisors, and Reliability Improvement Professionals.

The course is also highly relevant to Reliability Managers, Maintenance Managers, Engineering Managers, Operations Managers, Asset Managers, Plant Managers, Technical Services Managers, Maintenance Superintendents, and department heads responsible for investigating equipment failures and recurring operational problems. It is especially valuable for professionals involved in preventive and predictive maintenance, equipment performance improvement, criticality assessment, operational risk management, and reliability programs.

Executives, project managers, technical decision makers, engineering leaders, and professionals responsible for asset lifecycle performance will also benefit from understanding how RCA findings can be converted into measurable improvement decisions. The course is applicable across manufacturing, power generation, utilities, transportation, mining, petrochemicals, oil and gas, infrastructure, process industries, and other asset-intensive organizations.

Learning Outcomes

- Conduct structured Root Cause Analysis investigations from problem definition through corrective action and verification.
- Distinguish between symptoms, immediate causes, underlying causes, root causes, and contributing factors.
- Apply the Five Whys methodology to appropriate equipment and operational problems.
- Construct Fishbone and Ishikawa diagrams to categorize technical, operational, human, environmental, and organizational causes.
- Develop and interpret Fault Tree Analysis models to establish logical relationships between failures and contributing events.
- Analyze maintenance records, failure histories, inspection reports, and operational data to identify recurring failure patterns.
- Prioritize failures and operational problems according to criticality, frequency, risk, and impact on business performance.
- Validate proposed root causes using technical evidence, operational information, testing, and documented facts.
- Develop corrective and preventive actions that address root causes and reduce the likelihood of recurrence.
- Establish methods for monitoring corrective actions and verifying the sustainability of reliability improvements.

- Prepare professional RCA reports covering the problem statement, evidence, analysis, root causes, recommendations, and implementation status.
- Integrate RCA findings with reliability engineering, asset management, maintenance optimization, FMEA, FMECA, and Reliability-Centered Maintenance.

Course Outline

DAY 01

Root Cause Analysis Fundamentals and Reliability Improvement

- Introduction to Root Cause Analysis and its role in reliability improvement
- The difference between treating symptoms and eliminating root causes
- Relationship between RCA, reliability engineering, maintenance, asset management, and operational excellence
- Immediate causes, underlying causes, root causes, and contributing factors
- Developing a clear and evidence-based problem statement
- Criteria for selecting failures and problems that require RCA investigation
- Principles of evidence collection and failure investigation
- Roles of maintenance, engineering, operations, and management teams in RCA

PRACTICAL APPLICATION

Define an operational failure, establish the investigation scope, and identify the required evidence and information

DAY 02

Root Cause Analysis Tools and Analytical Techniques

- Five Whys methodology and practical applications
- Fishbone and Ishikawa cause-and-effect analysis
- Categorizing causes across equipment, materials, methods, environment, people, and processes
- Pareto Analysis for identifying priority problems and dominant contributors
- Fault Tree Analysis and logical modeling of failure causes

DAY 02 — CONTINUED

- Event sequence analysis and identification of contributing conditions
- Cause-and-effect relationships and evidence-based reasoning
- Selecting the appropriate RCA tool according to problem complexity
- Common Root Cause Analysis mistakes and how to avoid unsupported conclusions

PRACTICAL APPLICATION

Apply Five Whys, Fishbone Analysis, and Pareto Analysis to a recurring equipment failure

DAY 03

Failure Investigation and Data-Driven Root Cause Analysis

- Structured methodology for investigating equipment and system failures
- Collecting information from maintenance records, operating logs, inspections, and monitoring systems
- Failure history analysis and identification of recurring patterns
- Using Mean Time Between Failures and Mean Time To Repair data to support failure investigations
- Chronological event analysis and identification of deviations from normal operating conditions
- Validating potential causes through technical and operational evidence
- Human, procedural, organizational, and operational factors contributing to failures
- Distinguishing evidence-based root causes from assumptions and opinions
- Linking RCA with Failure Modes and Effects Analysis and criticality analysis

PRACTICAL APPLICATION

Conduct a complete RCA investigation using maintenance, failure, and operational data

DAY 04

Corrective Actions and Reliability Improvement

- Converting RCA findings into effective corrective and preventive actions
- Difference between corrective actions and preventive actions

DAY 04 — CONTINUED

- Developing actions that eliminate root causes rather than repeatedly treating symptoms
- Evaluating alternative solutions and selecting sustainable improvement measures
- Linking corrective actions to equipment design, maintenance practices, operating procedures, and technical controls
- Using RCA findings to improve preventive and predictive maintenance programs
- Converting failure investigations into reliability improvement initiatives
- Establishing action owners, resources, priorities, deadlines, and implementation requirements
- Managing organizational and technical changes resulting from reliability improvements

PRACTICAL APPLICATION

Develop a corrective and preventive action plan for a recurring equipment failure and establish measurable performance indicators

DAY 05

RCA Implementation and Building a Reliability Improvement Culture

- Establishing an organizational Root Cause Analysis framework
- Defining criteria for selecting failures and problems for formal RCA investigations
- Building RCA investigation teams and assigning responsibilities
- Documenting investigation results and preparing professional technical reports
- Monitoring corrective actions and verifying that failures do not recur
- Developing performance indicators for RCA effectiveness and reliability improvement
- Integrating RCA with Reliability-Centered Maintenance, FMEA, FMECA, and criticality analysis
- Using lessons learned from failures to improve equipment design, maintenance procedures, operating practices, and workforce capability
- Building a proactive organizational culture focused on learning from failures and preventing recurrence

DAY 05 — CONTINUED

FINAL WORKSHOP

Complete an end-to-end Root Cause Analysis case study, prepare a professional RCA report, and develop a reliability improvement implementation and follow-up plan

Register or Request More Information

Course page: <https://quest-training.com/courses/root-cause-analysis-rca-for-reliability-improvement-training-course>

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