

Course No. 2025

Root Cause Failure Analysis of Rotating Equipment Training Course

RELIABILITY & ASSET MANAGEMENT
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Root Cause Failure Analysis of Rotating Equipment Training Course provides a practical and systematic framework for identifying, analyzing, and eliminating the underlying causes of failures in rotating machinery. The programme is designed to help maintenance, reliability, and engineering professionals move beyond correcting immediate failure symptoms toward preventing recurrence and improving equipment reliability.

Participants will examine failure mechanisms affecting critical rotating equipment, including pumps, compressors, turbines, fans, blowers, gearboxes, motors, and other mechanical drive systems. The course addresses mechanical, operational, lubrication, alignment, vibration, electrical, process, and human factors that can contribute to equipment failure.

The programme introduces structured root cause failure analysis methodologies, supported by evidence collection, failure history analysis, inspection findings, vibration data, lubrication condition, operating parameters, maintenance records, and equipment documentation. Participants will learn how to distinguish immediate, contributing, and root causes and how to develop technically justified corrective and preventive actions.

Through practical case studies, failure investigation exercises, fault analysis, cause-and-effect techniques, and an integrated workshop, participants will develop the ability to conduct effective failure investigations, identify recurring failure patterns, improve maintenance strategies, and strengthen reliability and operational performance.

Objectives

- By the end of this training course, participants will be able to:
- Explain the principles and objectives of root cause failure analysis.
- Analyze common failure mechanisms affecting rotating equipment.
- Identify immediate, contributing, and systemic causes of equipment failures.
- Apply structured methodologies for investigating rotating equipment failures.
- Collect and evaluate technical evidence during failure investigations.
- Analyze equipment operating conditions and historical failure data.

- Interpret vibration, lubrication, alignment, and inspection information.
- Evaluate the effects of installation, operation, maintenance, and process conditions on equipment reliability.
- Apply cause-and-effect analysis and other root cause investigation techniques.
- Distinguish between symptoms, failure mechanisms, contributing factors, and root causes.
- Assess recurring equipment failures and identify common patterns.
- Develop technically appropriate corrective and preventive actions.
- Evaluate maintenance practices and identify opportunities for reliability improvement.
- Prioritize failure causes according to risk, frequency, and operational impact.
- Develop effective failure investigation reports and recommendations.
- Establish a structured framework for preventing recurrence and improving rotating equipment reliability.

Who Should Attend

This course is designed for mechanical engineers, rotating equipment engineers, maintenance engineers, reliability engineers, condition monitoring specialists, maintenance planners, and technical professionals responsible for the reliability and performance of rotating machinery.

It is also suitable for maintenance managers, engineering managers, operations professionals, inspection specialists, vibration analysts, lubrication specialists, equipment engineers, reliability leaders, and supervisors involved in equipment failure investigation and maintenance improvement.

The programme is particularly relevant to professionals working in oil and gas, refineries, petrochemical plants, power generation, energy, water and utilities, manufacturing, chemical processing, mining, marine operations, and other asset-intensive industries.

Learning Outcomes

- Upon completion of the course, participants will be able to:
- Conduct a structured investigation of rotating equipment failures.
- Identify failure modes affecting pumps, compressors, turbines, motors, gearboxes, and related machinery.

- Analyze mechanical and operational evidence associated with equipment failures.
- Evaluate failure history and maintenance records to identify recurring problems.
- Interpret relevant vibration and condition monitoring information.
- Assess lubrication-related failures and contamination issues.
- Identify misalignment, imbalance, looseness, resonance, and mechanical installation problems.
- Evaluate the impact of operating conditions and process variables on equipment performance.
- Analyze human, maintenance, design, and procedural contributing factors.
- Separate failure symptoms from actual root causes.
- Apply structured analytical tools to establish cause-and-effect relationships.
- Develop corrective actions that address the underlying causes of failure.
- Recommend preventive actions to reduce recurrence probability.
- Prioritize reliability improvement opportunities based on risk and business impact.
- Prepare professional root cause failure analysis reports.
- Develop an actionable reliability improvement plan for rotating equipment.

Course Outline

DAY 01

Fundamentals of Rotating Equipment Failure Analysis

- Principles of root cause failure analysis
- Failure modes, mechanisms, symptoms, and consequences
- Failure patterns and equipment reliability
- Overview of pumps, compressors, turbines, motors, fans, blowers, and gearboxes
- Mechanical and operational failure mechanisms
- Equipment criticality and failure consequences
- Failure history and maintenance records
- Establishing the scope of a failure investigation

PRACTICAL APPLICATION

Developing a rotating equipment failure investigation plan

DAY 02

Failure Evidence, Inspection and Condition Monitoring

- Failure investigation process and evidence collection
- Visual inspection and physical evidence
- Equipment operating data and process conditions
- Vibration analysis and condition monitoring information
- Lubrication analysis and contamination indicators
- Temperature, pressure, flow, and operating parameters
- Alignment and balancing information
- Maintenance history and previous corrective actions
- Inspection findings and equipment documentation

PRACTICAL APPLICATION

Evaluating technical evidence from a rotating equipment failure

DAY 03

Root Cause Analysis Techniques for Rotating Machinery

- Cause-and-effect relationships
- Failure mechanism identification
- Immediate, contributing, and root causes
- Cause-and-effect diagrams
- Fault tree and systematic failure analysis
- Five Whys and structured questioning
- Human, organizational, maintenance, and design factors
- Operational and process-related causes
- Identifying recurring and systemic failure causes

PRACTICAL APPLICATION

Conducting a complete root cause analysis of a rotating equipment failure

DAY 04

Corrective Actions, Reliability Improvement and Failure Prevention

- Developing corrective and preventive actions
- Eliminating recurrence rather than treating symptoms
- Maintenance strategy improvement
- Preventive and predictive maintenance considerations
- Equipment installation, alignment, balancing, and lubrication improvements
- Operating procedure and process improvements
- Spare parts and component quality considerations
- Risk-based prioritization of corrective actions
- Measuring the effectiveness of implemented actions

PRACTICAL APPLICATION

Developing a failure elimination and reliability improvement plan

DAY 05

Failure Reporting, Reliability Governance and Integrated Analysis

- Structure of professional failure investigation reports
- Technical findings and evidence-based conclusions
- Failure trends and recurring problem analysis
- Reliability indicators and equipment performance monitoring
- Lessons learned and organizational knowledge
- Integrating failure analysis with reliability programmes
- Management reporting and escalation
- Tracking corrective action effectiveness
- Building a continuous failure prevention culture
- Final Integrated Workshop: Conducting a complete Root Cause Failure Analysis for a critical rotating equipment failure and developing a corrective and preventive action plan



Register or Request More Information

Course page: <https://quest-training.com/courses/root-cause-failure-analysis-of-rotating-equipment-training-course>

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