MERCURY

Advanced Rotating Equipment Reliability Engineering Course

3 – 14 May 2027
Madrid (Spain)



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Advanced Rotating Equipment Reliability Engineering Course

Ref: 16224_1011362 **Date:** 3 – 14 May 2027 **Location:** Madrid (Spain) **Fees:** 11100 Euro

Advanced Rotating Equipment Reliability Engineering Course is a two-week course for engineers and analysts who already maintain pumps, compressors, turbines and fans and now need to predict failures and prove the value of reliability work. It adds predictive models, failure pattern analysis and a business-linked reliability framework to the basics. You build a Rotating Equipment Reliability Plan for your site. Mercury Training Center runs this two-week edition.

About This Course

Machine trains at the heart of a process keep failing the same way, yet maintenance plans stay unchanged and managers see cost without results. To follow the course you should already maintain, inspect or plan work on rotating machinery. You practice on failure data, models and worksheets, then apply each method to machines from your own site.

Who It Is For

- People who keep rotating machinery available and plan its maintenance
- People who analyze failures and set reliability targets for critical equipment
- People who run condition monitoring and interpret machine health data
- People who supervise operations that depend on pumps, compressors and turbines
- People who audit asset performance and advise on improvement projects

This course is not for readers who want a one-week introduction to rotating equipment reliability, who are better served by a shorter overview course, or for machine designers, who are better served by a mechanical design course.

Competencies You Will Build

- Reliability modeling: estimates inherent reliability with deterministic, Markov and Monte Carlo models.
- Failure pattern diagnosis: reads failure data and Weibull plots to choose the right response.
- Criticality-based planning: ranks machines by consequence and sets cost-effective tasks.
- Condition-based decisions: acts on vibration, thermal, oil and acoustic data before failure.
- Root cause investigation: leads RCFA and closes repeat failures with lasting actions.
- Business-linked reliability: ties KPIs and ROI to plant objectives and wins management support.

What You Will Be Able to Do

By the end of the course you will be able to:

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- From a machine train layout, build a Monte Carlo model and estimate its availability.
- Given failure records for a pump fleet, fit a Weibull distribution and name the failure pattern.
- Using an RCM decision worksheet, select tasks for each functional failure of a critical compressor.
- From vibration and oil analysis trends, decide when to intervene and justify the timing.
- Given a repeat bearing failure, map the event, build a cause tree and set corrective actions.
- Using reliability KPIs and cost data, present the return of an improvement project to managers.

Course Content

Day 1: Reliability and Competitive Advantage

- Reliability Definition and Probability of Failure for Machine Trains
- Reliability Metrics: MTBF, Availability and Failure Rate
- Strategic Importance of Reliability to Plant Output
- Assessing Current Performance With a Reliability Baseline
- Strategic Choices on Run, Repair or Replace

Day 2: Modeling Inherent Reliability

- Basic Modeling Building Blocks for Machine Trains
- Deterministic Models of Inherent Reliability
- Probabilistic Models and Failure Distributions
- Markov Chains for Standby and Repairable Machines
- Monte Carlo Simulation of Failure Scenarios

Day 3: Failure Patterns and Weibull Analysis

- Origins of Failure in Design, Installation and Operation
- Failure Types in Bearings, Seals and Couplings
- Six Common Failure Patterns and What They Imply
- Weibull Analysis of Machine Failure Data
- Matching Maintenance Tasks to Failure Patterns

Day 4: Criticality and Failure Management

- Risk Assessment and Criticality Ranking of Machines
- Equipment Functions and Functional Failures
- FMEA for Rotating Machinery
- Failure Consequence Classification
- Task Selection and a Practical Maintenance Plan

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Day 5: Setting Up Continuous Reliability Improvement

- Improvement Potential Versus Cost Assessment
- Obtaining Senior Management Support
- CRI Project Framework and Governance
- Technical and Human Considerations in CRI
- Likely Results and Review Cycles

Day 6: Reliability KPIs and Business Objectives

- Linking Reliability KPIs With Business Objectives
- Defining Measurable Reliability Targets
- Cost Versus Performance Evaluation
- Data Collection Systems for Asset Health
- Translating Maintenance Results Into ROI

Day 7: Condition Monitoring and Predictive Analytics

- Vibration Monitoring of Pumps, Fans and Compressors
- Thermal Monitoring of Bearings and Drives
- Oil Analysis and Acoustic Testing
- Predictive Analytics Tools and Real-Time Data in Planning
- Early Fault Detection and Alarm Limits

Day 8: Reliability-Centered Maintenance

- RCM Principles and Process
- RCM Task Identification Logic
- RCM Decision Worksheets for Critical Machines
- Verification and Validation of RCM Results
- RCM Implementation Planning

Day 9: Root Cause Analysis and Reliability Culture

- RCFA Methodology, Event Mapping and Cause-Tree Diagrams
- Systematic Investigation and Corrective and Preventive Actions
- Measuring RCFA Effectiveness
- Cross-Functional Teams, Training and Awareness
- Cultural KPIs, Recognition and a Lasting Reliability Mindset

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Day 10: Reliability Engineering Practice and Your Plan

- Exercise: Weibull and Monte Carlo Study of a Compressor Train
- Exercise: RCM Worksheet for a Critical Pump
- Exercise: RCFA on a Repeat Bearing Failure
- Exercise: Reliability KPI and ROI Case for Management
- Completing Your Rotating Equipment Reliability Plan

Case Studies and Exercises

The following are suggested activities.

- Case study: A gas compression station loses output each time a standby machine fails to start; you decide whether to change the test routine or the sparing.
- Case study: A chemical plant's feed pumps suffer repeat seal failures; you produce an RCFA and a corrective action list.
- Exercise: A water utility must cut pump maintenance cost without losing availability; you produce a criticality ranking and task plan.
- Exercise: A power station's fans show rising vibration; you decide on intervention timing from trend data.

What You Take Back

The Rotating Equipment Reliability Plan is a working document you build across the two weeks around the critical machines at your site. In your first month back, use it to set the reliability baseline, start condition monitoring on the top-ranked machines and present the first improvement case.

- A criticality ranking and reliability baseline for key machines
- Weibull and model results for the worst performers
- RCM task lists and condition monitoring limits
- KPIs and an ROI case linked to plant objectives

Quick Answers FAQ

What should I know before an advanced rotating equipment reliability engineering course?

You should already maintain, inspect or plan work on pumps, compressors, turbines or fans and be comfortable with spreadsheets. Basic statistics helps; the models are built step by step.

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How does a two-week rotating equipment reliability course differ from a one-week course?

The two-week course adds Markov and Monte Carlo modeling, condition monitoring, RCM, RCFA and business-linked KPIs to the core of failure patterns, criticality and continuous reliability improvement. The one-week course suits readers who need the core methods only.

What is the difference between RCM and RCFA for rotating equipment?

RCM decides in advance which tasks prevent or detect each failure mode of a machine. RCFA investigates a failure after it happens to find and remove its root cause. Reliability teams use both in one cycle.

What do I take back from an advanced rotating equipment reliability engineering course?

You take back the Rotating Equipment Reliability Plan, built on your own machines. It holds a criticality ranking, model results, RCM tasks, monitoring limits and an ROI case.

For Your Manager

After the course, the team member will be able to model machine reliability, analyze failure patterns, set RCM tasks and monitoring limits, lead root cause investigations and tie results to KPIs and ROI. They return with a Rotating Equipment Reliability Plan for the site's critical machines, first used to set the baseline and choose the first improvement project.