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COURSE BROCHURE

# Advanced Bearing Root Cause Damage Analysis Training Course

5 – 16 July 2027
Casablanca

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Registered in the United Kingdom and Saudi Arabia

# Advanced Bearing Root Cause Damage Analysis Training Course

**Ref:** 542_20060 **Date:** 5 – 16 July 2027 **Location:** Casablanca **Fees:** 6800 GBP

Bearing Root Cause Damage Analysis is an advanced 2-week training course for reliability engineers, maintenance engineers and condition monitoring specialists who read damaged rolling bearings as evidence, and who leave with a Bearing Failure Investigation Report with corrective actions. Unplanned stoppages of pumps, motors, gearboxes and fans still trace back to bearings that failed early. Jupiter Prime Training runs this course for engineers who want each replaced bearing to explain itself.

## Why Bearing Root Cause Damage Analysis Matters Now

Three forces raise the value of reading bearing damage correctly: production lines running closer to capacity with less spare redundancy, variable-speed drives that introduce electrical currents through bearings, and condition monitoring systems that detect defects early but cannot say why they began. Plants that classify damage consistently and trace it to lubrication, mounting, loading or electrical causes extend bearing life and stop repeat replacements; plants that simply swap bearings pay for the same failure again. The course rests on ISO 15243, which classifies rolling bearing damage and failures by terms, characteristics and causes, and on vibration evidence from envelope and spectrum analysis.

## Who Gains Most from Bearing Root Cause Damage Analysis

- Reliability engineers who decide whether a bearing failure warrants a formal investigation
- Maintenance engineers responsible for bearing mounting, dismounting, fits and lubrication practice
- Condition monitoring specialists who interpret vibration, oil and temperature signals on rotating machines
- Rotating equipment engineers who specify bearing arrangements, seals and housings for duty conditions
- Lubrication specialists who select greases and oils and set relubrication intervals

A rotating equipment group that sends its condition monitoring and maintenance engineers together gains most, because both sides learn to match a vibration signature with the marks on the raceway.

## Bearing Root Cause Damage Analysis Capabilities

Participants practise turning raceway marks, cage wear and lubricant residue into a defensible account of why a bearing failed.

- Apply the ISO 15243 damage classification to dismounted bearings — investigation leads agreeing the primary failure mode
- Assess load-zone patterns and running tracks to reveal misalignment or abnormal loading — rotating equipment engineers correcting designs
- Test lubrication evidence including grease condition, contamination and film failure — lubrication specialists revising practice
- Calculate bearing defect frequencies and match them to envelope spectra — condition monitoring teams confirming diagnoses
- Specify mounting, fit and electrical insulation corrections — maintenance planners preventing repeat damage
- Build a bearing investigation record with photographs and corrective actions — plant managers approving changes

## Key Bearing Root Cause Damage Analysis Terms

- Subsurface fatigue — cracking that starts below the raceway surface under cyclic contact stress and ends in flaking of material.
- Surface-initiated fatigue — micro-spalling or flaking that begins at the surface where lubrication is inadequate or the surface is damaged.
- Electrical erosion — craters or fluting on raceways and rolling elements caused by electric current passing through the bearing.
- True brinelling — permanent indentations in the raceway at rolling element pitch, caused by static overload or impact.
- False brinelling — wear marks at rolling element positions caused by vibration while the bearing is stationary.
- Running track — the visible pattern on raceways showing where rolling elements carried load, used to infer load direction and alignment.

## Bearing Root Cause Damage Analysis Day by Day

## Day 1: Bearings as Failure Witnesses

- Rolling Bearing Anatomy — Linking Rings, Rolling Elements and Cage to Damage
- Rated Life Versus Actual Life — Recognising Premature Bearing Failure
- Failure Cost Profiles in Rotating Equipment — Prioritising Bearings for Investigation
- ISO 15243 Structure — Grouping Damage by Mode and Cause
- Investigation Triggers and Scope — Deciding When a Bearing Deserves Analysis

## Day 2: Collecting Bearing Evidence

- Pre-Removal Records — Capturing Vibration, Temperature and Operating Conditions
- Dismounting Without Added Damage — Protecting Evidence on Raceways
- Grease and Oil Sampling — Preserving Lubricant Clues Before Cleaning
- Macro Photography of Raceways — Documenting Running Tracks and Marks
- Bearing Sectioning Requests — Deciding When Laboratory Metallurgy Is Needed

## Day 3: Reading Running Tracks and Load Zones

- Normal Running Track Patterns — Establishing the Reference for Comparison
- Axial and Radial Load Signatures — Identifying Unexpected Thrust
- Misalignment Track Patterns — Tracing Shaft and Housing Errors
- Out-of-Round Housing Evidence — Distinguishing Distortion From Overload
- Preload and Internal Clearance Indicators — Judging Fit and Temperature Effects

## Day 4: Fatigue Damage

- Subsurface Fatigue Spalling — Separating Material Limits From Overload
- Surface-Initiated Micro-Spalling — Connecting Distress to Film Thickness
- Inclusion and Material Defect Origins — Escalating to Supplier Quality
- Spall Progression Stages — Estimating How Long Damage Developed
- Fatigue Cause Matrix — Ranking Load, Lubrication and Material Causes

## Day 5: Wear, Corrosion and Lubrication Faults

- Abrasive and Adhesive Wear Patterns — Locating Contamination and Smearing Sources
- Moisture and Fretting Corrosion — Tracing Seal and Fit Failures
- Grease Degradation Evidence — Reviewing Product Choice and Relubrication Intervals
- Lubricant Starvation and Overgreasing Signs — Correcting Quantity Practice
- Seal and Contamination Pathways — Specifying Sealing Arrangement Changes

## Day 6: Electrical Erosion, Deformation and Fracture

- Electrical Fluting and Craters — Linking Damage to Variable-Speed Drives
- Shaft Voltage Measurement and Grounding — Choosing Insulated Bearings or Brushes
- True and False Brinelling — Separating Impact From Transport Vibration
- Ring Cracks and Forced Fracture — Distinguishing Fit Stress From Overload
- Cage Damage Mechanisms — Reading Speed, Acceleration and Lubrication Effects

## Day 7: Mounting, Fits and Handling Faults

- Shaft and Housing Fit Checks — Correcting Creep and Ring Movement
- Induction Heating and Hydraulic Mounting — Preventing Installation Damage
- Shaft Alignment Records — Linking Coupling Errors to Bearing Distress
- Storage and Handling Damage — Controlling Corrosion and Indentation Before Use
- Installation Quality Checklists — Setting Mounting Standards for Technicians

## Day 8: Vibration Evidence for Bearing Damage

- Bearing Defect Frequencies — Calculating Outer Race, Inner Race and Cage Rates
- Envelope and Demodulation Spectra — Detecting Early Raceway Defects
- Time Waveform Impact Patterns — Confirming Defect Severity
- Oil Debris and Temperature Trends — Corroborating Vibration Findings
- Signature-to-Damage Correlation — Matching Monitoring Data With Dismounted Parts

## Day 9: From Damage Mode to Corrective Action

- Primary and Secondary Damage Separation — Avoiding Misleading Conclusions
- Bearing Cause Hypothesis Testing — Eliminating Causes With Physical Evidence
- Corrective Action Selection — Choosing Design, Lubrication or Practice Changes
- Bearing Upgrade Options — Weighing Coatings, Ceramic Elements and Seals
- Repeat Failure Tracking — Verifying Corrected Bearings Reach Expected Life

## Day 10: Practising the Bearing Failure Investigation Report

- Applying ISO 15243 Classification — Naming the Damage on Case Bearings
- Applying Running Track Reading — Establishing Load and Alignment Conditions
- Applying Defect Frequency Analysis — Linking Spectra to Case Damage
- Peer Challenge of Case Conclusions — Testing Evidence Before Sign-Off
- Bearing Failure Investigation Report — Recording Evidence, Causes and Corrective Actions

## Applying Bearing Root Cause Damage Analysis After the Course

- Collect the last three failed bearings from critical pumps or motors, classify their damage using ISO 15243 terms and present the findings to the maintenance planning group.
- Set up a bearing evidence kit and dismounting procedure so that technicians preserve raceways, lubricant samples and photographs on the next failure.

## Bearing Root Cause Damage Analysis Questions FAQ

### What is bearing root cause damage analysis and why does it matter now?

Bearing root cause damage analysis is the practice of reading marks on failed rolling bearings to identify why they failed. It matters now because higher equipment utilisation and variable-speed drives make premature bearing failures more costly and more frequent.

### Which roles gain most from bearing root cause damage analysis?

Reliability engineers, maintenance engineers and condition monitoring specialists gain most from bearing root cause damage analysis. Rotating equipment and lubrication specialists also benefit when they must change bearing arrangements, fits or lubricants.

### How does bearing root cause damage analysis differ from a general root cause failure analysis course?

Bearing root cause damage analysis concentrates on one component and its specific damage modes, running tracks and vibration signatures. A general failure analysis course covers investigation methods across many assets, whereas here you learn to read raceways, cages and lubricants in detail.

## What do you bring back from bearing root cause damage analysis training?

You bring back a Bearing Failure Investigation Report method, with damage classification, load-zone findings, vibration correlation and corrective actions, ready to use on the next bearing removed at your plant.

## Bearing Root Cause Damage Analysis: The Way Forward

The Bearing Failure Investigation Report first informs whether a failed bearing points to a lubrication, mounting, loading or electrical correction. Reliability, maintenance and condition monitoring engineers use it to change practice rather than replace parts. After the first investigations, revisit the defect frequency library and evidence kit, since refineries, cement plants and power stations each reveal damage patterns specific to their duties.