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# Equipment Root Cause Investigation and Defect Elimination Training Course

12 – 16 September 2027  
Doha





## Equipment Root Cause Investigation and Defect Elimination Training Course

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### Programme Summary

Equipment root cause investigation and defect elimination is a one-week training course for maintenance, reliability and plant leaders working at strategic level, culminating in a defect elimination programme charter for their own site. Repeat breakdowns drain budgets when investigations stop at the broken part rather than the decisions behind it. The approach links failure mechanisms, evidence discipline, structured analysis and action governance. Mars Training Centre UK delivers this programme in equipment root cause investigation.

### The Business Case

Most plants investigate failures, yet the same bad actors keep returning. Analyses ending with "operator error" or "replaced bearing" leave latent causes in design, procurement and maintenance strategy untouched. Leaders who demand verified evidence and track corrective actions to closure turn each failure into a lasting gain.

- Equipment Availability: Reduces unplanned downtime by removing the causes of chronic failures on critical assets.
- Maintenance Cost: Lowers spending on emergency repairs and spares tied to recurring defects.
- Operational Risk Exposure: Cuts the chance that an unexplained failure escalates into a production loss.

### Principles and Evidence Base

- IEC 62740 Root Cause Analysis: Provides the reference description of analysis techniques compared and selected in Session 3.
- PROACT RCA Methodology: Structures evidence preservation, team formation, logic tree analysis and tracking of results in Sessions 2 to 4.
- ISO 14224 Failure Data Taxonomy: Supplies the equipment, failure mode and failure mechanism classification used for bad-actor analysis in Sessions 1 and 4.
- ISO 55000 Asset Management: Frames defect elimination as continual improvement within the asset management system in Session 4.

### Intended Participants

- Executives accountable for maintenance and reliability performance.
- Senior leaders who sponsor failure investigations and approve corrective action budgets.
- Heads of asset management who set maintenance strategy for critical equipment.
- Operations directors responsible for production availability and plant uptime.



The programme serves maintenance, reliability, operations and asset integrity functions across oil and gas production, refining, power generation, petrochemicals and water utilities.

## Learning Outcomes

1. Participants will be able to diagnose the dominant failure modes and mechanisms behind an organisation's bad-actor equipment.
2. Participants will be able to construct an evidence preservation and investigation trigger policy for equipment failures.
3. Participants will be able to select and apply suitable analysis techniques, from the five whys to fault tree analysis.
4. Participants will be able to distinguish physical, human and latent roots in an analysis.
5. Participants will be able to design a defect elimination programme with ownership, metrics and closure tracking.
6. Participants will be able to justify investigation findings and corrective action investment to an executive committee.

## Programme Structure

### Day 1: Equipment Failure Behaviour and Bad Actors

Why does equipment fail, and which failures cost the organisation most?

- Failure Modes Versus Failure Mechanisms
- Fatigue, Corrosion, Wear and Overload Patterns
- ISO 14224 Classification of Equipment Failure Data
- Pareto Analysis of Bad-Actor Assets From CMMS Records
- Cost of Unreliability Estimation

### Day 2: Evidence Preservation and Investigation Set-Up

How is an investigation triggered, staffed and protected from lost evidence?

- Investigation Triggers and Severity Thresholds
- The PROACT Preserve and Order Stages
- Physical Parts, Position, People and Paper Evidence
- Basic Fractography and Visual Examination of Failed Components
- Charter, Scope and Independence of the Investigation Team

### Day 3: Root Cause Analysis Techniques

Which analysis technique fits which failure, and how is a conclusion verified?



- Technique Selection Using IEC 62740
- Five Whys and Ishikawa Diagrams and Their Limits
- Logic Tree Construction and Hypothesis Verification
- Fault Tree Analysis for Complex Equipment Systems
- Physical, Human and Latent Root Classification

## Day 4: Designing a Defect Elimination Programme

How does an organisation stop failures from returning rather than repairing them faster?

- Corrective Action Hierarchy and Effectiveness Testing
- Linking Findings to FMEA and Maintenance Strategy Updates
- Defect Elimination Governance Within an ISO 55000 System
- Action Tracking, Closure Verification and Leading Indicators
- Building an Investigation Culture Free of Blame

## Day 5: Leading Equipment Root Cause Investigation in Practice

How are the methods combined into a programme the organisation will fund and sustain?

- Reviewing a Compressor Failure Report Against the Session 3 Techniques
- Applying Bad-Actor Analysis to a Participant Plant
- Communicating Latent Roots to Senior Decision-Makers
- Prioritising Corrective Actions by Value and Risk
- Defect Elimination Programme Charter Presentation

## Methodology

The programme relies on case analysis of equipment failures from refining, power generation and offshore production, with structured exercises in which participants build logic trees, test hypotheses against evidence and critique investigation reports. Session 5 asks each participant to defend a charter before peers.

- Suggested activity: Building a logic tree for a repeat pump seal failure at a refinery.
- Suggested activity: Critiquing a gas turbine failure report that concluded with operator error.
- Suggested activity: Ranking bad actors from a sample power station maintenance data set.

## Capstone Output

Each participant completes a defect elimination programme charter for their own site. It sets investigation triggers, team roles, preferred analysis techniques, a bad-actor priority list, action tracking rules and review indicators, ready for approval by plant leadership.



## Frequently Asked Questions

### **Is equipment root cause investigation training suitable for senior managers without an engineering background?**

Yes. It is written for strategic leaders who sponsor and review investigations. The focus is judging analysis quality and governing actions, not laboratory testing.

### **Which standards does the equipment root cause investigation programme rest on?**

It draws on IEC 62740 for analysis techniques, the PROACT methodology for evidence and logic trees, ISO 14224 for failure data and ISO 55000 for asset management governance.

### **How is the defect elimination charter from the root cause investigation programme used at work?**

You leave with a charter setting triggers, roles, methods, bad-actor priorities and tracking rules. It can go to plant leadership as the basis for site defect elimination.