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# AC Motor Reliability: Condition Monitoring, Relay Settings and Repair Strategy Course

10 – 14 October 2027  
Muscat





## AC Motor Reliability: Condition Monitoring, Relay Settings and Repair Strategy Course

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### Programme Summary

AC motor reliability, covering condition monitoring, protection and repair strategy, is the subject of this one-week training course for electrical and maintenance managers and heads of function, ending in a motor fleet reliability plan. Motors drive pumps, compressors, fans and conveyors, and one unplanned failure can stop a process. Good decisions depend on reading monitoring evidence, checking protection and ranking motors by risk. The programme moves from failure causes, through diagnosis, to design of a monitoring and repair strategy, then applies it to one fleet. Mars Training Centre UK delivers this AC motor reliability programme for managers of motor-driven plant.

### The Business Case

When motors are maintained on fixed calendars and protected with default settings, plants repair healthy units, miss the ones that are degrading and trip production for avoidable causes. A motor that fails in service can damage the driven machine and interrupt output for days. Managers who can read vibration, thermography and current evidence, question protection settings and apply a repair or replace rule can direct budgets where they lower exposure.

- Unplanned Downtime: Falls as degrading motors are found before they trip or fail in service.
- Maintenance Spend: Improves as repair, rewind and replacement choices follow evidence and cost.
- Protection Performance: Strengthens as relay settings match motor duty and starting conditions.

### Principles and Evidence Base

- Condition-based maintenance: It replaces fixed intervals with evidence when the monitoring plan is built in Session 4.
- Failure mode and effects analysis: It structures the failure cause catalogue in Session 1 and the investigations in Session 3.
- Pareto analysis: It focuses attention on the few motors and failure causes that drive most losses in Session 4.
- Risk ranking by likelihood and consequence: It orders the fleet for action in Sessions 4 and 5.

### Intended Participants

- Electrical managers who are accountable for the availability of induction and synchronous motors and their drives.
- Maintenance managers who set inspection, monitoring and repair strategy for motor fleets.
- Reliability leaders who review failure data and justify spending on condition monitoring.
- Heads of function who approve motor specifications, spares holdings and repair contracts.



The programme serves power generation, oil and gas, water utilities, mining and process manufacturing, where motor-driven plant is central to output.

## Learning Outcomes

1. Participants will be able to classify the electrical, mechanical and thermal causes of motor failure.
2. Participants will be able to evaluate vibration, thermography and motor current signature analysis results for a given motor.
3. Participants will be able to review motor protection settings against duty, starting and overload conditions.
4. Participants will be able to diagnose probable faults in motors and their drives from combined evidence.
5. Participants will be able to construct a risk ranking and a monitoring plan for a motor fleet.
6. Participants will be able to justify motor repair or replace decisions to a finance or executive committee.

## Programme Structure

### Day 1: AC Motor Reliability and Failure Causes

Why do AC motors and their drives fail, and where does the evidence sit?

- Induction and Synchronous Motor Construction
- Electrical, Mechanical and Thermal Stress Sources
- Drive and Supply Quality Effects
- Failure Cause Catalogue
- Reliability Data and Failure Records

### Day 2: Condition Monitoring Methods

What do vibration, heat and current signals reveal about motor health?

- Vibration Spectrum Reading
- Infrared Thermography Survey Method
- Current Signature Interpretation Guide
- Insulation Resistance and Polarisation Trends
- Alarm Limit and Trend Review

### Day 3: Protection and Fault Diagnosis

How should a motor be protected, and how is a trip or failure diagnosed?



- Overload and Thermal Model Settings
- Starting Current and Stall Protection Review
- Earth Fault and Unbalance Protection Checks
- Combined Evidence Fault Tree
- Failed Motor Inspection Protocol

## Day 4: Maintenance Strategy and Repair Decisions

How are motors ranked, monitored and repaired or replaced?

- Criticality and Risk Ranking Matrix
- Monitoring Plan by Motor Class
- Repair, Rewind or Replace Cost Comparison
- Spares and Standby Motor Policy
- Repair Contractor Specification Checklist

## Day 5: Applying AC Motor Reliability to One Fleet

Is the fleet reliability plan ready for an investment committee?

- Applying the Session 1 Failure Cause Catalogue to the Fleet
- Reading the Session 2 Monitoring Results for Selected Motors
- Reviewing Session 3 Protection Settings for Critical Units
- Ranking Motors with the Session 4 Risk Matrix
- Completing the Motor Fleet Reliability Plan

## Methodology

The programme uses a data exercise built on anonymised vibration spectra, thermal images, current signature plots, relay settings and failure reports from process and power plants. Participants work in small teams as maintenance manager, reliability lead and finance lead, interpreting evidence, disagreeing about causes and recording what extra data would change each decision.

- Suggested activity: Reading a current signature plot and agreeing on the likely fault.
- Suggested activity: Checking relay settings for a motor that trips during starting.
- Suggested activity: Defending a repair or replace ranking to a panel acting as an investment committee.

## Capstone Output

Each participant completes a motor fleet reliability plan. It holds a risk ranking, a monitoring plan by motor class, protection review findings for critical units, a repair or replace rule and a spares policy. The plan is used to brief an executive committee, set maintenance and monitoring budgets and guide the response when a motor trips.



## Frequently Asked Questions

### **Is AC motor reliability suitable for managers who are not motor specialists?**

Yes. AC motor reliability is taught for managers who review evidence and decide, assuming familiarity with plant electrical systems but no hands-on testing experience.

### **Which principles does AC motor reliability rest on in this training?**

AC motor reliability here rests on condition-based maintenance, failure mode and effects analysis, Pareto analysis and likelihood and consequence risk ranking.

### **How is the plan from AC motor reliability used at work?**

You use the motor fleet reliability plan to brief executives, set monitoring and maintenance budgets and guide your response when a motor trips.

### **How does AC motor reliability differ from a variable speed drive programme?**

AC motor reliability centres on motor failure causes, monitoring and protection across a fleet, while a variable speed drive programme centres on selecting and applying drive equipment.