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# Engineering Troubleshooting, Root Cause and Option Appraisal Training Course

3 – 7 January 2027  
Zoom





## Engineering Troubleshooting, Root Cause and Option Appraisal Training Course

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### Programme Summary

Engineering troubleshooting, root cause and option appraisal is the subject of this one-week training course for engineers, technical supervisors and maintenance and operations managers, ending in a fault investigation and decision file for one real fault. Many technical teams restore service quickly but treat the symptom, so the same fault returns and the chosen remedy is argued from habit rather than evidence. The programme moves from problem definition, through diagnosis of causes, to the appraisal of corrective options, then applies each step to one fault. Mars Training Centre UK delivers this engineering troubleshooting programme for mixed-organisation cohorts.

### The Business Case

Repeat faults consume technician hours, interrupt production and expose people to the same hazard more than once. When a team cannot show why a fault occurred, it chooses remedies by seniority or precedent, and costly changes are made on weak grounds. Teams that define the problem precisely, test causes against evidence and compare options on risk and cost close faults for good and record why each decision was taken.

- Repeat Fault Rate: Falls as causes are verified before corrective action is chosen.
- Time to Resolution: Shortens as evidence is gathered in a fixed order.
- Decision Quality: Improves as options are scored against agreed criteria and risk.

### Principles and Evidence Base

- 8D: It structures the team steps from containment to closure used in Sessions 1 and 5.
- Pareto analysis: It ranks recurring faults so effort goes to the vital few in Session 2.
- Fault tree analysis: It traces a fault to its possible causes through logic in Session 2.
- FMEA: It ranks failure modes and the risk of each corrective option in Session 3.

### Intended Participants

- Engineers who investigate equipment and process faults.
- Technical supervisors who lead the response when a fault stops production.
- Maintenance managers who answer for repeat failures and corrective work.
- Operations managers who must choose between competing remedies.
- Reliability and quality engineers who close corrective action records.

Typical sectors include oil and gas, power generation, chemical processing and manufacturing.



## Learning Outcomes

1. Participants will be able to construct a problem statement that separates what is faulty from what is not.
2. Participants will be able to diagnose a fault by combining evidence, a 5 Whys chain and root cause analysis.
3. Participants will be able to construct a fault tree analysis and a cause-and-effect diagram for a stated failure.
4. Participants will be able to evaluate corrective action options for risk, cost and downtime.
5. Participants will be able to justify one option with a weighted decision matrix and a record of assumptions.
6. Participants will be able to present a fault investigation and decision file for one fault to senior colleagues.

## Programme Structure

### Day 1: Engineering Troubleshooting: Defining the Fault

How is a fault described so that the right problem is investigated?

- Problem Statement Sheet
- Is and Is-Not Comparison Table
- Event Timeline Chart
- 8D Team and Containment Plan
- Evidence Collection Log

### Day 2: Diagnosing Causes from Evidence

Which causes does the evidence support, and which does it rule out?

- Pareto Chart of Fault Records
- 5 Whys Chain Record
- Cause-and-Effect Diagram
- Fault Tree Analysis Diagram
- Cause Verification Test Plan

### Day 3: Designing Corrective Options

What corrective options would remove the verified cause?

- Option Long List
- FMEA Worksheet
- Corrective and Preventive Action Register
- Interim Containment Check
- Cost and Downtime Estimate Table



## Day 4: Appraising Options and Deciding

How is one option chosen on evidence and risk?

- Weighted Decision Matrix
- Risk-Ranked Option Table
- Assumption and Bias Check
- Decision Log
- Implementation Plan Outline

## Day 5: Applying Troubleshooting and Appraisal to One Fault

Does the investigation hold when tested on one real fault?

- Applying the Session 1 Problem Statement to One Fault
- Testing the Session 2 Cause Findings Against Evidence
- Challenging the Session 3 Options with Peers
- Scoring the Session 4 Decision Matrix on Live Data
- Completing the Fault Investigation and Decision File

## Methodology

The programme uses a case analysis method built on anonymised fault reports, event logs, trend charts and inspection findings from oil and gas, power and process plants. Participants work in small groups on one fault, defend their findings to peers who act as operations and safety colleagues, and receive facilitator feedback on each work product, including fault diagnosis.

- Suggested activity: Rewriting a vague fault report as a precise problem statement.
- Suggested activity: Testing a favoured cause against two pieces of contrary evidence.
- Suggested activity: Scoring three corrective options and defending the ranking.

## Capstone Output

Each participant completes a fault investigation and decision file for one real fault. It holds a problem statement, an evidence log, a verified cause, a ranked set of options and a decision record. The file is used at work to brief senior colleagues and to support the corrective action that follows.

## Frequently Asked Questions

### Is engineering troubleshooting suitable for engineers who have not led an investigation before?

Yes. Engineering troubleshooting is taught from first principles and assumes technical knowledge of your own plant, not earlier experience of formal investigations.



## **Which methods does engineering troubleshooting rest on in this programme?**

Engineering troubleshooting here rests on 8D, Pareto analysis, fault tree analysis and FMEA, together with the 5 Whys.

## **How is the engineering troubleshooting file used at work?**

You use the file to brief senior colleagues, justify the chosen remedy and support problem solving on later faults.

## **How does engineering troubleshooting differ from a programme on quality management systems?**

It centres on finding the cause of a fault and choosing a remedy, while a quality management programme centres on system design and audit.