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# Plant Upset Troubleshooting and Root Cause Analysis Training Course

8 – 12 November 2026  
Muscat





## Plant Upset Troubleshooting and Root Cause Analysis Training Course

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### Programme Summary

Plant upset troubleshooting and root cause analysis is a five-day training course for operations leaders at managerial level, culminating in a troubleshooting playbook for a recurring upset at their own plant. Process units drift off specification, trip or lose capacity, and the same upsets often return because crews restore operation without proving why it failed. The approach combines disciplined data gathering, hypothesis testing and structured root cause methods with team routines that keep fixes in place. Mars Training Centre UK delivers this programme in plant upset troubleshooting and root cause analysis.

### The Business Case

Every unresolved upset costs throughput, downgraded product, energy and safety margin. When troubleshooting depends on a few individuals and guesswork, plants repeat the same failures. Leaders who install a shared diagnostic method, clear roles and verified corrective actions shorten upsets and stop repeats.

- Production Losses and Downtime: Reduce as upsets are diagnosed faster and recurring causes are removed rather than worked around.
- Product Quality: Improves as off-spec events are traced to their process causes and controlled at source.
- Process Safety Exposure: Falls as abnormal situations are recognised early and handled with a consistent method.

### Principles and Evidence Base

- Kepner-Tregoe Problem Analysis: Structures the is and is-not specification of a problem and the testing of possible causes in Session 2.
- Fault Tree Analysis and the Fishbone Ishikawa Diagram: Organise candidate causes into testable logic in Session 3.
- Abnormal Situation Management ASM Consortium: Frames the early recognition and handling of plant upsets in Session 1.
- Pareto Analysis: Ranks downtime and losses so effort targets the largest recurring problems in Session 4.



## Intended Participants

- Managers accountable for the throughput, yield and reliability of process units.
- Leaders who chair incident reviews and approve corrective actions after upsets.
- Technical heads who direct process engineers and shift teams during abnormal operation.
- Superintendents responsible for turning lessons from upsets into revised procedures.

The programme serves refining, petrochemicals, chemicals, fertilisers, utilities and gas processing operations.

## Learning Outcomes

1. Participants will be able to diagnose a plant upset by separating symptoms, triggers and underlying causes.
2. Participants will be able to construct a precise problem statement from historian trends, laboratory data and field observations.
3. Participants will be able to evaluate competing hypotheses using balances, design data and targeted plant tests.
4. Participants will be able to select a root cause method suited to the complexity and consequence of a problem.
5. Participants will be able to organise a troubleshooting team with defined roles, decision rights and review routines.
6. Participants will be able to justify corrective actions and verification measures that prevent recurrence.

## Programme Structure

### Day 1: Plant Upset Troubleshooting Foundations

What separates a disciplined troubleshooting response from trial and error?

- Anatomy of an Upset: Symptom, Trigger and Cause
- Abnormal Situation Management Principles
- Off-Spec, Trip and Capacity Shortfall Patterns
- Cognitive Traps in Diagnosis Under Pressure
- Troubleshooting Maturity Self-Assessment

### Day 2: Problem Definition and Evidence Gathering

How is a problem specified precisely enough to be solved?

- Kepner-Tregoe Is and Is-Not Specification
- Process Historian Trend Review
- Instrument and Laboratory Data Validation
- Mass and Energy Balance Checks
- Comparison With Design and Past Normal Operation



## Day 3: Root Cause Analysis Methods

Which method fits the problem, and how is a cause proven rather than assumed?

- 5 Whys and Its Limits
- Fishbone Ishikawa Diagram for Process Causes
- Fault Tree Analysis for Trips and Failures
- Cause Mapping of Multi-Factor Incidents
- Hypothesis Testing Through Planned Plant Trials

## Day 4: Troubleshooting Teams and Lasting Fixes

How do leaders organise people and actions so an upset does not return?

- Pareto Analysis of Downtime and Losses
- Troubleshooting Team Roles and Escalation Rules
- Shift Handover and Operator Knowledge Capture
- Corrective Action Selection and Management of Change
- Effectiveness Verification and Recurrence Tracking

## Day 5: Applying Root Cause Analysis to a Plant Upset

How are definition, analysis and team routines combined into one usable playbook?

- Upset Selection From Participant Loss Data
- Evidence Pack and Problem Statement Build
- Cause Analysis Peer Challenge
- Corrective Action and Verification Plan
- Troubleshooting Playbook Presentation

## Methodology

The programme relies on case analysis of real upset histories. Participants work through trend data, laboratory results and shift logs from refinery, chemical and utility units, test hypotheses against the evidence and compare conclusions with the causes later confirmed.

- Suggested activity: Specifying a recurring off-spec event with an is and is-not analysis.
- Suggested activity: Building a fault tree for a compressor trip from historian data.
- Suggested activity: Running a Pareto review of a quarter of downtime records.



## Capstone Output

Each participant completes a troubleshooting playbook for a recurring upset at their plant. It holds a problem statement, evidence pack, cause analysis, corrective actions, verification measures and a team routine for future events, ready to brief plant leadership and train shift crews.

## Frequently Asked Questions

### **Is plant upset troubleshooting and root cause analysis suitable for managers who no longer work on shift?**

Yes. It suits operations managers, superintendents and technical heads who direct troubleshooting rather than perform it. It assumes experience of process operations but no formal training in root cause analysis.

### **Which methods underpin plant upset troubleshooting and root cause analysis?**

It draws on Kepner-Tregoe problem analysis, fault tree analysis, the fishbone Ishikawa diagram, the 5 Whys, Pareto analysis and the principles of Abnormal Situation Management.

### **How is the plant upset troubleshooting playbook used at work?**

You take back a playbook your leadership can approve and shift crews can follow, with proven causes, corrective actions and checks that confirm the upset has stopped recurring.

### **How does plant upset troubleshooting differ from general problem-solving programmes?**

It works with process data, unit behaviour, plant trials and the shift routines of continuous operations, which general problem-solving programmes do not address.