

PROCESS PLANT TROUBLESHOOTING & ENGINEERING PROBLEM SOLVING



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Introduction

When a process plant misbehaves, production stops and every hour carries a cost. Yet many investigations stall because teams adjust the obvious variable, watch the problem return, and repeat the cycle. This Process Plant Troubleshooting & Engineering Problem Solving Training Course builds the diagnostic discipline that ends that loop. Learners study systematic troubleshooting, root cause analysis, and process data interpretation for plants. Furthermore, the course covers equipment fault diagnosis, control loop problems, and how to verify that a fix actually holds. As a result, participants diagnose faults faster, reduce repeat failures, and restore stable operation with confidence.

Process Plant Troubleshooting & Engineering Problem Solving Course Objectives

- Apply a systematic troubleshooting methodology instead of trial-and-error adjustment.
- Use the KepnerTregoe problem analysis process to isolate deviations.
- Define process deviations precisely with the 5W2H scoping method.
- Conduct root cause analysis using the 5 Whys and fishbone diagrams.
- Read process data with trend analysis, control charts, and mass balance checks.
- Diagnose rotating equipment faults through vibration and performance signatures.
- Troubleshoot control loops using PID tuning principles and loop diagnostics.
- Apply fault tree analysis to complex, multi-cause plant failures.
- Prioritise corrective actions with FMEA and risk-based ranking.
- Verify fixes through structured testing and confirm sustained stability.



Course Methodology

This course combines short lectures with plant-focused case work. Participants work through realistic troubleshooting scenarios covering pumps, heat exchangers, columns, and control loops, and defend their diagnosis before a review panel. Trainers use industrial case studies, process data sets, and structured peer critique. Group debriefs examine which diagnostic step changed the conclusion. In addition, participants build a personal troubleshooting reference guide.

Who Should Take This Course

- Process, plant, and production engineers
- Maintenance and reliability engineers
- Instrumentation and control engineers and technicians
- Operations supervisors and shift team leaders
- Commissioning and start-up engineers
- Technical services and troubleshooting specialists
- HSE and process safety engineers supporting incident investigation

Process Plant Troubleshooting & Engineering Problem Solving Course Outlines

Day 1: Systematic Troubleshooting Foundations

- Why trial-and-error troubleshooting costs plants money
- Defining the deviation: expected versus actual performance
- The 5W2H method for scoping a plant problem
- The KepnerTregoe problem analysis process

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- Distinguishing symptoms, causes, and contributing factors
- Building a troubleshooting logic tree
- Diagnostic thinking exercise on a plant scenario

Day 2: Process Data and Root Cause Analysis

- Reading trends, DCS data, and historian records
- Mass and energy balance checks for verification
- Control charts and variation analysis in process data
- Root cause analysis with the 5 Whys
- Fishbone (Ishikawa) diagrams for cause classification
- Data quality and sensor reliability considerations
- Root cause clinic using real plant data

Day 3: Equipment and Control Loop Troubleshooting

- Rotating equipment faults: vibration, cavitation, and wear signatures
- Heat exchanger and fouling diagnosis
- Pump and compressor performance curve analysis
- Column and separation troubleshooting
- Control loop problems: oscillation, offset, and instability
- PID tuning principles and valve diagnostics
- Equipment fault diagnosis workshop

Day 4: Complex Failures and Risk Prioritisation

- Fault tree analysis for multi-cause failures
- Interactions between process, equipment, and human factors





- FMEA: severity, occurrence, and detection ratings
- RPN calculation and risk-based action ranking
- Root cause versus root cause of recurrence
- Human factors and operator response in incidents
- Complex failure simulation with coaching

Day 5: Implementing, Verifying, and Documenting Fixes

- Turning diagnosis into corrective and preventive actions
- Structured testing and confirmation of stability
- PDCA cycles for verifying sustained improvement
- Reliability-centred maintenance implications
- Writing troubleshooting reports and recommendations
- Preventing recurrence through design and procedure change
- Final case assessment and personal action plan

Conclusion

By successfully completing Process Plant Troubleshooting & Engineering Problem Solving, participants will gain a practical understanding of how to diagnose plant faults systematically, identify their real causes, and verify that corrective action works. They will be able to interpret process data, troubleshoot equipment and control loops, prioritise risks, and document findings in a form that supports future reliability. In addition, they will know how to stop the same failure from returning. Gentex Training Center designed this course so that learners return to their plants with a repeatable troubleshooting method.



FAQs

Q1 What is the "Process Plant Troubleshooting & Engineering Problem Solving" course about?

It teaches a systematic method for diagnosing plant faults and solving them at the cause. Participants cover deviation definition, process data interpretation, equipment and control loop troubleshooting, fault tree analysis, risk prioritisation, and fix verification.

Q2 What are the key benefits of the "Process Plant Troubleshooting & Engineering Problem Solving" course?

Participants cut unplanned downtime and repeat failures, diagnose faults faster with less trial-and-error adjustment, and restore stable operation sooner. They also prioritise corrective work in the right order and produce documentation that improves long-term plant reliability.

Q3 What skills will I gain from the "Process Plant Troubleshooting & Engineering Problem Solving" course?

You will gain systematic fault diagnosis and deviation analysis, process data interpretation and root cause analysis, equipment and control loop troubleshooting, and corrective action verification and reporting. These four skills combine to make your troubleshooting faster and more permanent.



Q4 What tools, methods, or standards are covered in the "Process Plant Troubleshooting & Engineering Problem Solving" course?

The course covers the KepnerTregoe problem analysis process, the 5W2H scoping method, the 5 Whys, fishbone diagrams, fault tree analysis, FMEA with RPN prioritisation, process trend and mass balance analysis, control charts, PID tuning principles, performance curve analysis, reliability-centred maintenance concepts, and PDCA verification.

Q5 How is the "Process Plant Troubleshooting & Engineering Problem Solving" course applied in real-world practice?

Professionals apply it to pump and compressor failures, heat exchanger fouling, column instability, control loop oscillation, off-specification production, and repeated shutdowns. The methods transfer to any plant situation where the cause is unclear and every hour of downtime carries cost.