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COURSE BROCHURE

Advanced Refinery Unit Troubleshooting and Failure Analysis Training Course

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Registered in the United Kingdom and Saudi Arabia

Advanced Refinery Unit Troubleshooting and Failure Analysis Training Course

Refinery unit troubleshooting and failure analysis is a 2-week advanced training course for refinery process, mechanical and operations engineers who must explain why a column floods, an exchanger fouls or a compressor trips, and it ends with a refinery upset solution case ready for management sign-off. Tighter run lengths, heavier crude slates and leaner site teams make every unplanned slowdown expensive. Jupiter Prime Training runs this course for engineers who carry that pressure.

Why Refinery Unit Troubleshooting and Failure Analysis Matters Now

Three pressures shape troubleshooting on refinery units today: crude diets that change faster than equipment was designed for, extended intervals between turnarounds that leave degraded internals in service longer, and a generation of experienced unit engineers handing over to younger staff. A site that diagnoses upsets from evidence restores throughput and avoids repeat failures; a site that guesses swaps parts, loses margin and repeats incidents. The course rests on Root Cause Failure Analysis RCFA, Failure Mode and Effects Analysis FMEA and the Kepner-Tregoe problem analysis approach, applied to real column, furnace, exchanger and machinery cases.

Who Gains Most from Refinery Unit Troubleshooting and Failure Analysis

- Process engineers who monitor unit performance and recommend operating moves during upsets
- Mechanical and rotating equipment engineers who investigate seal, bearing and vibration failures
- Operations engineers who coordinate shift response when a unit leaves its operating envelope
- Inspection and materials engineers who interpret fouling, corrosion and tube damage findings
- Technical service engineers who build the case for modifications and turnaround scope

Refinery technical departments gain most when process, mechanical and operations engineers from one complex attend together and adopt a shared diagnosis method for upsets.

Refinery Unit Troubleshooting and Failure Analysis Capabilities

Participants learn to move from alarms and symptoms to a defended cause, then to an engineering fix that survives scrutiny from operations and maintenance.

- Test competing failure hypotheses against historian trends, lab results and field observations — unit superintendents
- Calculate column hydraulic loading, flooding and weeping margins from operating data — throughput decisions
- Assess exchanger fouling resistance and furnace tube metal temperatures — run-length and cleaning decisions
- Apply vibration, seal and bearing evidence to diagnose pump and compressor failures — rotating equipment specialists
- Build a cause-and-effect chain with Kepner-Tregoe and RCFA logic — incident investigation panels
- Weigh engineering solutions by cost, risk and turnaround timing — refinery management and planners

Key Refinery Unit Troubleshooting and Failure Analysis Terms

- Jet flooding — liquid entrainment that rises to the tray above when vapour velocity exceeds the tray's capacity, collapsing separation.
- Fouling resistance — the added thermal resistance from deposits on exchanger surfaces, reducing heat transfer and raising energy use.
- Tube metal temperature — the measured or calculated skin temperature of a furnace tube, the main limit on firing rate.
- Net positive suction head — the pressure margin above vapour pressure at a pump inlet that prevents cavitation damage.
- Surge — unstable reverse flow in a centrifugal compressor at low flow, causing vibration and possible mechanical damage.
- Root cause — the underlying condition which, once removed, prevents a failure from recurring, beyond the immediate trigger.

Refinery Unit Troubleshooting and Failure Analysis Day by Day

Day 1: The Economics of Unit Upsets

- Margin Loss Mapping — Ranking Upsets by Lost Throughput and Product Giveaway
- Operating Envelopes and Integrity Operating Windows — Defining Safe Limits
- Crude Slate Variability — Linking Feed Changes to Equipment Stress
- Historian and Laboratory Records — Building the Evidence Base for Diagnosis
- Troubleshooting Roles on Site — Process, Mechanical and Operations Responsibilities

Day 2: Structured Problem Diagnosis

- Kepner-Tregoe Problem Analysis — Separating Is and Is-Not Evidence
- Root Cause Failure Analysis Sequence — From Symptom to Underlying Cause
- Fault Tree Construction — Testing Logical Paths to the Failure
- Failure Mode and Effects Analysis — Prioritising Equipment Weak Points
- Hypothesis Testing Plans — Choosing Field Tests That Discriminate Causes

Day 3: Distillation Column Hydraulics

- Tray and Packing Capacity Charts — Locating Flood and Weep Limits
- Pressure Drop Surveys — Detecting Fouled or Damaged Internals
- Gamma Scans — Imaging Liquid Levels and Collapsed Trays
- Downcomer Backup Calculation — Explaining Sudden Loss of Separation
- Reflux and Reboiler Duty Balances — Restoring Product Specifications

Day 4: Column Operating Problems

- Foaming and Entrainment Diagnosis — Antifoam Use or Feed Changes
- Overhead Corrosion and Salt Deposition — Wash Water and Neutraliser Decisions
- Vacuum Column Performance — Ejector and Wash Bed Checks
- Temperature Profile Interpretation — Spotting Maldistribution and Bypassing
- Composition Drift Cases from Crude and Gas Plants — Comparing Fixes

Day 5: Heat Exchangers and Preheat Trains

- Heat Transfer Coefficient Tracking — Detecting Fouling Onset
- Preheat Train Monitoring Models — Timing Cleaning Against Energy Loss
- Tube Leak Detection — Pressure Testing and Product Contamination Clues
- Vibration and Erosion in Bundles — Baffle and Inlet Design Checks
- Air Cooler Performance — Fan, Fin and Ambient Limitations

Day 6: Fired Heaters

- Draft and Excess Air Profiles — Balancing Efficiency and Flame Stability
- Tube Skin Thermocouples and Infrared Surveys — Finding Hot Spots
- Coking and Flow Maldistribution — Pass Balancing Decisions
- Burner Flame Impingement — Adjusting Firing Pattern and Fuel Quality
- Creep and Remaining Life Assessment — Tube Replacement Timing

Day 7: Pumps and Rotating Equipment

- Pump Curves and System Curves — Diagnosing Low Flow and Head Loss
- Cavitation and Suction Conditions — Net Positive Suction Head Checks
- Mechanical Seal Failure Patterns — Reading Face and Elastomer Damage
- Vibration Spectrum Interpretation — Imbalance, Misalignment and Bearing Defects
- Bad Actor Lists — Targeting Repeat Pump Failures

Day 8: Compressors and Machinery Protection

- Compressor Performance Maps — Locating the Operating Point Against Surge
- Anti-Surge Control Review — Recycle Valve and Controller Response
- Reciprocating Compressor Valve Failures — Temperature and Pressure Clues
- Lube and Seal Oil Systems — Contamination and Trip Causes
- Machinery Trip Logs — Separating Instrument Faults from Real Events

Day 9: Failure Evidence and Engineering Options

- Metallurgical Failure Signatures — Fatigue, Creep and Corrosion Fractures
- Fouling Deposit Analysis — Linking Chemistry to Feed and Additives
- Process Simulation Checks — Testing Proposed Operating Changes
- Management of Change Screening — Hazards of Each Proposed Modification
- Option Ranking Matrices — Cost, Risk and Turnaround Timing

Day 10: Practising the Refinery Upset Solution Case

- Evidence Timeline for a Column and Exchanger Upset — Applying Days 1 and 3
- Kepner-Tregoe and Fault Tree Diagnosis — Applying Day 2 Methods
- Furnace and Machinery Contributors — Applying Days 6 to 8
- Solution Options and Change Screening — Applying Day 9 Ranking
- Refinery Upset Solution Case — Cause, Fix, Cost and Implementation Steps

Applying Refinery Unit Troubleshooting and Failure Analysis After the Course

- Run a Kepner-Tregoe and fault tree session on the most frequent upset in your unit, using historian trends and field tests to confirm the cause.
- Set up a preheat train fouling and furnace tube temperature tracker so cleaning and firing decisions rest on measured margins.

Refinery Unit Troubleshooting and Failure Analysis Questions FAQ

What is refinery unit troubleshooting and failure analysis and why does it matter now?

Refinery unit troubleshooting and failure analysis is the evidence-based diagnosis of why columns, exchangers, furnaces and machines underperform or fail. It matters now because variable crude slates and longer run lengths make every unexplained upset a direct loss of margin and reliability.

Which roles gain most from refinery unit troubleshooting and failure analysis training?

Process, mechanical and operations engineers on refinery units gain most. Inspection and technical service engineers also benefit, since they interpret deposit and damage evidence and prepare the modifications that follow an investigation.

How does refinery unit troubleshooting and failure analysis differ from a general process troubleshooting course?

Refinery unit troubleshooting and failure analysis is specific to refinery equipment. Instead of generic problem-solving methods, it spends two weeks on column hydraulics, preheat fouling, furnace tube limits and machinery failures, combining process and mechanical evidence in one diagnosis.

What do you bring back from refinery unit troubleshooting and failure analysis training?

You bring back a refinery upset solution case built on a real or realistic incident. It shows the evidence timeline, the confirmed cause, ranked engineering options, change screening and the steps needed to implement the chosen fix.

Refinery Unit Troubleshooting and Failure Analysis: The Way Forward

The refinery upset solution case first informs whether a unit can be fixed by operating changes or needs a modification at the next turnaround. Unit superintendents, maintenance planners and technical managers use it to approve spending. After its first use, revisit the evidence timeline, because the data gaps it exposes show which instruments and surveys the site should add.