Advanced Root Cause Analysis for Chemical Process Failures Training Course

30 Nov - 04 Dec 2026

Cape town

4600 € (Per Person)

Ref: #ACE7616_296531

Course Introduction / Overview:

This intensive training course provides a comprehensive framework for mastering Root Cause Analysis (RCA) specifically within the high-stakes environment of the chemical processing industry. Moving beyond superficial problem-solving, this program equips participants with the analytical tools and systematic thinking required to uncover the deep-seated physical, human, and latent organizational causes of process failures. The curriculum is designed to prevent recurrence by addressing the fundamental issues rather than just the immediate symptoms. As pioneering process safety expert Trevor Kletz argued in his seminal work, "What Went Wrong? Case Histories of Process Plant Disasters and How They Could Have Been Avoided," understanding the 'why' behind an incident is paramount to creating a safer operational future. This course, offered by BIG BEN Training Center, delves into this philosophy, integrating established methodologies with practical, industry-specific case studies. Participants will learn to lead rigorous investigations, analyze complex causal chains, and develop robust corrective and preventive action plans that enhance safety, reliability, and operational excellence, ultimately protecting assets, personnel, and the environment.

Target Audience / This training course is suitable for:

- Process Safety Engineers.
- Chemical Engineers and Technologists.
- Plant and Operations Managers.
- Maintenance and Reliability Professionals.
- Health, Safety, and Environment (HSE) Specialists.
- Incident Investigators and Team Leaders.
- Quality Assurance and Control Personnel.
- Supervisors and Team Leads in chemical manufacturing.
- Process Control and Instrumentation Engineers.

Target Sectors and Industries:

- Petrochemicals and Refining.
- Pharmaceuticals and Biotechnology.
- Specialty and Fine Chemicals Manufacturing.
- Oil and Gas Exploration and Production.
- Plastics and Polymers Industry.
- Agrochemicals and Fertilizers.
- Food and Beverage Processing.
- Water and Wastewater Treatment Facilities.
- Governmental regulatory bodies and safety agencies.

Target Organizations Departments:

- Operations and Production.
- Engineering and Technical Services.
- Maintenance and Reliability.
- Health, Safety, and Environment (HSE).
- Quality Assurance and Quality Control (QA/QC).
- Process Safety Management (PSM) Group.
- Research and Development (R&D).
- Plant Management and Site Leadership.

Course Offerings:

By the end of this course, the participants will have able to:

- Apply a structured, systematic approach to incident investigation in chemical environments.
- Differentiate between direct causes, contributing factors, and fundamental root causes.
- Utilize a variety of RCA tools, including 5 Whys, Fishbone Diagrams, and Fault Tree Analysis.
- Analyze the role of human factors and organizational culture in process failures.
- Conduct effective evidence gathering and stakeholder interviews during an investigation.
- Develop robust Corrective and Preventive Action (CAPA) plans to prevent recurrence.
- Write clear, concise, and comprehensive RCA reports for management and regulatory bodies.
- Lead and facilitate a multidisciplinary root cause analysis investigation team.
- Integrate lessons learned from investigations into the organization's safety management system.

Course Methodology:

The training methodology employed by BIG BEN Training Center is designed for maximum engagement and practical skill acquisition. This course moves beyond traditional lectures to create a dynamic and interactive learning environment. A cornerstone of the program is the extensive use of real-world case studies drawn from the chemical processing industry, allowing participants to analyze complex incidents and apply RCA techniques in a controlled setting. The training emphasizes a hands-on approach, with a significant portion of the time dedicated to group workshops and team-based exercises where participants will use tools like Fault Tree Analysis and FMEA on simulated scenarios. These interactive sessions are designed to foster collaborative problem-solving and critical thinking. Expert instructors will facilitate discussions, provide personalized feedback, and guide participants through the complexities of incident investigation. The methodology ensures that attendees not only understand the theory behind Root Cause Analysis but also gain the confidence and competence to apply these critical skills effectively in their own workplace to drive tangible improvements in safety and reliability.

Course Agenda (Course Units):

Unit One: Foundations of RCA in the Chemical Industry

- Introduction to Process Safety and Incident Causation Models.
- The high cost of process failures and the business case for effective RCA.
- Differentiating between symptoms, direct causes, contributing factors, and root causes.
- Overview of major RCA methodologies and their applications.
- Establishing a formal incident investigation process.
- The legal and regulatory framework for incident reporting.
- Defining the scope and objectives of an investigation.

Unit Two: Core RCA Tools and Techniques

- Mastering the 5 Whys technique for simple incidents.
- Developing comprehensive Fishbone (Ishikawa) Diagrams for cause mapping.
- Introduction to Fault Tree Analysis (FTA) for quantitative risk assessment.
- Applying Failure Mode and Effects Analysis (FMEA) proactively.
- Utilizing Barrier Analysis to identify failed or missing safeguards.
- Introduction to Change Analysis for identifying triggers.
- Practical workshops applying each tool to chemical process scenarios.

Unit Three: Human Factors and Organizational Influences

- Understanding the Swiss Cheese Model of accident causation.
- Analyzing human error types: slips, lapses, mistakes, and violations.
- The role of safety culture in preventing process failures.
- Investigating latent organizational weaknesses and systemic issues.
- Cognitive biases and their impact on decision-making during operations.
- Techniques for conducting non-confrontational witness interviews.
- Assessing procedural adherence and the quality of operating instructions.

Unit Four: Advanced Investigation and Data Analysis

- Techniques for securing an incident scene and preserving evidence.
- Collecting and analyzing physical evidence and material samples.
- Leveraging process data from DCS, SCADA, and data historians.
- Building a timeline and sequence of events (Chronology).
- Causal Factor Charting to visualize complex event chains.
- Conducting effective interviews with operators, engineers, and management.
- Validating root cause hypotheses with evidence.

Unit Five: Reporting, Corrective Actions, and Continuous Improvement

- Developing effective and sustainable Corrective and Preventive Actions (CAPA).
- The hierarchy of controls and its application to CAPA development.
- Writing a clear, objective, and persuasive RCA report.
- Presenting investigation findings to senior management and stakeholders.
- Tracking CAPA implementation and verifying effectiveness.
- Integrating lessons learned into training, procedures, and management systems.
- Fostering a culture of continuous improvement and organizational learning.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

Beyond identifying the immediate root cause, how can an organization effectively diagnose and rectify the latent systemic weaknesses that allowed a process failure to occur in the first place?

What unique qualities does this course offer compared to other courses?

This course distinguishes itself by moving beyond a purely mechanical application of RCA tools and focusing intensely on the systemic and human-centric aspects of failures within the chemical industry. While many programs teach the 'how' of using a Fishbone Diagram or Fault Tree Analysis, our curriculum dedicates significant time to the 'why'—exploring the latent organizational weaknesses, cultural factors, and cognitive biases that are often the true precursors to major incidents. We utilize a case study methodology that eschews simplistic examples in favor of complex, multi-faceted scenarios mirroring the realities of modern chemical processing. This approach forces participants to engage in deep critical thinking and to understand the intricate interplay between equipment, procedures, and people. The emphasis is not just on finding a single root cause, but on mapping complex causal chains to reveal systemic vulnerabilities. The ultimate goal is to cultivate a proactive mindset, empowering participants to identify and mitigate risks before they escalate, thereby transforming them from reactive problem-solvers into true architects of process safety and reliability.