

COURSE OVERVIEW PE0929
Root Cause Analysis - Advanced
(E-Learning Module)

Course Title

Root Cause Analysis - Advanced
 (E-Learning Module)

Course Reference

PE0929

Course Format & Compatibility

SCORM 1.2. Compatible with IE11, MS-Edge, Google Chrome, Windows, Linux, Unix, Android, IOS, iPadOS, macOS, iPhone, iPad & HarmonyOS (Huawei)

Course Duration

30 online contact hours
 (3.0 CEUs/30 PDHs)



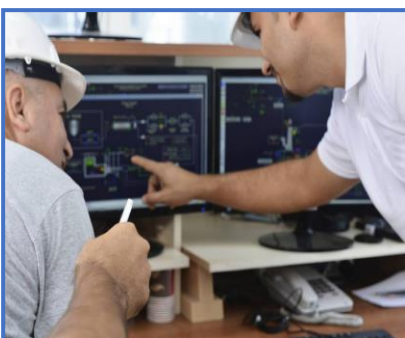
Course Description



This E-Learning is designed to provide participants with a detailed and advanced overview of root cause analysis. It covers the near miss, hazard, HSE-critical, major hazard site, occupational hazard, operational hazard and permit-to-work system; the personal protective equipment (PPE) and task risk assessment; the three basic types of accidents, contribute factors and systems and procedures; the human behaviour, common causes of incidents, causes of injuries and types of incidents to investigate; the reporting procedure, organizing data, incident report, writing a good report and identifying information; and the evaluation, cause analysis, action plan and incident investigation preparations.



Further, the course will also discuss the aim of the investigation and the benefits of accident investigation; the securing incident site; ensuring no escalation potential exists; the investigation strategy, RCA – associated techniques and root cause analysis; the layers of latent causes, risk significance and the range of factors of hazard identification; the risk assessment, qualitative, quantitative, basic steps of a QRA and the risk assessment methods; the ALARP assessment criteria, hazard evaluation, hazard reduction techniques, control measures, hierarchy of control and control measure effectiveness; and the risk assessment options, risk assessment logic diagram, HIRA procedure, risk matrix and the 8 steps for risk management.



During this interactive course, participants will learn the layer of protection analysis; the common data for hazard identification, the accident investigation and stages in an accident/incident investigation; dealing with immediate risks, the level of investigation and analyzing the results; the fishbone diagram; the tools used in root cause analysis; the questions to ask when performing RCA; investigating causes of failures and mishaps; the use of fault tree analysis and the 5 whys; creating a simplified fault tree for root cause analysis; assessing the frequency of likelihood of potential hazardous incidents or losses; quantifying incident frequency on fault trees; conducting incident investigation; performing investigation procedures; getting accident/incident reporting; and the hierarchy control, system improvement and safe operations.

Course Objectives

At the end of this course, the Trainee will be able to:-

- Apply and gain an advanced knowledge on root cause analysis
- Explain trouble shooting and root cause analysis (RCA) methods for application in oil and gas processing
- Identify and describe techniques associated with complex root cause analysis (RCA)
- Describe the concept of root cause analysis (RCA) and controls over operating conditions
- Communicate results within plant and between several plants using company prescribed protocols
- Analyse start-up, shutdown, utility failure and emergency shut down scenarios using root cause analysis (RCA) techniques
- Carryout root cause analysis (RCA) of facility operational upsets for separation, compression, utilities and other processes
- Verify log sheets, record problems, approve root cause analysis (RCA) techniques, identify main causes and provide solutions
- Discuss near miss, hazard, HSE-critical, major hazard site, occupational hazard, operational hazard and permit-to-work system
- Identify personal protective equipment (PPE), apply task risk assessment and avoid unsafe act and unsafe condition
- Identify the three basic types of accidents, contribute factors and apply systems and procedures
- Recognize the human behaviour, common causes of incidents, causes of injuries and types of incidents to investigate
- Employ reporting procedure, organize data, apply incident report, write a good report and identify information
- Carryout evaluation, cause analysis, action plan and incident investigation preparations
- Discuss the aim of the investigation and the benefits of accident investigation
- Secure incident site and ensure no escalation potential exists as well as employ investigation strategy, RCA – associated techniques and root cause analysis

- Identify the layers of latent causes, risk significance and the range of factors of hazard identification
- Apply risk assessment, qualitative, quantitative, the basic steps of a QRA and the risk assessment methods
- Carryout ALARP assessment criteria, hazard evaluation, hazard reduction techniques, control measures, hierarchy of control and control measure effectiveness
- Identify risk assessment options and illustrate risk assessment logic diagram, HIRA procedure, risk matrix, 8 steps for risk management and layer of protection analysis
- Recognize the common data for hazard identification, prepare for the review and apply accident investigation and the stages in an accident/incident investigation
- Deal with immediate risks, select the level of investigation, investigate the event, determine causes and record and analyze the results
- Review the process, organize data, apply root cause analysis and verify the complaint
- Illustrate fishbone diagram, identify the tools used in root cause analysis and list the questions to ask when performing RCA
- Investigate causes of failures and mishaps as well as use fault tree analysis and the 5 whys
- Create a simplified fault tree for root cause analysis, assess the frequency of likelihood of potential hazardous incidents or losses and quantify incident frequency on fault trees
- Conduct incident investigation, perform investigation procedures and get accident/incident reporting
- Report incidents/accidents, conduct investigation and apply hierarchy control, system improvement and safe operations

Who Should Attend

This course provides an overview of all significant aspects and considerations of advanced root cause analysis for senior process engineers, process engineers and other technical staff.

Training Methodology

This Trainee-centered course includes the following training methodologies:-

- Talking presentation Slides (ppt with audio)
- Simulation & Animation
- Exercises
- Videos
- Case Studies
- Gamification (learning through games)
- Quizzes, Pre-test & Post-test


Every section/module of the course ends up with a Quiz which must be passed by the trainee in order to move to the next section/module. A Post-test at the end of the course must be passed in order to get the online accredited certificate.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course.

Certificate Accreditations


Certificates are accredited by the following international accreditation organizations: -

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USA International Association for Continuing Education and Training (IACET)

Haward Technology is an Authorized Training Provider by the International Association for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 1-2013 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 1-2013 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units (CEUs)** in accordance with the rules & regulations of the International Association for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

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British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Course Fee

As per proposal

Course Contents

- Introduction
- Definitions
- Incident
- Vehicle Accident
- Near Miss
- Hazard
- Hazard Awareness
- HSE-Critical
- Major Hazard Site
- Occupational Hazard
- Operational Hazard
- Permit-To-Work System
- Personal Protective Equipment (PPE)
- Risk
- Root Cause
- Task Risk Assessment
- Unsafe Act
- Unsafe Condition
- The Accident
- What is an accident?
- Three basic types of accidents
- Accidents have two things in common.
- Outcomes of Accidents
- Contributing Factors
- Environmental
- Design
- Systems & procedures
- Human behaviour
- Common Causes Of Incidents Examples!
- Bhopal Union Carbide Plant Accident 1984



- Petrobras P-36 Sinking 2001
- The Causes of Injuries
- Types of Incidents to investigate
- Purpose and Scope
- Reporting Procedure
- Organizing data
- Incident report
- Writing a Good Report
- Identifying information
- Evaluation
- Description
- Cause analysis
- Action plan
- Case study #1
- Quiz #1
- Incident Investigation Preparations
- Leading Causes of Workplace Deaths
- The Aim of the Investigation
- Benefits of Accident Investigation
- Who Should Investigate
- Securing Incident Site & Ensuring No Escalation Potential Exists
- Investigation Strategy
- Case study #2
- Quiz #2
- RCA – Associated Techniques
- Root Cause Analysis
- What is Root Cause?
- Go Deeper than Obvious
- The Domino Theory
- Layers and Layers of Latent Causes
- Philosophy of Root Cause Analysis
- Symptom Approach vs. Root Cause
- What is a Hazard?





- What is Risk?
- Risk Significance
- Hazard Identification – Range of Factors
- Risk Assessment
- Qualitative
- Quantitative
- The Basic Steps of a QRA
- Overview of Risk Assessment Methods
- ALARP Assessment Criteria
- Hazard Evaluation
- Hazard Reduction Techniques
- Control Measures
- Hierarchy of Control
- Control Measure Effectiveness
- Control Measures Examples
- Risk Assessment Options
- Risk Assessment Logic Diagram
- HIRA Procedure
- Qualitative Risk Assessment Matrix #
- Risk Matrix
- Using the Risk Matrix
- 8 Steps For Risk Management
- Layers of Protection
- Layer of Protection Analysis
- Triggers for Early Management Risk Review
- Common Data for Hazard Identification
- Information for Early Reviews
- Prepare for the Review
- More Detailed List of Desired Information
- Detailed List
- Case study #3
- Quiz #3
- Accident Studies





- Objectives of this Section
- Accident Investigation
- What to Investigate?
- Accident Studies
- Stages in an Accident/Incident Investigation
- Dealing with Immediate Risks
- Selecting the Level of Investigation
- Investigating the Event
- A few Sources Should Give the Investigator All that is Needed to Know
- Interviews
- Observation
- Documents
- Determining Causes
- Determine what Changes are Needed
- Recording & Analysing the Results
- Reviewing the Process
- Case study #4
- Quiz #4
- Organizing Data
- Root Cause Analysis
- Objective
- What is Root Cause?
- Go Deeper than Blame
- The Domino Theory
- Layers and Layers of Latent Causes
- Philosophy of Root Cause Analysis
- We Perform Root Cause Analysis to Prevent Turnbacks and Customer Escapes from Recurring
- Symptom Approach vs. Root Cause
- How do we do Root Cause Analysis?
- Example: The Washing Machine
- Verify the Complaint
- Fishbone Diagram - A Useful Tool
- Investigate Why





- Root Cause of our Example?
- Tools Used in Root Cause Analysis
- Brainstorming
- Fishbone Diagram
- Questions to Ask When Performing RCA
- Asking Why: Sometimes Simple, Sometimes Complex
- Case study #5
- Quiz #5
- Logic Trees & Predefined Trees
- Root Cause Analysis – Steps
- Investigating Causes of Failures & Mishaps
- What is Root Cause Analysis? (RCA)
- Where Did it Come From?
- RCA Goals
- Why involve residents in RCA?
- ACGME “Procedure Log”
- RCA Model
- When is an RCA Done?
- A Decision-Making Tool (SAC)
- Why is an RCA Important?
- Why Use a Particular Method?
- How RCAs Work
- Key RCA Roles
- Overview of Steps
- Triage Cards
- RCA Team in Action
- RCA Role Play
- Case Summary
- Definitions of RCA & Related Terms
- Company Mishap Classification Levels
- Case study #6
- Quiz #6
- Fault Tree Analysis (FTA)



- What is fault tree analysis?
- History
- FTA Main Steps
- Preparation for FTA
- Boundary Conditions
- Fault Tree Construction
- Fault Tree Symbols
- Example: Redundant Fire Pumps
- Event and Fault Trees
- The 5 Whys
- Creating a Simplified Fault Tree for Root Cause Analysis
- Assessment of the Frequency of Likelihood of Potential Hazardous Incidents or Losses
- Fault Trees
- Fault Tree Analysis
- Fault Tree Construction
- Fault Tree Construction
- Fault Tree Example
- Fault Tree Analysis Limitations
- Fault Tree Analysis Advantages
- Simple Example
- Fault Tree for Simple Example
- Quantification of a Fault Tree
- Quantifying Incident Frequency on Fault Trees
- Case study #7
- Quiz #7
- Conduct Incident Investigation
- Investigation Procedures
- The Purpose of Accident Investigation
- Goals
- What Causes the Most Accidents?
- Preconditions for Accident Investigation
- Effective Investigations can:
- Getting Accident/Incident Reporting



- How To Get Incidents/Accidents Reported
- Steps in Investigation
- Conducting Investigation
- The Six-Step Process
- Step 1: Secure the Accident Scene
- Step 2: Collect Facts About what Happened
- Interviewing
- Cooperate, Don't Intimidate!
- What Should We Say and Do?
- What Should We NOT say and do?
- Step 3: Develop the Sequence of Events
- Step 4: Determine the Causes
- The Domino Sequence
- Step 4: Determine the Causes
- Direct Cause of Injury
- Surface Causes of the Accident
- Root Causes of the Accident
- Steps in Cause Analysis
- Step 5: Recommend Corrective Actions & Improvements
- Hierarchy of Control
- Principles of Prevention
- Improvement Strategies to Fix the System
- System Improvements
- Permanent Actions
- Step 6: Write the Report
- Writing the investigation report
- The Piper Alpha Disaster
- Key Event 1 - Initial Explosion
- Key Event 2 - Prolonged Oil Fire
- Key Event 3 - Gas Pipe Failures
- Key Event 4 - Accommodation Deaths
- Key Event 5 - Fire Fighting
- Key Event 6 - Monitoring/Auditing





- Lessons to be Learned
- Safe Operations
- Error Amelioration
- ISO - Recommended Risk Assessment Process (ISO Guide 51: Safety Aspects - Guidelines for Inclusion in Standards)
- Incident Investigating Team Composition & Duties
- Who should Investigate?
- The Line Supervisors
- The Middle Managers
- Staff Personal
- What to Investigate?
- Case study #8
- Quiz #8
- Team Investigations
- Team Investigations (Other than Board of Inquiry)
- Loss Potential Matrix
- Case study #9
- Quiz #9
- Accidents
- Causation, Reporting & Investigation
- Accident Reporting
- Accident Investigation Records
- Use of Investigation Records
- Accident Investigation
- Initial Actions
- Witnesses & Conditions
- Investigators
- Immediate supervisor
- Recognising Hazards
- Safety Practitioner
- The Investigation
- Promptness
- Fire
- Evidence





- Equipment
- Accident Investigation Procedure
- Talking with On-Site Personnel
- Interviewing Witnesses
- Types of Witness
- Putting witnesses at ease
- Interview Location
- Question Phrasing
- Attitude
- Conclusion
- What Should be Investigated
- Case study #10
- Quiz #10

