



*Training Course:  
Process Equipment & Piping Systems*

*16 - 20 December 2024  
Casablanca (Morocco)  
New Hotel*

## Training Course: Process Equipment & Piping Systems

Training Course code: EN6037 From: 16 - 20 December 2024 Venue: Casablanca (Morocco) - New Hotel Training Course  
Fees: 5100 € Euro

### Introduction

Process equipment and piping systems constitute the major portion of plant assets and their integrity and reliability are essential for plant availability and performance. Many process equipment and piping systems are subjected to hazardous service conditions and damage mechanisms which, if not adequately monitored and assessed, could result in major failures with consequential significant injuries and business losses.

It is essential to inspect the process equipment and piping system to detect any damage, characterize it, and assess its impact on the equipment integrity. With so many pieces of equipment and extensive piping systems and networks, it is obviously impossible to inspect totally every piece of equipment or piping in a plant. Therefore, an approach based on criticality, i.e. risk-based, taking into consideration the damage mechanisms and failure risk must be taken.

### Course Objectives of Process Equipment & Piping Systems

The key objectives of this comprehensive course are as follows:

- To increase the participants awareness and understanding that the mechanical integrity of process equipment depends jointly on the proper design, operation, condition assessment, and maintenance of the equipment.
- To provide the participants with a clear understanding of the degradation mechanisms that process equipment could be subjected to over their operating life, how to identify them, predict and determine their impact, and what appropriate measures can be taken to prevent and control the resultant damage.
- To provide the participants with the knowledge and failure analysis skills they need to conduct damage and failure analysis so as to prevent similar failures from happening.

### Cours Benefits of Process Equipment & Piping Systems

The delegate will gain sound and practical understanding of the major degradation mechanisms in oil & gas plants and refinery process units, how to predict them, how to assess their impact on process equipment over their operating life, and how to prevent and control these degradation and damage mechanisms using best industry practices including API 571 and API 580.

- Enhance knowledge about inspection and testing strategies and methods and their effective application to achieve the highest probability of detection of damage and defects.
- The delegate will achieve a better understanding of the regulations and industry practices pertaining to repairs and alterations to safeguard against related failure and to avoid excessive repair costs.
- Enhance competence and productivity thereby enhancing their competence and performance level and making additional value added contributions to their organizations.

### The Core Competencies

Participants will enhance their competencies in the following areas:

- Working knowledge in the mechanical design of pressure equipment and piping systems.
- The inter-dependence of design, operation, and maintenance for achieving mechanical integrity of pressure equipment and piping systems.
- Understanding, prediction, and identification of degradation and damage mechanisms that affect process equipment fitness for continued service and could result in significant potential failures.
- Application of risk-based inspection - API 580.
- NDT methods and their effective application.
- Performing fitness-for-service assessments - API 579.
- Failure investigation techniques and root cause analysis.

## Course Outlines of Process Equipment & Piping Systems

### Day One

#### Failure Mechanics

- Wear & Failure Mechanisms
  - Imperfections and Defects
  - Corrosion Mechanisms
- Failure Modes
- Fatigue
- Fretting
- Creep & Thermal fatigue
- Stress Corrosion Cracking, Other modes
- Carbon & Alloy steels
- Nickel, Titanium, and Specialty alloys
- Aluminum, aluminum alloys
- Copper, copper alloys
- Plastic piping
- Alternative options-linings, cladding
- Limitations and safeguards
- Material selection - economics-life cycle costing
- Material properties, and selection

### Day Two

#### Failure Prevention By Design

- Failure Causes - Design, Operation; Maintenance, Other Causes
- Material properties, and selection
  - Physical properties and limitations of components
  - Physical properties of steel and alloy piping and tubing
  - Physical properties of fittings
- Basic Design
- Pressure Vessels
- Piping Systems
- Liquid Storage Tanks
- Operation and Maintenance of Process Equipment
- Damage Mechanisms Affecting Process Equipment

### Day Three

## Process Equipment Failures

- Failures in Pressure Vessels, Piping and Boilers
  - Strength reduction through material loss
  - Case histories
- Piping System Vibration
- Mechanical & Flow-Induced Resonance
- Transient Hydraulic pulsation
- Pipe supports and restraints
- Wind Loading
- Industry Practices for Failure Prevention

## Day Four

### Inspection, Assessment, and Maintenance

- Inspection Strategies Plans and Procedures - Risk-Based Inspection API 580
  - Developing an RBI Plan
  - Fitness-For-Service Assessment API 579
- NDT Methods and Techniques
- Probability of Detection
- Damage Characterization
- Selecting the correct techniques
- Smart pigging
- Cleaning
- Operational procedures
- Pigging of Pipelines

## Day Five

### Operation and Maintenance

- Maintenance Programs
- Repair and Alteration of Pressure Equipment and Piping
  - Rerating Piping and Pressure Vessels
  - Estimation of the Consequences of Pressure Vessels and Piping Failures
- Failure Analysis Techniques

## Registration form on the Training Course: Process Equipment & Piping Systems

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Complete & Mail or fax to Global Horizon Training Center (GHTC) at the address given below

### Delegate Information

Full Name (Mr / Ms / Dr / Eng): .....  
 Position: .....  
 Telephone / Mobile: .....  
 Personal E-Mail: .....  
 Official E-Mail: .....

### Company Information

Company Name: .....  
 Address: .....  
 City / Country: .....

### Person Responsible for Training and Development

Full Name (Mr / Ms / Dr / Eng): .....  
 Position: .....  
 Telephone / Mobile: .....  
 Personal E-Mail: .....  
 Official E-Mail: .....

### Payment Method

- Please find enclosed a cheque made payable to Global Horizon
- Please invoice me
- Please invoice my company

### Easy Ways To Register

Telephone:  
+201095004484 to  
provisionally reserve your  
place.

Fax your completed  
registration  
form to: +20233379764

E-mail to us :  
info@gh4t.com  
or training@gh4t.com

Complete & return the  
booking form with cheque  
to: Global Horizon  
3 Oudai street, Aldouki,  
Giza, Giza Governorate,  
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