COURSE OVERVIEW FE0309
Materials Selection & Properties (E-Learning Module)

Course Title
Materials Selection & Properties
(E-Learning Module)

Course Reference
FE0309

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 up-to-date overview of materials selection and properties. It covers the metallurgy, steels and cast irons classification; the metals and non-metals, alloys and ferrous metals; the steel and cast irons classifications and its types; the stainless steels and non-ferrous alloys; aluminum and aluminum alloys, copper and copper alloys, nickel and nickel-based alloys and titanium alloys; the heat treatment of non-ferrous and the mechanical properties of material covering malleability, ductility, toughness, hardness and tensile strength; and the mechanical properties of materials comprising of elastic limit, direct extrusion, open die forging, spinning, shell drawing, plastic deformation, twilling, fracture, polycrystalline material and cold working, etc.

Further, the course will also discuss the mechanical properties of metals and alloys; the damage tolerant design, fracture mechanics, failure processes, material hot working, testing of metals, tensile testing and sample preparation; the area of a circular cross section and tensile strength calculation; and the percent elongation, percent reduction of area, stress-strain diagram, brittle and ductile failure, true stress strain diagram, temperature effects, directional properties and rolling directions.

Moreover, the course will also cover the fatigue testing, bend testing, hardness testing steps, testing of metals, Brinell test, hardness test, impact test, creep test and stress-rupture test; the alloy elements in steels including the effects of alloying elements; the electrochemical principles, passivity, corrosion management strategy, corrosion engineering and the mechanism of corrosion; the factors affecting corrosion; the electrochemical principles, corrosion as a chemical reaction, ionic corrosions and anodic and cathodic corrosion; the electrochemistry of corrosion, electrochemical reactions and polarization; the importance of oxygen; the corrosion prevention by electrochemical methods and corrosion rate measurements by electrochemical techniques; the forms and types of corrosion; the galvanic action, velocity effects, velocity-related attack, other types of local attack, hydrogen phenomena, corrosion in soils and pipeline corrosion; the high temperature corrosion, prediction, control and materials used; the water and steam corrosion; the water treatment against corrosion; the localized forms of water/steam corrosion; the various the types of atmospheric corrosion; the change of environment and design considerations; the materials selection for corrosion control; the materials standards and specifications, engineering materials, materials properties and the effect of temperature on material selection; the materials categories, carbon steel materials, stainless steel and failure prevention of RCFA; and the ductile and brittle fractures, failure mechanism, failure processes and failure mechanism.

During this course, participants will learn the failure prevention and root cause failure analysis; the failure levels, failure classifications and types of root causes; the four major steps of root cause analysis; the process of root cause analysis and the features of fault tree software; the corrosion measurements and corrosion testing; the corrosion coupons, flat (strip) coupons, disc (flush) coupons and cylindrical coupons; the coupon preparation and cleaning, ultrasonic cleaning, chemical cleaning, electrolytic cleaning, sodium hydroxide – zinc cleaning, mechanical cleaning and coupon mounting; the conversion, coupon position and orientation and coupon holders; the pitting rate calculation, corrosion and pitting rate comparisons and electrical resistance monitoring; the principles of operation and ER sensing elements; the corrosion rate calculation, linear polarization resistance monitoring and electrochemical techniques ; the electrochemical polarization, electrical resistance probes, hydrogen permeation monitoring and electrochemical corrosion rate measurement techniques; the electrochemical method, corrosion potential measurements and corrosion monitoring; the electrochemical impedance spectroscopy (EIS), electrochemical noise and galvanic corrosion tests; the potentiodynamic curves, tafel extrapolation, microcor online system, environmental condition monitoring system, relative humidity, differential pressure and downhole corrosion monitoring system; the features of high-resolution on-line pipe thickness monitor, integrated corrosion management system and biofilm activity monitoring system; the corrosion management for oil and gas assets; and the asset CMS structure and its stages.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain a comprehensive knowledge in materials selection and properties
- Understand the various ASTM standards and requirements of such standards
- Understand the degradation in various operating environment and select the best material for those services

- Discuss the metallurgy, steels and cast irons classification
- Describe metals and non-metals, alloys and ferrous metals
- Classify steel and cast irons and its types including stainless steels and non-ferrous alloys
- Identify aluminum and aluminum alloys, copper and copper alloys, nickel and nickel-based alloys and titanium alloys
- Discuss heat treatment of non-ferrous and the mechanical properties of material covering malleability, ductility, toughness, hardness and tensile strength
- Determine mechanical properties of materials comprising of elastic limit, direct extrusion, open die forging, spinning, shell drawing, plastic deformation, twilling, fracture, polycrystalline material and cold working, etc
- Identify the mechanical properties of metals and alloys
- Illustrate damage tolerant design, fracture mechanics, failure processes, material hot working, testing of metals, tensile testing and sample preparation
- Recognize the area of a circular cross section and calculate tensile strength
- Discuss percent elongation, percent reduction of area, stress-strain diagram, brittle and ductile failure, true stress strain diagram, temperature effects, directional properties and rolling directions
- Carryout fatigue testing, bend testing, hardness testing steps, testing of metals, Brinell test, hardness test, impact test, creep test and stress-rupture test
- Identify the alloy elements in steels including the effects of alloying elements
- Explain electrochemical principles, passivity, corrosion management strategy, corrosion engineering and the mechanism of corrosion
- Identify the factors affecting corrosion as well as discuss the electrochemical principles, corrosion as a chemical reaction, ionic corrosions and anodic and cathodic corrosion
- Describe the electrochemistry of corrosion, electrochemical reactions and polarization
- Explain the importance of oxygen including the passivity and protective films, anodes and cathodes and local cells (electron flow)
- Employ corrosion prevention by electrochemical methods and corrosion rate measurements by electrochemical techniques
- Identify the forms and types of corrosion including general and localized corrosion
- Describe galvanic action, velocity effects, velocity-related attack, other types of local attack, hydrogen phenomena, corrosion in soils and pipeline corrosion
- Explain high temperature corrosion, prediction, control and materials used
- Discuss water and steam corrosion including the role of contaminants in water, types of water, corrosion of materials and cooling systems
- Carryout water treatment against corrosion and identify localized forms of water/steam corrosion

- Recognize the various the types of atmospheric corrosion apply testing for environmental cracking
- Interpret the change of environment and design considerations as well as employ materials selection for corrosion control
- Recognize materials standards and specifications, engineering materials, materials properties and the effect of temperature on material selection
- Identify materials categories, carbon steel materials, stainless steel and failure prevention of RCFA
- Describe ductile and brittle fractures, failure mechanism, failure processes and failure mechanism
- Carryout failure prevention and root cause failure analysis and avoid errors in failure analysis process
- Recognize failure levels, failure classifications and types of root causes
- Collect data and select diagnostic action and identify the four major steps of root cause analysis
- Illustrate the process of root cause analysis and discuss the features of fault tree software
- Apply corrosion measurements and corrosion testing as well as recognize corrosion coupons, flat (strip) coupons, disc (flush) coupons, cylindrical coupons, and etc.
- Carryout coupon preparation and cleaning, ultrasonic cleaning, chemical cleaning, electrolytic cleaning, sodium hydroxide – zinc cleaning, mechanical cleaning and coupon mounting
- Discuss conversion, coupon position and orientation and coupon holders as well as apply pitting rate calculation, corrosion and pitting rate comparisons and electrical resistance monitoring
- Explain the principles of operation and ER sensing elements and employ corrosion rate calculation, linear polarization resistance monitoring and electrochemical techniques
- Determine electrochemical polarization, electrical resistance probes, hydrogen permeation monitoring and electrochemical corrosion rate measurement techniques
- Perform electrochemical method, corrosion potential measurements and corrosion monitoring
- Apply electrochemical impedance spectroscopy (EIS), electrochemical noise and galvanic corrosion tests
- Describe potentiodynamic curves, tafel extrapolation, microcor online system, environmental condition monitoring system, relative humidity, differential pressure and downhole corrosion monitoring system
- Recognize the features of high-resolution on-line pipe thickness monitor, integrated corrosion management system and biofilm activity monitoring system
- Implement corrosion management for oil and gas assets as well as identify the asset CMS structure and its stages

Who Should Attend

This course provides an overview of all significant aspects and considerations of materials selection and properties for mechanical and inspection engineers.

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: -

- 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.

- 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.

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 Fee

As per proposal

Course Contents

- Introduction to Metallurgy, Steels and Cast Irons Classification
- Introduction to Metallurgy & Glossary
- What is a Metal?
- Metallurgy
- Process Metallurgy
- Physical Metallurgy
- Pure Metals/Alloys
- Metals & Non-Metals
- Alloys
- Smelting
- Extraction
- Review of Ferrous Metals
- Iron
- Classification of Steel & Cast Irons
- Classification of Steels
- AISI Series
- Classification of Steels: AISI Series (More Detail)
- Cast Irons & Its Types

- White Cast Iron
- Pearlite Malleable Cast Iron
- Malleable Cast Iron
- Gray Cast Iron
- Chilled Cast Iron
- Nodular Cast Iron
- Alloy Cast Irons
- Case Study #1
- Quiz #1
- Stainless Steels & Non-Ferrous Alloys
- Stainless Steels
- Carbon and Alloy Steels
- Types of Stainless Steels
- Martensitic Stainless Steels
- Ferritic Stainless Steels
- Austenitic Stainless Steels
- Duplex Stainless Steels
- Precipitation-Hardening Stainless Steels
- Non-Ferrous Alloys
- Aluminum and Aluminum Alloys
- Copper and Copper Alloys
- Nickel & and Nickel-Based Alloys
- Titanium Alloys
- Heat Treatment of Nonferrous
- Aluminum Alloys
- Solution Treatment (W Condition)
- Precipitation Treatment
- Solution Treated and Stabilized Treatment (TF7 Condition)
- Stress Relieving and Annealing Treatment (TS Condition)
- Copper Alloys
- Case Study #2
- Quiz #2
- Mechanical Properties of Material

- Definitions
- Malleability
- Ductility
- Toughness
- Charpy V-Notch Impact Test 4.5
- Ductile/Brittle Transition Curve 4.6
- Charpy V-notch Impact Test Specimen 4.7
- Charpy V-Notch Impact Test 4.8
- Charpy Impact Test 4.9
- Transition Temperature Samples
- Charpy Test Results
- Hardness
- Hardness Testing
- Tensile Testing
- Mechanical Properties of Materials
- Elastic Limit
- Direct Extrusion
- Open Die Forging
- Spinning
- Shell Drawing
- Plastic Deformation
- Twinning
- Fracture
- Polycrystalline Material
- Cold Working
- Stored Energy
- Strength of Materials
- Elastic and Plastic Behavior
- Ductile vs. Brittle Behavior
- Mechanical Properties of Metals & Alloys
- Failure
- Fracture
- Damage Tolerant Design

- Fracture Mechanics
- Failure Processes
- Material Hot Working
- Hot Working
- Testing of Metals
- Tensile Test
- Typical Stress/Strain Curve – Steel
- Sample Preparation
- Area of a Circular Cross Section
- Calculation of Tensile Strength
- Percent Elongation
- Percent Reduction of Area
- Stress-Strain Diagram
- Brittle vs Ductile Failure
- True Stress Strain Diagram
- Temperature Effects
- Directional Properties
- Rolling Directions
- Fatigue Testing
- Typical S-N Curves
- Notch Effects on Fatigue
- Bend testing
- Bend Test Procedure
- Guided Bend Test Jig
- Bend Test Samples - Transverse Weld Bend Specimens
- Bend Test Samples - Longitudinal Weld Bend Specimens
- Hardness Testing Steps
- Testing of Metals
- Brinell Test
- Hardness Tester
- Impact Test
- Creep Test
- Stress-Rupture Test

- Case Study #3
- Quiz #3
- Alloy Elements in Steels
- Alloying
- Effects of Alloying Elements
- Carbon Steels
- Manganese
- Phosphorous
- Silicon
- Alloy Steels
- The Effects on Carbide
- Nickel Steels (2xxx Series)
- Chromium Steels (5xxx Series)
- Nickel-Chromium Steels (3xxx Series)
- Manganese Steels (31xx Series)
- Molybdenum Steels (4xxx Series)
- Case Study #4
- Quiz #4
- Electrochemical Principles & Passivity
- Corrosion Management Strategy
- Human Life and Safety
- Corrosion Engineering
- Importance of Corrosion
- Corrosion Theory
- The Corrosion Triangle
- Mechanism of Corrosion
- Factors Accelerating Corrosion
- Temperature
- Hygroscopic (Osmotic) Blisters
- Aerobic conditions, Presence of Oxygen
- Presence of Some Bacteria on the Surface
- Acids and Alkalies
- Bi-Metallic Corrosion

- Corrosion Management Strategy
- Electrochemical Principles, Overview & Glossary
- Corrosion as a Chemical Reaction
- Ionic Corrosions Anodic & Cathodic Corrosion
- Electrochemistry of Corrosion
- Electrochemical Reactions
- Polarization
- Cathodic Polarization
- Activation Polarization
- Concentration Polarization
- Importance of Oxygen
- Passivity and Protective Films
- Definition and Nature
- Effect of Oxidizers
- Passivity and Protective Films
- Passivity and Passive (Protective) Films
- Anodes & Cathodes, Local Cells
- Anode Reactions
- Cathode Reactions
- Local Cells (Electron Flow)
- Origins of Local Cells
- Differential Aeration
- Local Cells & Corrosion Types
- Open Pitting
- Crevice Corrosion
- Filiform Corrosion
- Corrosion Prevention by Electrochemical Methods
- Anodic Protection
- Cathodic Protection
- Corrosion Rate Measurements by Electrochemical Techniques
- Apparatus
- Corrosion Rate Calculations
- Applications

- Case Study #5
- Quiz #5
- Forms & Types of Corrosion
- General and Localized Corrosion
- Galvanic Action
- Corrosion Potential and Galvanic Series
- Magnitude of Galvanic Effects
- Preventing Galvanic Corrosion
- Velocity Effects, Velocity-related Attack
- Erosion Corrosion
- Cavitation
- Impingement
- Other Types of Local Attack
- Fretting Corrosion
- Inter-granular Corrosion Cracking
- Trans-granular Corrosion
- Corrosion Fatigue
- Hydrogen Phenomena
- Hydrogen Diffusion
- Hydrogen Blistering
- Hydrogen-Induced Cracking (HIC)
- Corrosion in Soils
- Electrolytes and Ionization
- Pipeline Corrosion
- Exposure
- Case Study #6
- Quiz #6
- High Temperature Corrosion
- Introduction
- Overview
- Prediction
- Control
- Materials Used for High Temperature Corrosion

- Alloys
- Case Study #7
- Quiz #7
- Water & Steam Corrosion
- Role of Contaminants in Water
- Common Water Impurities
- Chemical characteristics of water
- TSS (Total Suspended Solids)
- TDS (Total Dissolved Solids)
- Hardness
- Dissolved Oxygen
- Contaminants
- Types of Water
- Corrosion of Materials
- Zinc
- Aluminum
- Iron and Steel
- Stainless Steels
- Cooling Systems
- Open Recirculation System (Cooling Tower)
- Closed Recirculation System (Closed Loop)
- Dissolved Oxygen in Water
- Water Salinity
- Water Temperature
- State of Metal Surfaces
- Contact Between Different Metals
- Water Circulation Rate
- Surrounding Environment
- Water Treatment
- Water Treatment Against Corrosion
- Localized Forms of Water/Steam Corrosion
- Pitting Corrosion
- Crevice Corrosion

- Impingement Corrosion
- Intergranular Corrosion
- Stress Corrosion Cracking
- Corrosion Fatigue
- Case Study #8
- Quiz #8
- Atmospheric & Environmental Corrosion
- Types of Atmospheric Corrosion
- Environmental Cracking
- Fracture Mode
- Stress
- Stress Corrosion Cracking (SCC) Process
- Mechanism of SCC
- Behavior of Steels
- Behavior of Stainless Steels
- Behavior of Titanium Alloys
- Slow Strain Rate Test
- Other Tests
- Change of Environment
- Factors Affecting Atmospheric Corrosion
- Design Considerations
- Iron and Steel
- Case Study #9
- Quiz #9
- Materials Selection for Corrosion Control
- Introduction
- Materials
- Materials Standards and Specifications
- Engineering Materials
- Materials Properties
- Mechanical Properties
- Hardness
- Toughness

- Test Methods
- Factors Affecting Material Toughness
- Ductile-to-Brittle Transition
- V-Charpy Impact Test Specimen
- V-Charpy Impact Test Set-Up
- Wear Resistance
- Classification of Wear
- Creep
- Rupture
- Materials Selection
- Effect of Temperature on Material Selection
- Materials Selection the Galvanic Series of Metals in Sea Water
- Materials Categories
- Carbon Steel
- Carbon Steel Materials
- Stainless Steel
- Austenitic Stainless Steel
- Ferritic Stainless Steel
- Martensitic Stainless Steel
- Super Stainless Steel
- Duplex Stainless Steel
- Nickel and Nickel Alloys
- Ni (Alloys 200 & 201)
- Ni-Cu Alloys (Alloys 400, K-500, Cupronickels 90/10 & 70-30)
- Nickel-Molybdenum Alloys (Alloy B-2)
- Nickel-Chromium-Iron Alloys (Alloys 600 & 800)
- Nickel-Chromium-Molybdenum Alloys (C-276, C-4 & alloy 625)
- Titanium and Titanium Alloys
- Case Study #10
- Quiz #10
- Failures & Failure Prevention RCFA
- Introduction
- Ductile and Brittle Fractures

- Brittle Fractures
- Residual Stresses
- Ductile Fractures
- Failures from Improper Fabrication
- Improper Thermal Treatment
- Improper Electroplating
- Residual Stresses
- Failure Mechanism
- Failure Processes
- How Components Fail?
- Fatigue Damage
- Three Stages to Fatigue
- Distortion Failures
- Wear Failure
- Types of Wear
- Liquid Erosion Failure
- Corrosion Failures
- Uniform and Localized Corrosion
- Stress Corrosion Cracking
- Liquid Metal Embrittlement
- Hydrogen Damage Failures
- Corrosion Fatigue
- Elevated Temperature Failures
- Failure Prevention & Root Cause Failure Analysis
- Introduction
- Common Questions We Address
- What is a Failure? What is Failure Analysis?
- Why do Failures Happen?
- What is the Root Cause Analysis?
- Root cause analysis (RCA)
- Safety-based RCA
- Production-based RCA
- Process-based RCA

- Failure-based RCA
- Systems-based RCA
- Avoiding Errors in Failure Analysis Process
- Failure Levels
- The Simplest
- A Second Level
- A Third Level
- Failure Classifications
- Sporadic and Chronic
- Group Exercise
- Types of Root Causes
- Root Cause
- Physical (P) Root Causes (Immediate Cause)
- Human (H) Root Causes
- Latent (L)
- More Examples for RC
- Latent Root Cause
- Form the Analysis Team
- The Mission
- Skill Areas for Good RCA Team
- How to Collect Data & Select Diagnostic Action?
- Failure Analysis Work
- Root Cause Analysis: Four Major Steps
- Step 1: Data Collection and Preservation
- Step 2: Causal Factor Charting
- Step 3: Root Cause Identification
- Step 4: Recommendation Generation and Implementation
- Root Cause Analysis: The Process
- RCA Software
- Features of Fault Tree Software
- Case Study #11
- Quiz #11
- Corrosion Measurements

- Corrosion Testing
- Corrosion Coupons
- Flat (Strip) Coupons
- Disc (Flush) Coupons
- Cylindrical Coupons
- Welded Coupons
- Stressed Coupons
- Scale Coupons
- Bio-Film (Mesh) Coupons
- Insulators
- Surface Condition of Coupons
- Coupon Finishes
- Coupon Preparation & Cleaning
- Ultrasonic Cleaning
- Chemical Cleaning
- Electrolytic Cleaning
- Sodium Hydroxide – Zinc Cleaning
- Mechanical Cleaning
- Coupon Mounting
- Time of Test
- Proposed Corrosion Coupon Programme
- Conversion
- Coupon Position and Orientation
- Preferred Flow Direction
- Ladder Strip Coupon Holder
- Flush Disc Coupon Holder in High Pressure Access Fitting
- Coupon Holders
- Fixed (Pipe Plug) Coupon Holders
- Retractable Coupon Holders
- Retrievable Coupon Holders
- For High Pressure (HPTM and MHTM) Access Systems)
- Board Mounted Coupon Rack with Flow Meter
- Economics of Corrosion Testing

- Weight Measured to the Nearest 0.0001 grams
- Coupon Evaluation after Exposure
- Pitting Rate Calculation
- Coupon Storage Bags
- Corrosion and Pitting Rate Comparisons
- Electrical Resistance Monitoring
- Principles of Operation
- ER Sensing Elements
- Corrosion Rate Calculation
- Linear Polarization Resistance Monitoring
- Electrochemical Techniques
- Electrochemical Polarization
- Electrical Resistance Probes
- ER Probe Types
- Hydrogen Permeation Monitoring
- Hydrogen Permeation Monitoring Principles
- Electrochemical Corrosion Rate Measurement Techniques
- Electrochemical Method
- Corrosion Potential Measurements
- Tafel Extrapolation
- LPR Theory
- Corrosion Monitoring
- Electrochemical Impedance Spectroscopy (EIS)
- In Situ Monitors Corrosion
- Electrochemical Noise
- Galvanic Corrosion Test
- Potentiodynamic Curves
- Proposed Relationship between Corrosion Rate and Remaining Service Life
- Estimated Corrosion Rates for Oxidation
- Microcor® Online System
- Environmental Condition Monitoring System
- Corrosion
- Relative Humidity

- Temperature
- Differential Pressure (Optional)
- Downhole Corrosion Monitoring System
- High Resolution On-line Pipe Thickness Monitor
- Integrated Corrosion Management System
- Biofilm Activity Monitoring System
- The Solution
- Possible pH Measurement Points in Oil Refining
- Desalter
- The InTrac 777 Retractable Housing
- Intract 7XXe Housing
- EasyClean for Digital Integration
- Crude Distiller Overhead Condenser Boot Water
- Alkylation (simplified) H2SO4
- Claus Tail Gas Clean-Up
- pH Measurement at Sour Water Stripper
- iSense – ISM Asset Suite
- Crude Unit Overhead Condenser Water
- pH Control in Sour Water Stripping
- FSM Online/FSM Log
- Real Time Corrosion Monitoring Directly on the Pipe Wall
- FSM Online Applications
- Case Study #12
- Quiz #12
- Corrosion Management for Oil and Gas Assets
- The Big Misunderstanding and Its Consequences
- Asset CMS Structure and Its Stages
- Case Study #13
- Quiz #13