COURSE OVERVIEW PE0139
Process Optimization - Fundamental (E-Learning Module)

Course Title
Process Optimization - Fundamental (E-Learning Module)

Course Reference
PE0139

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 course is designed to provide participants with a detailed and up-to-date overview of process optimization fundamental. It covers the block diagram, process flow diagram, piping & instrumentation diagram, abbreviations & symbols, isometric drawings and separation process; the emulsion treatment equipment, crude oil dehydration and desalting, tanks and the required treatment for water injection; the filtration, removal of dissolved matter, classifications of ion exchange resins, waste management and drainage and effluent treatment systems; and the reverse osmosis, common waste water contaminates, typical chemical treatment for contaminant removal and gravity sedimentation.

Further, the course will also discuss the stabilizer and clarifier for raw water treatment, radial flow clarifier schematic and common impurities found in water; the pressure measurements, back pressure method, ultrasonic sound waves method, flow measurement and temperature measurement; the corrosion mechanism, refinery corrosion, caustic cracking, cavitation, furnace reliability and temperature variations after process control modifications; and the aspects of underground corrosion and apply the general procedure to determine corrosivity of oil wells, generic riser repair procedure and integrity management.

During this interactive course, participants will learn the hazard evaluation, hazard identification (HAZID), risk assessment techniques, hierarchy of risk reduction, management of mechanical integrity and integrity management process; the inspection methods, mandatory inspections/tests, inspection selection, pipeline integrity management, pipeline inspection and repairs; the corrosion management, modification management, common maintenance strategy, equipment planning and maintenance management; the performance indicators, wellhead bay deluge testing, types of protective devices and hierarchy of protective systems; the emergency response, hierarchy of risk reduction, integrity management, self-verification, development of monitoring plan and corrosion monitoring system design; the data management, critique of corrosion monitoring techniques, field signature method, solid particle erosion monitoring and corrosion inhibitors selection; the mineral scale and deposition factors, factors affecting the rate of scale formation and the assessment of defect severity as per client agreed criteria; the pressure measurement, preventive scale formation and scale removal; the factors affecting the rate of scale formation, mechanisms of scale inhibition, hydrocarbon-water processing, gravity separation, wax removal and inhibitor testing; and the emulsion treatment, prevent scale formation, removal of scale forming constituents, continuous injection and selection and evaluation of chemicals.

Course Objectives

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

- Apply and gain a fundamental knowledge on process optimization
- Explain basic principles of process optimisation
- Describe site process control philosophies and emergency shutdown logic
- Review and analyse parameters and values in operations log sheet(s)
- Describe the importance of all critical process equipment and parameters
- Carryout basic performance review for process equipment and systems and provide recommendations for optimization
- Illustrate block diagram, process flow diagram, piping & instrumentation diagram, abbreviations & symbols, isometric drawings and separation process
- Discuss emulsion treatment equipment, crude oil dehydration and desalting, tanks and the required treatment for water injection
- Apply filtration, removal of dissolved matter, classifications of ion exchange resins, waste management and drainage and effluent treatment systems
- Recognize reverse osmosis, common waste water contaminates, typical chemical treatment for contaminant removal and gravity sedimentation
- Identify stabilizer and clarifier for raw water treatment, radial flow clarifier schematic and common impurities found in water
- Carryout pressure measurements, back pressure method, ultrasonic sound waves method, flow measurement and temperature measurement
- Determine corrosion mechanism, refinery corrosion, caustic cracking, cavitation, furnace reliability and temperature variations after process control modifications

- Explain the aspects of underground corrosion and apply the general procedure to determine corrosivity of oil wells, generic riser repair procedure and integrity management
- Employ hazard evaluation, hazard identification (HAZID), risk assessment techniques, hierarchy of risk reduction, management of mechanical integrity and integrity management process
- Implement inspection methods, mandatory inspections/tests, inspection selection, pipeline integrity management, pipeline inspection and repairs
- Apply corrosion management, modification management, common maintenance strategy, equipment planning and maintenance management
- Identify performance indicators, wellhead bay deluge testing, types of protective devices and hierarchy of protective systems
- Perform emergency response, hierarchy of risk reduction, integrity management, self-verification, development of monitoring plan and corrosion monitoring system design
- Carryout data management, critique of corrosion monitoring techniques, field signature method, solid particle erosion monitoring and corrosion inhibitors selection
- Identify mineral scale and deposition factors, factors affecting the rate of scale formation and the assessment of defect severity as per client agreed criteria
- Implement pressure measurement, preventive scale formation and scale removal
- Recognize the factors affecting the rate of scale formation, mechanisms of scale inhibition, hydrocarbon-water processing, gravity separation, wax removal and inhibitor testing
- Apply emulsion treatment, prevent scale formation, removal of scale forming constituents, continuous injection and selection and evaluation of chemicals
- Discuss the petroleum fundamentals, petroleum industry and oil and gas process
- Illustrate oil processing, oil refining, gas processing, gas sweetening and gas dehydration
- Implement process safety and identify the requirement for process safety
- Apply process safety management and the stages of process safety
- Discuss the instrument theory and hazardous area including manual and automatic control
- Describe the operating principles of open and close control loops including the operation and control philosophy

Who Should Attend

This course provides a basic overview of all process optimization for managers, leaders, section heads, superintendents, supervisors, process engineers, production engineers, plant engineers and planning 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.

Course Fee

As per proposal

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 Contents

- Block Diagram
- Process Flow Diagram
- Piping & Instrumentation Diagram
- Abbreviations & Symbols
- As Built Drawings
- Orthographic Drawings
- Isometric Drawings
- Exploded Drawings
- Basic Theory of Separation
- The Separation Process
- Construction of Separators
- Separator Instrumentation and Control
- Separation in Stages
- Classification of Separators
- Oil field Emulsions
- Emulsifying Agents
- Emulsion Stability
- Principle of Emulsion Breaking
- Emulsion Treatment Equipment
- Crude Oil Dehydration and Desalting at Halfaya CPF1 and CPF2
- Crude Oil Treatment Process Flow Diagram

- Electrostatic Dehydrator
- Electrostatic Desalter
- Fixed Roof Tanks
- Floating Roof Storage Tanks
- Dome Roof Storage Tanks
- Spherical Tank
- Bullet Tanks
- Measuring Meters
- Water properties/contamination
- Main water problems
- The different water sources for water injection
- Required treatment for water injection
- Chemicals for water injection (raw river water)
- Chemicals for water injection
- Filtration
- Dual Flow Filter
- Media Loading
- Acceptance of the System
- Media Loading Sequence
- Typical Dual Media Filter
- Typical Disposable Filter Cartridges
- Diatomaceous Earth Filtration
- Common Types of Filters
- Removal of Dissolved Mater
- Silt Density Index (SDI)
- Statistical Process Control
- Zeolites
- Classifications of Ion Exchange Resins
- Sodium Zeolite Softening
- Softener Operation
- Sodium Zeolite Softener
- Softener Backwash
- Brining

- Slow Rinse
- Fast Rinse
- Poro-Edge Automatic Strainer Protects Process Equipment
- Typical Recirculating Cooling Water System
- Typical Lake and River Water Application
- Typical Recycle or Reuse Solution System
- Proposed Automatic Back Wash Strainer Location
- Effluent Treatment Plant
- Effluent Treatment Facilities
- Waste Management
- Drainage and Effluent Treatment Systems
- Source Of Water
- Common Source Of Water
- Ground Water
- Surface Water (Rains, Rivers, Sea Water)
- The Nature of water
- Osmotic Equilibrium
- Reverse Osmosis
- Wastewater Treatment & Reuse
- Common Waste Water Contaminates
- Typical Chemical Treatment for Contaminant Removal
- Gravity Sedimentation
- Parts of an Up Flow Clarifier
- Settling Modes
- " V "- Notched Weir and Flume "
- Skimmer and Scum Trough
- Clarifier Design
- Laboratory Evaluation of Coagulants
- Stabilizer and Clarifier for Raw Water Treatment
- Radial Flow Clarifier Schematic
- Water Treatment
- Sources of Water
- Raw Water Contaminants

- Common Impurities Found In Water
- Water Treatment Overview
- Water Treatment Processes
- Water Treatment Path
- Atmospheric pressure
- Pressure exerted by liquids
- Pressure Units
- Pressure Scale
- Pressure Measurements
- Bourdon Tube Pressure Gauges
- Diaphragm Pressure Gauges
- Pressure Transmitter
- Standard Transmitter Set Up Diagram
- Control Loop – Case Study
- Differential Pressure Transmitter
- Pressure Switches
- Level
- Dip Tapes And Dip Sticks
- Gauge Glasses
- Magnetic float indicators
- Differential Pressure Cells (DP Cells)
- Displacer
- Back Pressure Method
- Ultrasonic Sound Waves Method
- Nucleonic Level Measurement System
- Level Switches
- Flow Measurement
- Volumetric And Mass Flow Rate Flow
- Flow Patterns
- Flow Measurement Devices
- Orifice Plate Flow Meter
- Venturi Tube Flow Meters
- Pitot Tube Flow Meters

- Turbine Flow Meters
- Paddle Wheel Flow Meters
- Ultrasonic Flow Meters
- Positive Displacement [PD] Flow Meters
- Variable Area Flow Meters
- Temperature measurement
- Temperature Units
- Measurement Devices
- Glass Capillary Thermometers
- Bimetallic Thermometers
- Gas And Liquid Filled Thermometers
- Vapour Tension Thermometers
- Thermocouple
- Resistance Temperature Devices (RTDS)
- Radiation Temperature Detectors
- Temperature Switches
- Corrosion mechanism
- Atmospheric corrosion
- Form of Corrosion
- Uniform corrosion
- Pitting corrosion
- Galvanized corrosion
- Erosion corrosion
- Cavitation corrosion
- Fretting corrosion
- Inter – Granular corrosion
- Exfoliation corrosion
- De-alloying or selective leaching
- Stress corrosion cracking (SCC)
- Corrosion of the metal
- Corrosion of Alloy
- Corrosion in soil
- Corrosion inspection and monitoring

- How Does Corrosion Affect on our life
- How Does Corrosion Affect Profits
- Corrosion Definitions
- Corrosion in Petroleum Production
- Theory of Corrosion
- Electromotive Force Series for Metals
- The Corrosion Cell
- Potential
- Galvanic Series
- Four Parts Of Corrosion Cell
- Corrosion Battery
- Factors Influencing Corrosion
- How Corrosion Occurs
- How to Control Corrosion
- How Fast Will Corrosion Occur?
- The Variation of Corrosion Rate With pH
- Velocity Phenomena
- Corrosion Failure Analysis - Erosion Corrosion
- Prevention Of Erosion Corrosion
- Types of Corrosion
- General Corrosion
- Galvanic Attack
- Galvanic Series
- Corrosion Failure Analysis Galvanic Corrosion
- Prevention Of Galvanic Corrosion
- Case Study
- Problem Symptom
- Remedial Action
- Material Comparison
- Galvanic Corrosion
- Pitting Corrosion
- Crevice Corrosion
- Localised Attack

- Inter granular Corrosion
- Intergranular Attack Weld decay
- Intergranular Attack
- Corrosion Failure Analysis Hydrogen Sulfide Corrosion
- Prevention of Hydrogen Sulfide Corrosion
- SSCC Mechanism
- Sulfide Stress Corr. Cracking (SSCC)
- SSCC Decision Criteria
- Stress Corrosion Cracking
- Corrosion Failure Analysis Oxygen Corrosion
- Prevention of Oxygen Corrosion
- Corrosion Failure Analysis Carbon Dioxide Corrosion
- Prevention of Carbon Dioxide Corrosion
- Refinery Corrosion
- What We Are Trying to Prevent
- What Caused This Fire?
- Cause of the Fire
- Why did this failure occur there?
- Area Where the Fire Took Place
- The Cause of this Corrosion
- Another Failure that Could Have Been Prevented
- Fatigue Cracking of a Small Connections
- Small Connection Detail
- Instrumentation Connection that Failed by Fatigue
- Types of Low Temperature Refinery Corrosion
- Types of Stress Corrosion Cracking in Refineries
- Fire on the CFHU Starting at Instrumentation Tubing
- Chloride Stress Corrosion Cracking
- Caustic Cracking
- Types of High Temperature Refinery Corrosion
- High and Low Temperature Oxidation
- An Example of High Temperature Oxidation
- Corrosion Under Insulation

- The Role of Insulation
- Large Icicles Are Also a Safety Hazard – Don't Walk Under Them!
- Ladder Support CUI
- CUI of Vessel Skirts
- Vessel Holed Through from OD and It Was Sucking in Air
- 3-Inches of Corrosion Deposits Beneath the Insulation
- Underground Corrosion
- Crevice Corrosion
- Oxygen Pitting
- Cavitation
- Wet H2S & Wet NH4SH Corrosion
- What Operators Can Do About NH4SH and H2S Corrosion
- Amine Corrosion
- Amine Corrosion – What You Can Do
- Mix Point Corrosion
- Acid Corrosion
- Polythionic Stress Corrosion Cracking on FCU 500
- Sensitization of the Stainless followed by Corrosion
- High Temperature Furnace Corrosion
- Furnace Reliability
- Control Valve % Open
- Out Temperature Fluctuations
- Creep Rupture
- H-3 Furnace on 11A Pipe Still
- Naphthenic Acid Corrosion
- Exceeding Process Limits - TAN Data on Feed to 12 Pipe Still
- Another High Temperature Problem – Weld Overlay Disbonding
- Sulfidic Corrosion
- FCU 500 Sulfidic Corrosion Failure
- Debutanizer Section of a Hydroformer
- Debutanizer Tower of 4 Ultraformer
- Temperature & Pressure Variations Over the Last Year
- Close-Up View of Largest Temperature Cycle

- Temperature Variations After Process Control Modifications
- What to do about Process Variations
- CUI Corrosion at Whiting Refinery
- Corrosion Under Insulation
- The Role of Insulation
- An Oxygen Concentration Cell on a Wet Surface
- Examples of CUI & Underground Corrosion
- 4 Treater CUI
- Icicle Safety Hazard
- Corrosion Deposits 3-Inches Thick
- Vessel Pitted Through from OD and Air Was Sucked as The Vacuum Tower Operated
- SRU Soil-Air Interface Corrosion
- Steam Leak Providing Plenty of Water for Corrosion - SRU
- Soil-Air Interface Corrosion Is Similar to CUI - Dirt Holds Water Against the Pipe
- Soil-Air Interface Corrosion
- VRU 100/200 Underground Corrosion
- Underground Corrosion
- Aspects of Underground Corrosion
- CUI Checklist for Identifying CUI
- CUI Checklist
- General Procedure to Determine Corrosivity of Oil Wells
- Generic Riser Repair Procedure
- Integrity Management
- Timings and ground rules
- Definition
- Longford pre-course study
- BP Integrity Management Standard
- BP HSE Policy
- 3-year PSIM Rolling Action Plans
- IM Objectives in E & P
- North Sea pig launcher HIPO
- Root Causes of Integrity Incidents
- E&P IM Performance

- Hazard Evaluation
- Disasters and regulations
- Ship and rig collision hazards
- Earthquake in Alaska
- Unsafe spacing of storage tanks
- BP storage tank fire video
- Tank farm fire
- Hazards of lightning
- Hurricane damage
- Hazard Evaluation: key concepts
- Hazard barrier diagram
- Recognizing hazards
- What are we trying to avoid?
- Team exercise: barrier diagram
- Major accident consequences
- Hazard identification (HAZID)
- Risk assessment techniques
- Major Hazard Risk Matrix
- BP Trinidad MAHA matrix
- Typical 30-year old platform design
- October major hazard risk matrix
- ALARP
- Quantitative risk assessment
- Individual Fatality Statistics (Egypt)
- Which is safer?
- Which is inherently safer?
- Inherent safety design concepts
- Inherent safety concepts offshore
- Inherently safer design: Tangguh
- Corrosion resistant well flowlines
- Tangguh platform individual risks
- Rehabilitation project
- Stages of safety

- Hierarchy of Risk Reduction
- Hazard Identification – Application
- Why Analyze Risk?
- Analyzing Risk
- Reducing Risk
- Document
- What's the purpose?
- Risk Tools Pyramid
- Major Accident Hazards
- Process Tools
- Selecting a Tool vs. Project Stage
- Risk Summary
- Safety Critical Equipment
- The Longford Plant Fire
- Lessons from Longford
- PSIM "Minimum Requirements" Hazard Evaluation
- Mechanical Integrity
- Mechanical Integrity – Scope
- Mechanical integrity problems – examples
- Kuparuk pipelines, Alaska (2003)
- Krechba (In Salah) Gas Plant, 2004
- Brittle fracture on hydrostatic test
- Mechanical damage to BP pipeline
- Longford exchanger: brittle fracture
- Rig collision damage on BP Platform
- Cracking at K-node of platform jacket
- BP heat exchanger, brittle fracture
- TransCanada gas line rupture
- BP Cochin (US) pipeline failure, 2003
- BP 12" Anadarko pipeline failure (2002)
- Rupture of M-08 gas riser
- BP Forties 4" gas line rupture (2002)
- BP Harding Gas Lift Manifold

- BP LPG plant, Sharjah (2002)
- Corrosion at piping support, BP site
- Collapse of LPG storage sphere
- Structural collapse of water tank
- Well blow-out
- Management of mechanical integrity
- Integrity management process
- Assurance in Design
- Assurance in Contractors
- Assurance in Materials
- Assurance in Operations
- Assurance in Maintenance
- Assurance in Decommissioning
- Inspection Methods – General
- Why Inspect?
- Inspection Methods
- Destructive vs. Nondestructive
- Inspection Methods
- Mandatory Inspections/Tests
- Inspection Selection
- Summary
- Team exercise: inspection plans
- Causes of leaks
- Never happened in history?
- Pipeline Integrity Management
- Operations & Safety Systems
- Pipeline Inspection and Repairs
- Corrosion Management
- Modification Management
- Flow Assurance
- Common Maintenance Strategy
- Equipment Planning
- Reliability Objectives

- Components
- CMS Process
- Maintenance Management
- Plan Content
- Example Activities
- Failure Analysis
- Failure Analysis Results
- Performance Measures
- Tool Box
- Lessons from Longford PSIM “Minimum Requirements” Mechanical Integrity
- Protective Systems
- Layers of protective barriers
- Protective Systems - key concepts
- Protective Systems Types
- Safety-Related Devices (pressure)
- Upkeep & Readiness
- Performance Indicators
- Process alarms / trips: the first barriers
- Example safety instrumented function
- Safety Integrity Levels (SIL)
- PSVs: the last overpressure barriers
- Lock-open / lock-close valves: SCE
- Pipeline ESDV on 30 yr old BP platform
- Storage tank overpressure
- Vacuum collapse of storage tank……
- Roof vent blocked by plastic sheet
- “EX” boxes to avoid ignition source (!!)
- Forties Alpha and EX fittings
- WJ Junction Box Inspections
- Control of hot work a “protective system”
- Cold work to avoid ignition source
- Team exercise
- Wellhead bay deluge testing

- Evacuation / survival equipment is SCE
- Types of protective devices
- Hierarchy of Protective Systems
- Team exercise: protecting your assets
- Toilet explosion!! (Feb 2004)
- “Layers of protection” on a storage tank
- Ashland tank disaster, 1988
- Ashland tank disaster
- Tank containment: team exercise
- Avoiding an “Ashland”
- Lessons from Longford
- Management of Change
- MOC – Scope
- Typical MOC procedure
- Management of Change Considerations
- Temporary Changes
- Emergency Change
- Technical Authority (TA)
- Change Creep
- Flixborough Case Study
- Overview of the Incident
- Process Description
- Reactor Connections
- Events Leading to the Explosion
- The Explosion
- One Theory
- Investigation Inquiry
- Lessons from Longford
- The IM Incident and Learning Pyramid
- Lessons from Longford
- Element 7: Emergency Response
- Emergency response
- Hierarchy of Risk Reduction

- Lessons from Longford
- PSIM Performance Metrics
- IM Scorecard
- Integrity Management
- The new IM Standard
- Element 5: Competent Personnel
- Engineering Authorities: key roles
- Element 6: Incident Investigation
- High reliability organisations
- Element 8: Performance Mgt and Assurance
- The IM Matrix
- The Integrity Management “Journey’’ to become the Great Operator !
- Element 5: Minimum Requirements
- Element 6: Minimum Requirements
- Element 7: Emergency Response
- Element 7: Minimum Requirements
- Self-verification
- BUL and PUL support for IM
- Element 8: Minimum Requirements
- IM risk matrix
- IM Competency Development
- Competency-on-Line for IM
- COMAH accidents, Apr 2000-Mar 2001
- COMAH accidents, Apr 2001-Mar 2002
- Major IM Legislation in UK & US
- Link Between GHSER and PSIM
- Ship collision
- Earthquake
- Tangguh Platform Inherent Safety Goals
- Distribution of hazards – offshore
- BP Grangemouth 1987
- Gas Injection Pipework (170 bar)
- Corrosion Control System

- Management of Corrosion Under Insulation
- Individual risk summary – Cassia
- Cassia: process accident risks
- Cassia: riser accident risks
- Causes of pipeline / riser failures
- Pipeline / riser adjustment factors
- Inherent safety of risers
- bpTT: major accident scenarios
- Can you see anything wrong?
- Canada Gas BU
- Inherent safety……some ideas
- Canadian Regulations
- TNK-BP: long term delivery risk matrix
- TNK-BP: typical pipeline manifold leak
- BP Indonesia Actual / Estimated IM Spends
- Training - Process Safety / Integrity Management
- Competence Components
- Competence Levels
- Competence Management
- Key IM Competence
- Java PU Risk Matrix, 2004
- West Java: 2002-05 Integrity Program
- Java PU progress against PS/IM Std
- The good old days
- West Java 2003 HC Leaks
- West Java 2004 HC Leaks (to June)
- West Java Mechanical Integrity Plans
- IM Matrix
- Kingdom of Microorganisms
- Classification of Bacteria
- Simplified organic degradation
- Sulfate Reduction
- Microbial Induced Souring

- Bacterial Population in Oilfield Systems
- Recognition of MIC (Direct)
- Sulfate Reducing Bacteria
- Problems Types of SRB
- Salinity
- Redox
- Temperature
- pH
- Pressure
- Water
- Oxygen Relationship
- Morphology of Bacteria
- Microorganisms
- Classes of Biocides
- Prevention of MIC
- Corrosion Failure Analysis Sulfate Reducing Bacteria Corrosion
- Prevention of SRB Corrosion
- Corrosion Failure Analysis Acid Producing Bacteria (APB) Corr.
- Prevention of Acid Producing Bacteria Corrosion
- Corrosion Failure Analysis Underdeposit Corrosion
- Prevention of Underdeposit Corrosion
- Guidance on Practice for Corrosion Monitoring
- Introduction
- Scope
- Normative references
- Symbols and abbreviations
- Development of monitoring plan
- Corrosion monitoring system design
- General
- Device selection and placement
- Corrosion data quality
- Corrosion monitoring economics
- Data management

- Critique of corrosion monitoring techniques
- Probes and coupons
- Weight loss coupons
- Electrical resistance probes
- High sensitivity ER probes
- Field signature method
- Solid particle erosion monitoring
- Hydrogen probes
- Other monitoring techniques
- Stream analysis
- Bibliography
- Management & Monitoring
- Corrosion Monitoring
- Inspection, Survey, and Monitoring
- Corrosion Surveillance
- Corrosion Monitoring Philosophy
- Corrosion Monitoring Techniques
- Corrosion Control Chemicals
- Definitions
- Corrosion Inhibitors
- Amine Fatty Acid
- Continuous Treatment
- Initial Film Establishment
- The Protective Film Slow the Corrosion Process by :
- Corrosion Inhibitors Types
- Anodic Inhibitors
- Non-Oxidizing Inhibitors
- Cathodic Inhibitors
- Organic Inhibitors
- Corrosion Inhibitors Selection
- The Advantages of Side – Stream Testing
- Guidelines for Inhibitor Selection
- Selection of Corrosion Inhibitors

- Inhibitor Application
- Flowing Well Downhole Injection Valve (Courtesy NACE)
- Flowing Well Concentric Kill String
- Measuring and Monitoring Corrosion
- Corrosion Monitoring is used to Determine the Effects of Corrosion
- Corrosion Monitoring Techniques
- Desirable Properties of A Corrosion Inhibitor
- Factors Involved in Inhibitors Selection
- Screening Tests
- Static and Wheel Tests
- Mineral Scale in Oilfield Production Systems
- Scale Deposition in Oilfield Production Systems
- Mineral Scale and Deposition Factors
- Common Mineral Scales
- Mineral Scale and Deposition Factors
- Low Specific Activity (LSA) Scale
- Mineral Scale and Deposition Factors
- Reasons for Scale Formation
- Calcium Carbonate Scale Mechanism
- Calcium Carbonate Deposition
- Calcium Sulphate Scale Mechanism
- Barium Sulphate Deposition
- Strontium Sulphate Scale Mechanism
- Mineral Scale and Deposition Factors
- System Factors
- Factors Affecting the Rate of Scale Formation
- Degree of Supersaturation
- Rate of Nucleation
- Rate of Crystal Growth
- Adherence of Scale
- Scale Deposition in Oilfield Production Systems
- Possible Locations of Scale:
- Three Phase Separator

- Scale Control
- Chemical Treatment
- Mechanical Treatment
- Scale Inhibitors
- Inorganic Phosphates
- Phosphate esters
- Polymers
- Phosphono - methylated amines (Phosphonates)
- PMPA (phosphono - methylated polyamine)
- Mixed formulations
- Mechanisms of Scale Inhibition
- Scale Inhibitor Selection Criteria
- Scale Deposition in Oilfield Production Systems
- Scale Composition Determination
- Selection of Scale Inhibitor
- Compatibility
- Water Injection System – Application
- Scale Inhibitor Injection Points
- Production System – Application
- Downhole Injection Methods
- Via Lift Gas
- Downhole Capillary
- Coiled Tubing
- Squeeze Treatment
- Successful Squeeze
- Long Reach Horizontal
- Horizontal Well :Squeeze
- Typical Squeeze Treatment
- Typical Spearhead
- Scale Inhibitor Concentration
- Overflush, Shut in and Re-flow
- Successful Squeeze
- Unsuccessful Squeeze

- Squeeze Volume Calculations
- Overflush Volume
- Scale Control Chemical
- Scale Inhibitors
- Mechanisms
- Injection Rules
- Scale inhibitor common types
- Selection and evaluation
- Scale Inhibitor Application
- Scale Monitoring
- Non- chemical scale control devices
- Scale removal chemicals Hydrocarbons
- Scale Removal
- Water Formed Scales
- Preventing Scale Formation
- Scale Removal
- Chemical Cleaning for Heater Tubes @ Process Plant
- Process
- The Art of Pigging
- What is a pig?
- Cleaning-pig (PI-DI with brush)
- Caliper – Pig (Dimensioning)
- Smart Pig (Inspecting)
- Types of pigs
- Geometry Pig for inspection
- Sealing pig (BI-DI Pig)
- Foam pigs “Polly – pigs”
- Advantages of Polly pigs
- Disadvantages of Polly pigs
- Polly pigs are used for
- Cleaning pigs
- Utility Pig (Pin wheel pig)
- Cleaning pigs

- Mandrel (steel shaft) pig
- Specialty pigs
- Sealing pigs
- Batching pigs
- Displacement pigs
- Gauging pigs
- Geometry Pig
- Profile pig
- Dual diameter pigs
- Transmitter pigs
- Solid cast pigs
- Spheres pigs
- Pig speed
- Assessment of defect severity as per client agreed criteria
- Batching-Gauging Pigs
- Scale removal
- Scale removal Line scrapers (pigs)
- Foam Pigs
- Steel Mandrel Pigs
- Brushes and Brush Assemblies
- Gauging Plates
- Scraper Cups
- Scraper Discs
- Fluid Properties
- Density
- Specific gravity
- API Gravity
- Viscosity
- Vapor Pressure
- Flow Regimes
- Pressure and Static Head
- Pressure Measurement
- Hydraulics

- Reynold's Number
- Friction Loss
- D'Arcy Equation
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