Global Professionals Institute for Training

معهد المحترفون العالميون للتدريب الأهلي

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Water Treatment Process Operations and Troubleshooting

Schedule Dates:

Start Date	End Date	Place
05 January 2025	09 January 2025	Cairo Egypt

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Program Introduction:

The advanced Produced Water, injection Water treatment and water disposal represent the biggest operating cost for most oilfield operators. In addition to produced water, large quantities of seawater and water from other sources is treated and injected. The economic success of oil and gas development projects depends very much on our ability to successfully manage water.

This course discusses methods, equipment and tolls used for water processing Technology. The course includes all aspects related to Pressure Maintenance Plants (PMP), HP injection systems, and Salt water disposal.

The course covers the fundamental theory, and the latest technological developments. It particularly emphasizes field application through lots of practical field examples, exercises and case studies.

This course provides an overview of the main water handling systems typically encountered in upstream (E&P) operations, both onshore and offshore. The chemistry of the main water-related problems of mineral scales, corrosion, bacteria, and oily water will be reviewed both from the theoretical and practical aspects.

The course includes Semi-Batch Reverse Osmosis (Closed Circuit Reverse Osmosis CCRO) Chemistry, Operation, Maintenance, and Troubleshooting.

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Program Objective:

- ✓ To understand the general concept of water chemistry, characteristics quality and standards
- ✓ To monitor and control corrosion, scale, and bacterial growth in produced water and water injection/disposal systems
- ✓ To implement system surveillance programs to detect potential problems before system damage occurs
- ✓ To understand the most updated technologies of oilfield water treatment Handling, characteristics quality and standards
- ✓ To familiarize participants with sampling techniques and field and laboratory measurement
- ✓ To provide the theory and application of effective water treatment systems for industrial cooling and steam generation
- ✓ To introduce the up-to-date technologies for industrial wastewater minimization, water pollution control, and waste and sour water treatment.
- ✓ Obtain a broad working knowledge of well fluid separation and dehydration process to gain insight into both traditional and advanced techniques.
- ✓ Explain effects of deviation in values of process parameter from optimum ones.
- ✓ Inject the right quantity of water to reservoir and assure the right quality.
- ✓ Understand Reverse Osmosis And Semi Batch Reverse Osmosis Fundamentals.
- ✓ Explain key steps in operations and operation monitoring of CCRO units
- ✓ Describe Closed Circuit Reverse Osmosis (CCRO) Pretreatment systems and Chemicals

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Who should attend?

- Production & process engineers & operators
- Geologists
- Well log geologists & engineers
- Piping Engineers
- Pipeline Engineers
- HSE manager
- Petroleum Engineering & Reservoir engineers
- Plant and field engineers,
- Chemists, new engineers needing to understand produced water related problems in the production of oil and gas
- Technical managers and supervisors
- Maintenance coordinators
- Operations and manufacturing managers and supervisors
- Those from oil & gas exploration & production sector
- Those interested in obtaining a general understanding of the industry

Program Outlines

Day One

Pre-test

Oilfield Water

- Water chemistry fundamentals
- Composition of Produced Waters
- Subsurface Waters
- Chemical Classifications
- Interpretation of Classifications
- Water formed scales
- Stiff & Davis Saturation Index and LSI
- Corrosion fundamentals and monitoring
- Corrosion control
- Water processing technology

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DISSOLVED GAS REMOVAL
- Mechanical Removal Theory
- Dissolved Oxygen Removal and Exclusion
- Removal of Hydrogen Sulfide from Water
- Removal of Carbon Dioxide from Water

FILTRATION
- Conventional Graded Bed Filters
- High Rate Deep-Bed Filters
- Dual Flow Filter
- Diatomaceous Earth Filters (DE Filters)
- Cartridge Filters
- Filter Selection

- Filter Monitoring
- SUSPENDED OIL REMOVAL
- Skim Tanks
- Flotation Cells
- Coalescers
- Hydrocyclones
- Dynamic/Rotating Hydrocyclone (Centrifuge)
- WATER SOFTENING
- Precipitation Softening
- Ion Exchange Softening
- Demineralization
- Distillation

Day Two

Water Sampling & Analysis

- Water sampling and analysis
- Sample Collection
- Water analysis
- Analytical Methods
- Automated Analysis.
- Interpretation of Results
- Typical water quality specifications
- pH, TDS, Salinity, Particle Size, Oil & Grease, HACH test Kits and SRBs
- ICP, Atomic Absorption Graphite furnace, and Ion Chromatography
-

Injection Water Treatment Systems

- Settling Tanks and Skimmer Vessels
- Skimmer Sizing Equations
- Plate Coalescers
- Skimmer/Coalescers
- Precipitators/Coalescing Filters
- Free-Flow Turbulent Coalescers (SP Packs)
- Flotation Units
- Hydro cyclones,
- Disposal Piles

Oil Dehydration

- Introduction
- Emulsions
- Emulsifying Agents
- Emulsion Terminology
- Demulsifies
- Factors Affecting Emulsion Breakdown (Stokes' law)
- Theory of Desalting Process

- Dual Polarity Oil Dehydration
- Electrical Desalting of Crude Oils
- Corrosion control
  - THEORY OF CORROSION
  - Voltage Source
  - The Electrical Circuit
  - THE NATURE OF METALS
  - THE EFFECT OF METAL COMPOSITION
  - EFFECT OF WATER COMPOSITION
  - Conductivity of Water
  - pH of Water
  - Dissolved Gases
  - Organic Acids
  - Physical Variables
  - FORMS OF CORROSION
  - Galvanic Corrosion
  - Concentration Cells
  - Erosion-Corrosion and Impingement
  - Cavitation
  - Hydrogen Damage

Day Three

Water formed scales

- Calcium Carbonate
- Calcium Sulfate
- Barium Sulfate
- Strontium Sulfate
- Iron Compounds
- Silica Deposits

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PREDICTING SCALE FORMATION

- The Value of Solubility Calculations
- The Basis for Solubility Calculations
- Calcium Carbonate Scaling Calculations
- Calcium Carbonate Saturation Indexes
- Estimation of the Amount of CaCO3 Scale Formed
- Sulfate Scaling Calculations
- Traditional Approach to Sulfate Scale Solubilities
- Oddo & Tomson Sulfate Scale Calculations — 1994

Mixing waters — compatibility

- Incompatibility Between Injection and Formation Waters
- Evaluation of Incompatibility

Water injection systems

- WATER SENSITIVE FORMATIONS
- GUIDELINES TO SYSTEM DESIGN
- Water Source Selection
  - Corrosion
  - Scaling Tendency
  - Water Compatibility
  - Suspended Solids
  - Water Quality
  - Bacteria
  - Oil Content
  - Formation Sensitivity

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Day Four

- Types of Treating Systems
  - Closed Systems
  - Open Systems

- Primary Problems
  - Seawater
  - Fresh Surface Water
  - Produced Water
  - Subsurface Source Water

- Typical System Designs
  - Surface Waters
  - Seawater Injection Systems
  - Fresh Surface-Water Injection Systems

- Subsurface Waters
  - Produced-Water Injection Systems
  - Shallow Oxygenated Supply-Well Injection Systems
  - Oxygen-Free Supply-Well Injection Systems

- Water injection system inspection and analysis
  - Inspection and Analysis Techniques
  - Presentation of Results

- Equipment Description
- Horizontal Separators
- Vertical Separators
- Spherical Separators
- Other Configurations
- Scrubbers
- Operations

- Pressure Maintenance Plants (PMP), HP injection systems
- Start-up Procedure
- Shut-down Procedure
- Chemicals used in injection water and water disposal
- Chemicals of Large-Scale Steam flooding Pilot (LSP)

Troubleshooting's
Group Discussion on the Equipment Used

Day Five

Environmental impact of Oil and Gas Produced water

- Pollution Prevention
- Case Study Refinery wastewater management and minimization
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- Produced Water Treatment and Management
- Produced water treating equipment - theory of operation, advantages and disadvantages, and the importance of oil droplet size
- Produced water discharge/disposal and treatment principles
- Water injection and disposal systems - theory of operation, corrosion, scale, and biological control
- Salinity Management
- Conventional Systems
- Advanced Separation
- Membrane Processes
- Start-up, Shut down and Troubleshooting

Case Studies and Class Work Example

Video demo

Final Test

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Training Methodology:

- Slide presentations
- Interactive discussion
- Simulations and Gamification
- Online Video material

Cost Quotation in Kuwaiti Dinars

The total cost includes:

- Instructor(s) expenses
- Training materials
- Certification
- Lunch Buffett

Total Cost: 1250 KD per Participant

(One Thousand Two Hundred Fifty Kuwaiti Dinar)

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