Cathodic Protection System in Oil & Gas Exploration Industry

26 - 30 Nov 2017, Dubai

Key Topics to be discussed:
- Significance of Corrosion Control
- Corrosive Environments & Construction of Materials
- Cathodic Protection Systems and Coatings
- Anodes & Rectifiers
- Instrumentation & Safety Aspects

This course is Designed, Developed, and will be Delivered under ISO Quality Standards
Why Choose This Training Course?

Maintaining the ageing infrastructure such as underground pipelines is a challenge to the oil and gas industry worldwide. Corrosion is one of the major causes of ageing the industrial infrastructures. Understanding its mechanism and how to control it can lead to a remarkable reeducation in the operation cost of piping and static equipment.

Cathodic Protection (CP) is one of the most widely used methods to control corrosion control in industry. The Cathodic Protection is a method of that eliminates the corrosion of metals by the use of sacrificial anodes or the application of an electric current. It is a technique that has been known for 160 years, and is extensively applied to pipelines and tank farms, etc with great success. However, despite this long history and broad applicability, it is a technique that is all too often inadequately or even improperly applied; with the result that structures are poorly protected or, worse, adversely interfered with.

This 5-day training course provides you with fundamental principles, evaluation and applications of Cathodic Protection, helping participants recognise them, select Cathodic Protection control methods and apply them to protect the assets of the organisation.

Who is This Training Course For?

This PetroKnowledge training course is suitable for personnel who are working in technical areas related to materials, maintenance and integrity who deal directly or indirectly with cathodic protection. They include:

- Corrosion Engineers and Technicians
- Inspection and Maintenance personnel
- Static Equipment Engineers
- Safety Personnel
- Project Engineers
- Managers and Team Leaders

What Are the Goals?

This training course is designed to provide:

- The theoretical basis and the practical ability necessary operate and maintain Cathodic Protection (CP) systems in the oil and gas surface production facilities
- Understanding of the basic principles of corrosion and applications of galvanic and impressed current CP systems
- Understanding of the field equipment used to monitor CP systems and how they work
- Understanding of the various factors that impact the performance of these systems
- Learn about essential CP monitoring techniques to ensure effective operation
- Understanding of increase productivity by avoiding costly shutdowns thus reducing the cost of the overall corrosion control program

How Will This Training Course be Presented?

- This training course combines sound engineering principles, methods and applicable standards
- All lectures are in colorful presentation
- All lectures are interspersed with interactive discussion
- All lectures include group discussion, case history and exercises
- Actual major incidents as well as industry experience are reviewed
- Participants receive a multicolor course manual
- Pictures of real incidents and case history are shown
- Videos on the subject are shown
DAILY AGENDA

Day One: Principles and Types of Corrosion and Corrosion Control

Competency Description: Participants need to gain a sound understanding of corrosion mechanisms, key factors that drive the corrosion process and methods of corrosion control.

Key behaviours:
- Comprehensive understanding of key principles of corrosion
- Gain insight into the main elements of corrosion
- Understand the factors that influence and drive the corrosion process
- Gain knowledge of the methods of corrosion control

Topics to be covered:
Section I - Significance of Corrosion Control
- Corrosion - Largest Single Cause of Plant Failure
- Economic Effects
- Environmental Effects
- Safety Effects
- Corrosion Management Preventive Strategies
- Cost of Corrosion
- Case Study: Catastrophic Corrosion Accidents

Section II - Corrosion & its Control
- Requirements for Corrosion to Occur
- Metallurgical Factors
- Forms of Corrosion
- Corrosion Control Methods
- Environmental Modification
- Protective Coatings
- Introduction to Cathodic Protection

Day Two: Corrosion Environment, Material Selection and Elements of Cathodic Protection

Competency Description: Fundamentals of factors affecting corrosion and material properties. Elements and types of cathodic protection

Key behaviours:
- Gain insight of the factors affecting the corrosion process
- Gain knowledge regarding the main elements of cathodic protection
- Comprehensive understanding of the types and applications of Cathodic Protection methods
- Know the essential equipment required for Cathodic Protection

Topics to be covered:
Section III - Corrosive Environments & Construction of Materials
- Atmospheric Environments
- Marine atmospheres
- Industrial Atmospheres
- Underground Environments
- Material Selection
- Corrosion Properties of Steels
- Concrete Structure Environment

Section IV - Fundamentals of Cathodic Protection Systems
- Galvanic Series
- General Application of Cathodic Protection
- Industry Standard & Codes
- Principle of CPS
- The Cathodic Protection Cell
- Methods of Applying Cathodic Protection
- Sacrificial Cathodic Protection System
- Impressed-Current Cathodic Protection System
- Advantages of SCPS
- Disadvantages SCPS
- Advantages ICCP
- Disadvantages ICCP
- CPS Selection
- Basic Requirements for Cathodic Protection
- Cathodic Protection Criteria
- Current Rectifiers/DC Power Source
- High Impedance Voltmeter
- Reference Cells (Half Cells) Reference Cells
- Applicable NACE Standard for Cathodic Protection Systems

Day Three: Cathodic Protection Systems Design and Coating Issues

Competency Description: Essential elements of cathodic protection design and ground surveys, coating considerations and associated defects.

Key behaviours:
- Gain knowledge of essential elements of Cathodic Protection design and requirements
- Understand the methods of soil resistivity surveys required for the implementation of CP
- Appreciation of issues related to Coatings of pipelines
- Topics to be covered:

Section V - Cathodic Protection System Design
- Design Factors
- Electrolyte resistivity survey
- Electrolyte pH survey
- Structure versus electrolyte potential survey
- Current requirement
- Coating resistance
- Protective current required
- Sacrificial anode (galvanic) cathodic protection design
- Impressed current cathodic protection system design
- Soil resistivity
- Current requirement test
- Typical CPS Design Parameters

Section VI - Cathodic Protection Systems and Coatings
- Role of Protective Coating in CPS
- Selection Factors
- Coating Defects
- Coating Efficiency
- Overvoltage
- Cathodic Disbondment
- Commonly used Coating in Conjunction with CPS
Day Four: Cathodic Protection Anodes and Construction

**Competency Description:** All elements of Cathodic Protection design will be concluded and participants will be competent with governing equations that are required for the calculation of Cathodic Protection systems. In addition, examples of practical applications of Cathodic Protection will be introduced for typical static equipment.

**Key behaviours:**
- Know the types and applications of Cathodic Protection anodes
- Know the related Cathodic Protection equipment required for the implementation of Cathodic Protection systems
- Understand the development of Cathodic Protection Governing equations
- Knowledge enhancement using worked examples of Cathodic Protection calculations
- Gain insight into the application of Cathodic Protection for typical static equipment

**Topics to be covered:**

**Section VII - Anodes & Rectifiers**
- Anode Selection
- Anode material types, magnesium, zinc, aluminum, etc.
- Current output
- Driving Potential
- Anode life
- Anode Shape & Dimension
- Anode Efficiency
- Galvanic Anode Types
- Current Requirements for ICCP System
- Anode Materials for ICCP
- Anode Backfilling
- Installation of Sacrificial Anodes
- Impressed Current Anode Beds
- Impressed Current Rectifiers/DC Power Source
- Cathodic Protection Equations
- Solved Cathodic Protection calculation examples

**Section VIII - Practicing & Construction of Cathodic Protection System**
- Components of Cathodic Protection Systems
- Essential Components
- Isolating joints
- Junction Boxes
- Test stations, measuring points and coupons
- Thermite Weld
- Earthing Systems
- Line current measurement
- Pipe Sleeves/Casings
- Cathodic Protection Vessels & Tank Internals Vessels & Tank
- Tanks for Storage of Chemicals
- Water Circulating Systems
- Heat exchangers (tube and shell)
- Case Study: Construction of Cathodic Protection Systems

Day Five: Line and Coating Inspection, Safety and Corrosion Comics

**Competency Description:** Essential factors and examples affecting the installation and safety when using Cathodic Protection systems. In addition, economic factors will be examined.

**Key behaviours:**
- Learn the methods of pipeline and coating inspection
- Appreciation of relevant safety Aspects of Cathodic Protection
- Know the main elements of Cathodic Protection systems installation
- Appreciation of Cathodic Protection problems using troubleshooting examples
- Understand the economic factors related to Cathodic Protection costing using worked examples

**Topics to be covered:**

**Section IX - Inspection of Pipeline and Coating defects**
- Pearson Surveys
- Close Interval Potential Survey (CIPS) technique
- Direct Current Voltage Gradient (DCVG) technique
- Signal Attenuation Coating (SAC) Survey
- Common Impressed Current Rectifier Problems
- Over the Trench Pipe Holiday Inspection

**Section X - Instrumentation & Safety Aspects**
- Alkalinity
- Hydrogen Evolution
- Chloride Evolution
- Installation Adjacent to Telecommunication Services
- Installation Adjacent to Railway Signal & Protection Circuits
- Interaction at Discontinuities in Cathodically Protected Structures
- Installation at Jetties & Ships
- Danger of Electric Shock
- Installations on Immersed Structures
- Installations for the Internal Protection of Plant
- Fault Conditions in Electricity Power Systems
- Stray Current Corrosion

**Section XI - Corrosion Management Systems**
- Economic Considerations
- Corrosion Key Performance Indicators (KPIs)
- Asset Integrity and Corrosion Management
- Corrosion Data Management
Catholic Protection System in Oil & Gas Exploration Industry

**COURSE DATES, VENUES AND FEES**

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<tr>
<th>Date</th>
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<tr>
<td>26 - 30 Nov 2017</td>
<td>Dubai</td>
<td>$4,500</td>
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This fee is inclusive of Documentation, Lunch and Refreshments

Please use BLOCK CAPITALS to fill in this form. It is important that you read carefully through all information before starting to complete the form.

**REGISTRATION DETAILS**

Family Name: ____________________________________________ First Name (Mr./Ms.): _________________________________________

Position: ________________________________________________ Company: ____________________________________________________

Mailing Address: _______________________________________________________________________________________________________

Telephone: ____________________ Mobile: ____________________ Fax: ____________________ Email: ____________________

**AUTHORISATION**

Authorisation By: _______________________________________________________________________________________________________

Position: ________________________________________________ Company: ____________________________________________________

Mailing Address: _______________________________________________________________________________________________________

Telephone: ____________________ Mobile: ____________________ Fax: ____________________ Email: ____________________

**IN-HOUSE TRAINING**

Maximize your training budget and have several members of your staff, who require specific training, to attend with the advantage of not incurring additional travel costs when attending a ‘public’ training courses & seminars.

Would you like a PetroKnowledge training course delivered at a time or location to suit you? Would you like PetroKnowledge to tailor a course from our comprehensive library of programmes? Or would you like us to create an entirely new, bespoke course to suit the exact needs of your organisation?

Working in partnership with our clients, PetroKnowledge provides an enjoyable, creative learning experience that enables participants to develop their skills and knowledge. We can deliver not only generic, off-the-shelf courses from our extensive learning portfolio, but we can provide tailored as well as bespoke learning on any aspect of skill development or knowledge. Our in-house courses are conducted by the same expert trainers who conduct PetroKnowledge public courses so you can be assured they will fulfill the learning objective of any organisation.
BOOKING TERMS & CONDITIONS

Booking
- Bookings for courses can be made via our website (petroknowledge.com) or by contacting our Registration Desk on +971 2 5577389 or at reg@petroknowledge.com
- For on-line bookings, please select the course that you require and click on the “Register Now” button, following the instructions step by step
- Upon receipt of booking in order, enrollment on the respective training course will be confirmed by Registration Team with all necessary documentation

Invoicing and Payment
- Our fees include course presentation, relevant materials, physical & digital documentation, lunch and refreshments served during entire training. Accommodation charges are not included in the course fees
- Course fees are payable upon booking unless a valid, authorized Purchase Order is provided and accepted
- Invoices will be sent via email/courier to the ID/name and address provided
- We prefer to have the fees payment in our account before the start of training course. However, if your company has a different payment policy, the same should inform us in advance
- The currency of fees is in US Dollars (USD). Payments can be made in USD or UAE local currency AED (Arab Emirates Dirhams) either by Bank Transfer or by Credit Card. Our Bank Account details will be provided on the Invoice
- Please note that we do accept payment by cash, in USD or AED, only for the last minute bookings

Cancellation of Courses
- It may be necessary for PetroKnowledge to amend or cancel any course, course times, instructors, dates or published fees due to unforeseen circumstances and we reserve the right for such changes
- Any amendments will be advised before the course start date and any bookings already paid in full will not be subject to increased fees

Cancellation by Client
- Once you have completed your booking, received your confirmation of enrollment and a dated payment Invoice, you are deemed to have a contract with PetroKnowledge. You reserve the right to cancel this contract given the below terms
- All cancellations must be received in writing at reg@petroknowledge.com and info@petroknowledge.com at least 14 days prior to the training
- After the cancellation period has expired, consideration may be given, on a case to case basis, if a registered delegate nominates a substitute on the same course, shifts to next session of the course or moves to a new course
- For a cancellation request made on or before the statutory 14 day cancellation period, a refund may be given or a credit note issued which can be used against future course fees
- A 25% administration fee (of the total course fee at the time of booking) will be charged for any cancellations made outside of the statutory cancellation period

Attendance Certificate
- The daily course schedule should be accurately followed to ensure undeterred implementation of our training
- All delegates, who participated in their course throughout, will receive the Certificate of Completion on the last day
- Please report any foreseeable absences to a PetroKnowledge representative or to your sponsors directly
- An absence of three (3) or more sessions of the course will invalidate your eligibility for the Certificate of Completion