# Cathodic Protection System in Oil & Gas Exploration Industry

| Date | Venues | ($)Fees | Book your seat |
|------|--------|---------|----------------|
| 11 Feb -15 Feb 2024 | Kuala Lumpur | 3300 | Register Now |

## Introduction

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 seminar 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.

## Objectives

**This training seminar 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

## Training Methodology

- This training seminar combines sound engineering principles, methods and applicable standards
- All lectures are in colorful Power-Point 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 seminar manual
- Pictures of real incidents and case history are shown

- Videos on the subject are shown

## Organizational Impact

The Company will achieve improved corrosion management system through the performance of an efficient cathodic protection system based on total life cycle corrosion economy.

## Personal Impact

Participants will be more able to actively contribute towards reducing the probability of less unforeseen failures in cathodic protection systems.

 Participants will enhance their competence and productivity thereby enhancing their competence and performance and making additional value added contributions to their organizations in the field of cathodic protection.

## Who Should Attend?

This training seminar 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
- Mangers and Team Leaders

# SEMINAR OUTLINE

## DAY 1

**Principles and Types of Corrosion and Corrosion Control**

**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 2

**Corrosion Environment, Material Selection and Elements of Cathodic Protection**

**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 3

**Cathodic Protection Systems Design and Coating Issues**

**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 4

**Cathodic Protection Anodes and Construction**

**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
- CP Equations
- Solved CP 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 5

**Line and Coating Inspection, Safety and Corrosion Comics**

**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

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