MAESTRO CONSULTANTS

CORROSION CONTROL IN OIL & GAS EXPLORATION INDUSTRY

COURSE OUTLINE 2020

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TRAINING TITLE

CORROSION CONTROL IN OIL & GAS EXPLORATION INDUSTRY

VENUE

Dubai, UAE

DURATION

5 Days

DATES

06 - 10 September 2020

PRICE

US$4,000 per attendee including training material/handouts, morning/afternoon coffee breaks and Lunch buffet daily.

TRAINING INTRODUCTION

The annual losses due to corrosion and the cost of rectification run to several billion dollars in most of the countries. High production under aggressive and extreme operational conditions necessitates the development of new materials which also have peculiar failure patterns. Thus, mankind is on continuous experimentation with products and processes. Yet material failure not only entails in loss of production but loss of life as well. Prediction of failure pattern, residual life measurements, preventive measures are all approaches in corrosion studies for safe and economic operation of plant and machinery

TRAINING OBJECTIVES

This course aims to provide the participants with an understanding of why and how corrosion occurs, and how the environment in the gas and oil installations is aggressive to iron and steel equipment, plant and structures. It is designed to give a practical approach to control corrosion and prevent failures. Presented are the basic concepts of corrosion, the metallurgy of iron and steel, and the mechanism of failure. Participants learn the state of art of corrosion control and be able to apply it in day-to-day work, thereby ensuring safety, plant reliability and economy. It is an update of Corrosion problems which affect the oil and gas production and reduce the plant integrity. It necessitates an understanding that ageing plants can cause catastrophic failures and underlines the importance and methodology of inspection. This also imparts an awareness of the emerging technologies for corrosion control and failure prevention. Interactive discussions on photographs of plant failures and a working methodology of failure analysis reinforce the understanding of the theory taught.

TRAINING AUDIENCE

Process Engineers, Inspection Personnel, Mechanical Engineers, Material Selection Personnel and Corrosion Personnel. For all technicians, supervisors and maintenance staff who are interested in knowing why some components fail more often than expected- A Corrosion awareness for all Plant Engineers who are interested in learning the fitness for service of plant and equipment they are handling- For Safety Engineers who are interested in health safety and environment in case of unintended plant failure-for Finance Managers who are interested in knowing what affects production and asset management- and for all those who want to know more about inspection and monitoring.

COURSE OUTLINE

Day 1

The importance of the study

- Introduction
- Corrosion and society
- What is corrosion?
- Why is it important?
- The social, economical and environmental impacts
- Lessons from history
- The liability due to corrosion
- Interactive session on causes and possible avoidance
- From the known to the unknown
- The three classification of failures
- Metallurgical
- Mechanical
- Electrochemical
    - What the metallurgists failed to see
    - Metallurgical
    - Thermodynamics- the energy transfer principles
    - Why different metals react differently in same situation-Galvano's experiments
    - The atoms and electrons that matters- Niels Bohr's experiment
    - Live demo on corrosion in action
    - Describe one plant and machinery handled by you
    - What are the various auxiliaries connected to it or what different metals are used in that fabrication.

Day 2

Environment stronger than metals

- Why metals fail often and more than in the past
- Gas and oil installations- some process diagram
- Steel-One metal in different aggressive environment
- Gaseous environments- H2S, oxides of sulphur, carbon dioxide organo compounds, chlorine, ammonia
- Liquid environments- crude, salt and seawater, wash water, effluents,bacteria
- Solid environment- soils, sulphur, catalysts, trace metals
- Pourbaix experiments and principles
- Live demo on corrosion in action

Learning to handle failures - Corrosion Basics

- Definition of corrosion
- Grouping the information from the photographs of failures
- The eight forms of corrosion
- Evolving a theory based on failure analysis – cause and effect
- Relating to metallurgical, mechanical and electrochemical
- One more finding-operational factors also influence corrosion
- Velocity – impact on steel and stainless steel
- Temperature- high temperature and oxidation , cryogenic
- Pressure – pipeline systems, reaction towers and storage vessels
- Discussion on photographs showing failures due to stagnancy, erosion, cavitations, rupture, explosions - what factor was responsible for failure?
- Write a process diagram (indicate operational factors)
- What are the input and output (product impurities that affect plant performance)

Day 3

First step to control

- Measurement of loss (corrosion)
- Faradays electric laws
- Four components of corrosion cell
- Tools that can be used in field- known simple NDT Techniques-UT, PT and RT
- What do they tell us?
- Mechanism of Corrosion
- Tools that are used in field and laboratory-microscopy, electrochemical analysis,

- What do they tell us?
- More sophisticated tools –just know about them
- Some special corrosion problems related to oil and gas installations;
- High temperature oxidation
- Microbiologically induced corrosion
- What are the operative conditions that affect production?
- What are the failures noted in the past – by what tools?

Day 4

Step two- Preventive control

- Mechanical aspects
- Innovative Vs iterative Design
- Fabricational issues
- Metallurgical
- Material selection vs environment
- Galvanic effect
- Flow and velocity effects
- Temperature and creep effect
- Stress
- Chemical and electrochemical

Coating painting and lining

- Deft definition
- Classification and types for different environmental conditions
    - For atmospheric
    - Buried
    - Submerged
    - Internal
- Importance of Surface preparation & application
- Why Coating defects occur and the causes of failure
- Insulation & Lining materials- high temperature appliances- furnaces, chimney
- Under cladding issues- high temperature- energy losses and safety

Chemicals for fouling & corrosion control

- Selection of inhibitors for
    - Production & recovery
    - Pipeline & tanks
    - Cooling water
    - Acid systems
    - Boiler water
- Dosing methods
- Economics and control
- What are the type of maintenance/ preventive method used to measure avoid and control failure? What are the merits in each of them?
- What do you know more than safety personnel?
- Video on corrosion

Day 5

Ensuring reliability- Step three- Electrochemical and hi tech methods

Cathodic Protection

- Principles of CP
- Galvanic and Impressed systems
- Selection of material and design
- Pitfalls and failure
- Monitoring and control
    - Internal line Inspection
    - Planning for pigging of line
    - Various types of pigs
    - Data acquisition and study
    - Cost and limitations
    - Discussion

Corrosion awareness is important for operators/ inspection staff or maintenance staff?

Does corrosion awareness help in plant reliability, quality, productivity, and asset management.

TRAINING CERTIFICATE

MAESTRO CONSULTANTS Certificate of Completion for delegates who attend and complete the training course

METHODOLOGY

Our courses are highly interactive, typically taking a case study approach that we have found to be an effective method of fostering discussions and transferring knowledge. Participants will learn by active participation during the program through the use of individual exercises, questionnaires, team exercises, training videos and discussions of "real life" issues in their organizations. The material has been designed to enable delegates to apply all of the material with immediate effect back in the workplace.