

# Materials and Welding Challenges for Offshore Oil & Gas Industries

## INTRODUCTION

- Offshore Oil and Gas industries always operate in highly demanding environment. Materials Selection, Welding & Corrosion challenges are immense and require excellent knowledge and expertise.
- This training course is an extensive, in depth 5 day course on welding, metallurgy, and corrosion aspects of various materials used in Offshore Oil and gas Industries and is targeted to develop the skills in handling these underlined issues.
- This training course discusses in great details, various alloys, their metallurgical properties, design requirements as per the construction codes, welding practices, damage mechanisms, mitigation in offshore oil and gas production environments. It narrates materials selection criteria, welding problems, corrosion requirements and the best ways to achieve best results under most demanding offshore oil and gas production environments.

## OBJECTIVES

This training course focuses on the best and worst case scenarios with respect to Oil and Gas, metallurgy, welding and corrosion issues and improves the attributes as listed below:

- This training course is designed to increase knowledge base of the participants with respect to the above titled issues
- Make them aware of various materials used in Offshore O&G environments and associated welding engineering challenges
- Make them aware of corrosion issues in Offshore O&G environments and associated Life Cycle engineering challenges
- Get familiarized with the world class engineering standards. e.g., NACE, EEMUA, ASME / ASTM, Norsok, Various Leading Oil and Gas Design / Materials Selection Standards
- At the end, apply the right design, materials engineering to the best interest of the organization & projects related to O&G engineering

## TRAINING METHODOLOGY

- This training course combines structured and focused presentations and discussions of topics covered with relevant examples and question & answer sessions to maximize the benefits to the participants.
- Participants will be provided with comprehensive hard copy of course notes & all presentation material. Relevant computer simulations and videos will be utilized to help with the understanding of the various topics.

## ORGANISATIONAL IMPACT

- Ability to handle complex engineering issues involving extremely high end metallurgy and corrosion issues as well associated welding engineering related problems in O&G engineering production environments
- Less dependence on external service providers for solving problems, adding values, saving dollars for the employers
- Knowledgeable employees would be able to effectively supervise or mentor the external contractors, improving quality, reliability, integrity (for operating companies)

## PERSONAL IMPACT

- Enlighten engineering personnel, develops their knowledge base about engineering issues in offshore, oil and gas environments
- Participants will increase their basic knowledge in related topics such as fabrication and heat treatment of various complex steels and exotic alloys
- Participant will enhance their knowledge, regarding material section, welding challenges, corrosion, damage mechanisms, and integrity assessment
- Participants will enhance their competence and productivity thereby improving their performance level and making additional value added contributions to their organizations

## WHO SHOULD ATTEND?

- This training course is designed for Welding, Metallurgical, Corrosion, Inspection and Integrity Engineers. The course content had been carefully compiled to make this to be an excellent knowledge base even for current applications and as future reference for all offshore Oil & Gas welding & metallurgy. The course is designed to provide a broader and in-depth picture of Oil & Gas design guidelines, industry practices.

The target audience would be:

- Welding Personnel
- Metallurgy Personnel
- Inspection Personnel
- Equipment Engineers
- Maintenance Engineers and Planners
- Design Engineers

## Course Outline

### Introduction to Guidelines for Materials Selection for Offshore O&G Production Equipment

- EEMUA Publication 194, Guidelines for materials selection and corrosion control for subsea oil and gas production equipment
- ISO 21457-2010-Materials selection and Corrosion Control for Oil and Gas Production System

### Introduction to Guidelines for Materials Selection for Offshore O&G Production Equipment (Continuation)

- Petroleum, Petrochemical, and Natural Gas Industries — Materials for use in H<sub>2</sub>S-containing environments in oil and gas production
- NACE MR 0175-ISO 15156, 2015
- Norsok M001

### Materials for Offshore O&G Environments, Metallurgy and Welding Issues Duplex Stainless Steels

- Introduction to Duplex Stainless Steel
- Metallurgy
- Welding Issues
- Case Histories, Application Experiences

### Super Austenitic Stainless Steels

- Introduction
- Physical Metallurgy
- Welding Considerations
- Super Austenitic vs. Duplex Stainless Steel
- Design and Fabrication Pros and Cons

### Weldable Super Martensitic Stainless Steels

- Introduction
- Metallurgy
- Welding Issues
- Case Histories, Application Experiences



## Materials for Offshore O&G Environments, Metallurgy and Welding Issues (Continuation)

### Nickel Alloys

- Introduction
- Metallurgy
- Welding Issues
- Case Histories, Application Experiences

### Clad Steels

- Introduction
- Metallurgy
- Welding Issues
- Case Histories, Application Experiences

### Martensitic (13Cr) Stainless Steels

- Introduction
- Metallurgy
- Welding Issues
- Case Histories, Application Experiences

### Precipitation Hardenable Stainless Steels

- Introduction
- Metallurgy
- Welding Issues
- Case Histories, Application Experiences

## Materials for Offshore O&G Environments, Metallurgy and Welding Issues (Continuation) & Corrosion, Service Experiences, Failure Analysis

### Austenitic Stainless Steels

- Introduction
- Metallurgy
- Welding Issues
- Case Histories, Application Experiences

### Titanium Alloys

- Introduction
- Metallurgy
- Welding Issues

