

# MATERIAL SELECTION AND PROPERTIES

**MCE059**

## COURSE DESCRIPTION

Material selection involves a complex interaction between component function, material, process, component shape and costs. Those who select materials should at least have a broad and basic understanding of properties of materials and their processing characteristics. The function of the component must be clearly defined in order that the required mechanical properties may be identified. An ideal list of requirements may be easy to arrive at, but a material and process to satisfy all of these requirements is unlikely to exist and an appropriate compromise must be found. It is, therefore, important to distinguish essential properties from desirable properties, those that can be compromised in order to achieve the essential properties. Material properties are often quoted independent of shape but in some circumstances geometry can influence the response of a component with respect to stiffness and strength, to a considerable degree. This course covers the basics of material selection based on their properties and processing characteristics.

## COURSE GOAL

To enhance the participants' knowledge, skills and abilities necessary to distinguish essential properties from desirable properties, those that can be compromised in order to achieve the essential properties.

## COURSE OBJECTIVES

By the end of this course, participant will be able to:

- Understand the properties and applications of materials for the oil and gas industries.
- Be knowledgeable of corrosion issues and the various types of corrosion.
- Select materials for specific applications.
- Explain the mechanisms behind corrosion resistant materials.
- Have a good appreciation of material selection as a method of corrosion control.
- Be knowledgeable of protective coating for corrosion control.
- Evaluate the performance of corrosion inhibitors.

## WHO SHOULD ATTEND

Mechanical & Inspection Engineers

## COURSE DURATION

5 Working Days

## COURSE OUTLINES

### 1. Properties of Materials and Component Manufacture

- Introduction to material properties.
- Overview of different manufacturing processes.
- Relationship between material properties and manufacturing techniques.
- Case studies highlighting successful material-component combinations.

### 2. Strength, Stiffness, and Formability

- In-depth study of material strength and its significance.
- Understanding stiffness and its role in material selection.
- Formability considerations and their impact on component design.
- Practical examples and exercises to reinforce concepts.

### 3. Corrosion Resistance

- Comprehensive coverage of corrosion types.
- Corrosion mechanisms and their effects on materials.
- Methods for assessing and enhancing corrosion resistance.
- Real-world applications showcasing successful corrosion-resistant materials.

### 4. Fatigue and Wear Resistance

- Exploration of material response to fatigue.
- Strategies for improving fatigue resistance.
- Wear resistance considerations and selection criteria.
- Case studies illustrating the consequences of fatigue and wear.

### 5. Corrosion – Types and Control

- Detailed examination of various corrosion types (e.g., galvanic, pitting, crevice corrosion).
- Control measures for each type of corrosion.
- Practical demonstrations of corrosion control methods.
- Group discussions on corrosion challenges and solutions.

### 6. Sulphur and Chlorine Environments

- Specialized focus on material behavior in sulphur and chlorine-rich environments.
- Case studies highlighting materials suitable for such conditions.
- Mitigation strategies for materials exposed to these environments.
- Environmental testing and simulation exercises.

## 7. Corrosion Resistant Materials

- In-depth exploration of materials known for their corrosion resistance.
- Comparative analysis of different corrosion-resistant alloys.
- Practical considerations for selecting corrosion-resistant materials.
- Industry-specific examples and best practices.

## 8. Protective Coatings and Case Studies

- Types of protective coatings (metallic, liquid-applied, etc.).
- Application methods and considerations for each type.
- Case studies showcasing successful application of protective coatings.
- Hands-on exercises with common coating materials.

## 9. Metallic Coatings and Liquid Applied Coatings

- Detailed study of metallic coatings such as galvanizing and metal spray.
- Analysis of liquid-applied coatings: Epoxies, Alkyds, Acrylics, Polyurethanes, and Ethyl Silicates.
- Practical application techniques for metallic and liquid coatings.
- Evaluation of coating performance in different environments.

## 10. Material Selection

- Factors influencing material selection: functional properties, manufacturing properties, and economics.
- Case studies illustrating successful material selections.
- Hands-on exercises for participants to practice material selection.
- Open discussions and Q&A sessions for addressing specific challenges in material selection.

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