Tel No:+97126654546 | FaxNo:+97126654182 | Email: training@cmc-me.com | www.cmc-me.com

FE045:
Metallurgy for Non-Metallurgists Advanced

Training Description:

Metallurgy is a domain of materials science and engineering that studies the physical and chemical behavior of metallic elements, their inter-metallic compounds, and their mixtures, which are called alloys. It is used to separate metals from their ore, metallurgy is also the technology of metals: the way in which science is applied to the production of metals, and the engineering of metal components for usage in products for consumers and manufacturers. The production of metals involves the processing of ores to extract the metal they contain, and the mixture of metals, sometimes with other elements, to produce alloys.

During this interactive course, participants will learn the materials of construction used for the hydrocarbon processing and major utility sections of the plant; the chemical positions and properties of metallic materials; the iron-carbon phase diagram; the fabrication process for ferrous, non-ferrous and non-metallic materials; and the flow chart outlining the procedure for inspection of new materials.

Training Objectives:

Upon completion of this training course, participants will have gained an in-depth understanding of the important principals of engineering involving properties and characteristics of metals and alloys, including fabrication and heat treatment of commercial steels and non-ferrous alloys.

By the end of the training, participants will be able to:

- ✓ Apply and gain an advanced knowledge on metallurgy engineering
- ✓ Review the materials of construction used for the hydrocarbon processing and major utility sections of the plant including piping, vessels, towers, valves and tanks
- ✓ Indicate the chemical positions and properties of metallic materials and discuss why these materials where used and how the mechanical properties were established
- ✓ Hand sketch the iron-carbon phase diagram and indicate the significant temperatures for phase changes and discuss the significance of carbon, chromium and nickel on the microstructure and mechanical properties of ferrous alloys
- ✓ Discuss fabrication process for ferrous, non-ferrous and non-metallic materials
- ✓ Draw a flow chart outlining the procedure for inspection of new materials and provide an example of where this procedure has been applied
- ✓ Explain how this procedure is applied at the site and discuss any problems in may result in faulty material being used

Training Designed for:

This course is intended for all significant aspects and considerations of metallurgy for non-metallurgists who are involved in advanced metallurgy. The course is also intended for discipline-related graduates drawn from across the operating companies in the oil and gas industry in GCC.

Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request."

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

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Training Program:

DAY ONE:

- Oil Industry Materials
  - General Material Classifications (Metals, Ceramics, Polymers, Composites)
  - Structure of Materials, Solid State Structure, Primary Metallic Crystalline Structures
  - Chemical and Physical Properties
- Mechanical Properties and Material Testing
  - Mechanical Properties, Loading, Stress and Strain, Tensile Properties, Compressive, Bearing, & Shear Properties, Hardness, Creep and Stress Rupture Properties, Toughness, Fatigue Properties, Effect of Mechanical Properties of Pressure Vessels Material on Allowable Operating Pressure and Wall Thickness
- Alloying and Phase Diagrams
  - Property Modification, Alloying, Composition, Microstructure, and the Phase Diagram
  - The Allotropy of Iron, The Iron Carbon Equilibrium Diagram
- Recap

DAY TWO:

- Heat Treatment
  - Common Heat Treatments, Annealing, Normalizing, Tempering, Hardening, Carburizing, Nitriding, Quench Media, Stress Relieving
- Ferrous and Nonferrous Alloys
  - Steel Alloys, Effects of Elements on Steel, Stainless Steels, Aluminum Alloys, Copper Alloys, Nickel alloys, Titanium Alloys, Typical Alloys used in Oil & Gas Industry & their Applications
- Materials Specification
  - Codes and Standards
- Recap - Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow

DAY THREE:

- Commercially Available Alloys
  - Standards, Codes & Nomenclature, Composition & Equivalent
  - Physical & Mechanical Properties, Basis of Selection
  - Case Studies Examples from Am, Urea & Utilities
- Metals and Alloys Selection for Use in Different Environments
  - Hydrogen and Hydrogen Sulfide Corrosion, Oxidation or Scaling and Stack Gas Corrosion, Seawater, Water and Soils and Biological Corrosion, Corrosion by Mineral Acids and Alkalies, Organic Acids and Carbon Dioxide, Atmospheric Corrosion, Disbanding of Austenitic Stainless Cladode Steels, Behavior of Chromium - Nickel Steels in Special Corrosive Media
- Material Selection and Design Considerations
  - Introduction
  - Utilization of Material Information
  - Utilization of Material Properties
  - Using of Codes and Standards

- **Recap -** Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow

DAY FOUR:

- **Heat Treatment of Plain Carbon Steel**
  - Hardening of Carbon Steel (by quenching), Annealing, Normalising, Tempering, Austempering, Surface Treatments, Heat Affected Zone (HAZ) in Welding, Non-Ferrous Alloys, Nickel and Cobalt, Titanium Alloys
- **Case Studies / Practical Exercises**

DAY FIVE:

- **Corrosion in Metals**
  - The Electrochemical Cell, Types of Electrochemical Corrosion, Pitting, Crevice, Stress Corrosion, Hydrogen Induced, etc.
- **Protection Against Electrochemical Corrosion and Inspection**
  - Coatings, Internal, External, Polymers, Galvanizing, etc., Inhibitors, Types and Usage, Cathodic Protection, Impressed Current, Sacrificial, Inspection, Standards
- **Course Conclusion**
- **POST-ASSESSMENT and EVALUATION**

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

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