

METALLURGY FOR NON - METALLURGISTS



**FMC301
Facility Integrity,
Inspection,
Metallurgy and
Corrosion
Engineering**

COURSE TITLE**METALLURGY FOR NON - METALLURGISTS****COURSE DATE/VENUE**

21 - 25 June, 2021

London, UK

COURSE REFERENCE

FMC301

COURSE DURATION

05 Days

DISCIPLINE

Facility Integrity, Inspection, Metallurgy and Corrosion Engineering

COURSE INTRODUCTION

Although Carbon steel has been the first and widely used material in oil fields and other industry, today close to a hundred alloys and metals are used in various extracting and refining activities. Yet failures do happen, some of them leading to disastrous ends resulting in loss of assets and lives. . Plant and machinery designed with carbon steel material some three decades ago are now operating in the most demanding and aggressive conditions. Therefore Plant and machinery reliability has become a key issue in the interest of personnel safety, while total productivity and maintenance is a matter of equal importance Do metals fail due to normal out only or do they suffer from stress, fatigue and have ageing problems as humans? What are the tools available to test the reliability of old and new material? What are codes and standards for correct and economical material selection?

COURSE OBJECTIVE

This course is designed to discuss in detail all physical and chemical properties of materials and testing methods specially of carbon steel; the benefits of heat treatment; The usage of other non ferrous and non metallic material; and an over view of API and ASME Codes and standards

COURSE AUDIENCE

A condensed course on metallurgy for all plant inspectors, process engineers, and maintenance engineers who are interested in knowing why some components fail more often than expected- A Corrosion awareness- For plant operators/ engineers who are interested in learning about fitness for service of plant and equipment- For Managers interested in health safety and environment in case of unintended plant failure-for Managers interested in MRO and plant maintenance cost to know about alternative material.

COURSE CONTENT

Day 1 The origin of Metallurgy

- History
- The Stone Age and the discovery of metals
- Metals and non- metals
- Ferrous and non ferrous
- The art and science of metallurgy
- Steel making ancient and modern
- Discovery of other metals
- Periodic classification

○ Physical and Chemical properties

- Atomic model
- Crystal structure and grain boundaries
- Mechanical properties
- Demerits of carbon steel

- Discovery of stainless steel

Day 2 Carbon steel and its properties

- Fe- C diagram
- TTT diagram of low alloy
- Heat treatment
- Microstructure and properties
- Heat treatment as a chemical process
 - Nitriding
 - Carbonizing
 - Flame hardening
 - Ausforming
 - Induction hardening
 - PWHT
 - Stainless steel alloying material
 - Nickel and Chromium
 - Trace elements
 - High alloys

Day 3. Corrosion Effects & Equipment used in oil and gas extraction process

- The corrosive environment
- Corrosion Properties of Metals & Alloys
- Corrosion effects in offshore environment
- Reactors and pressure vessels
- Boilers and heat exchangers
- Heaters and dryers
- Separators
- Valves and compressors

- Pipes and storage vessels

Metals and alloys used in them – failures and causes

Selection of material for Offshore Production Fields

Selection of materials in offshore environment

Selection of materials for wellheads

Monitoring of corrosion & Non- Destructive Testing of (NDT) of Offshore Equipment

Day 4. Selection of material using codes and standards

- Brief over view of ASME and API and NACE standards
 - Modern lab techniques for testing
 - Microstructure and failure analysis
 - Inspection and acceptance of new material
 - Specifications and standards
- Inspection procedures
 - Laboratory and site
 - Destructive and non destructive
 - Physical and electrochemical

Day 5. Non ferrous metals and non metals in gas and oil industry

- Properties and application of
 - Copper and alloys,
 - Titanium,
 - Aluminum,
 - Nickel and alloys
- Non- metallic's
 - Ceramics
 - Fiberglass
 - Polymers and plastics

- And their various applications
- Design considerations
- Welding
- Joining
- Safety, health, and environment.

COURSE CERTIFICATE

TRAINIT ACADEMY will award an internationally recognized certificate(s) for each delegate on completion of training.

COURSE FEES

\$6,150 per Delegate. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

COURSE METHODOLOGY

The training course will be highly participatory and the course leader will present, guide and facilitate learning, using a range of methods including formal presentation, discussions, sector-specific case studies and exercises. Above all, the course leader will make extensive use of real-life case examples in which he has been personally involved. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Case studies & Practical Exercises
- 10% Role Play
- 10% Videos, Software or Simulators (as applicable) & General Discussions