

METALLIC AND NON METALLIC MATERIALS AND STRENGTH OF MATERIALS

Field Operations
Metallurgy - Corrosion - Inspection

E- 590

OBJECTIVES

To provide a broader knowledge of metallic and non-metallic engineering materials and understanding of the behavior of the equipments under pressure.

On completion of the course, participants know:

- the main characteristics of materials used in petroleum and chemical industries
- the principles of design and calculation of equipments.

▲ Who should attend?

Graduate engineers and technicians involved in inspection and maintenance of welded equipment and pipes in the petroleum, production, refining, petrochemical and chemical industries.

COURSE CONTENT

METALLURGY OF FERROUS AND NON-FERROUS METALS USED IN PROCESS INDUSTRIES AND OTHER MATERIALS 3.75 days

Overview of materials

Characteristics and physical properties.
Selection, specifications and designations.
Use and cost.

Metal structure

Crystallography (face-centered, body-centered and hexagonal structures).
The alloy diagrams and the phase rule.
The iron - carbide diagram.
Iron and steel making - Ingot stage (casting, forging, rolling).

Effects of alloying elements

On hardenability and physical and mechanical properties.
On the allotropic transformation of pure iron.

Heat treatments

Hardening and tempering.
Annealing and stress relieving.

Carbon steels, low alloy steels and alloy steels

Different equilibrium diagrams: iron, carbon, chromium, nickel system; Schaeffler diagram.
Different types of steels: low chromium molybdenum steels; stainless steels (classification, properties, sigma phase).

Refractory alloys for high temperature

High creep resistance, carburization and oxidation resistance.
Classification versus temperature.

Non-ferrous metals and cryogenic metals

Copper and its alloys, aluminium and its alloys.
Nickel and its alloys, titanium, tantalum, zirconium, cobalt.

Plastics

Thermoplastics: rigid polyvinylchloride (PVC), polyethylene and polypropylene, PTFE and others
Thermosetters. Reinforced plastics.

Other materials

Ceramics and glass.
Graphite.

Introduction to metallography - Practical work (if possible).

Polishing and etching.
Identification of different types of corrosion.

THICKNESS OFF SHELLS AND TUBES OF PRESSURE VESSELS 1.25 days

Mechanical properties of materials to assess

Stress deformation diagram: tensile strength, modulus of elasticity, elongation.
The importance of plasticity.
Hardness and resilience.
Behavior at different temperatures (creep and tensile strength versus temperature).

Rule for the design of shells and tubes

Design conditions: design pressure and design temperature, different codes, the main stresses in a cylindrical vessel: circumferential and longitudinal stress.
Thickness calculation. French and US codes: vessels under internal and external pressure. Test pressure and example.

▲ Duration

5 days

▲ Dates & Location

Non scheduled

**May only be organised
for a single company**

▲ Tuition Fees

To be agreed upon

▲ Course Coordinator

Dominique VALLANCE

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