



# FE018: Metallurgy, Metallurgy, Corrosion and Prevention of Failures: Material Selection and Properties

## Training Description:

This intensive training course provides an in-depth understanding of metallurgy, material properties, corrosion mechanisms, and practical strategies for preventing material failures in industrial applications. Participants will gain knowledge of the fundamental principles of materials science, how metals and alloys behave under different operational conditions and how environmental factors influence material degradation. Emphasis is placed on real-world applications, including selection of materials for specific engineering uses, inspection techniques, failure analysis and maintenance strategies to extend equipment life and ensure reliability. The training course combines theoretical concepts with practical case studies, fostering a problem-solving approach to corrosion and failure prevention.

## Training Objectives:

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

- ✓ Understand the fundamentals of metallurgy and material properties
- ✓ Identify common types of corrosion and degradation mechanisms
- ✓ Apply principles of material selection for specific engineering and operational requirements
- ✓ Conduct basic failure analysis and identify root causes of material failures
- ✓ Implement strategies for corrosion prevention, protection and maintenance
- ✓ Enhance safety, reliability, and lifecycle performance of materials and equipment

## Training Designed for:

This training course is designed for Mechanical, chemical, and materials engineers, Maintenance and reliability engineers, Inspection and quality assurance professionals, Plant managers, operations supervisors, and technical personnel, Professionals involved in material procurement and design and Anyone responsible for asset integrity, equipment reliability, or failure prevention.

## Training Requirement:

“Hands 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.

## Training Program:

### DAY ONE:

- ❖ Introduction to Metallurgy and Material Properties
  - Fundamentals of metallurgy: metals, alloys and microstructure
  - Physical and mechanical properties of materials (strength, hardness, toughness, ductility)
  - Heat treatment processes and their impact on material properties
  - Phase diagrams and material selection criteria
  - Introduction to non-metallic materials (polymers, composites, ceramics)
  - Case studies: material failures due to improper selection

### DAY TWO:

#### ❖ Corrosion Fundamentals and Mechanisms

- Principles of corrosion and electrochemical reactions
- Types of corrosion: uniform, pitting, crevice, intergranular, stress corrosion cracking
- Environmental factors influencing corrosion (temperature, humidity, chemicals)
- Galvanic series and material compatibility
- Corrosion testing and monitoring techniques
- **Case studies:** industrial corrosion failures

### DAY THREE:

#### ❖ Material Selection and Design for Corrosion Resistance

- Principles of material selection based on environment, cost, and performance
- Metallic vs non-metallic materials: pros and cons
- Coatings, surface treatments, and alloying for corrosion resistance
- Role of design in preventing corrosion and material degradation
- Codes, standards and best practices in material selection
- **Workshop:** material selection exercise for a real-world application

### DAY FOUR:

#### ❖ Failure Analysis and Prevention Strategies

- Common causes of material failures: mechanical, chemical and environmental
- Failure analysis methodology: visual inspection, laboratory testing, fracture analysis
- Corrosion under insulation (CUI), fatigue, and erosion-corrosion
- Maintenance strategies: inspection, monitoring and predictive techniques
- **Case studies:** catastrophic failures and lessons learned
- **Activity:** failure analysis problem-solving

### DAY FIVE:

#### ❖ Corrosion Protection, Maintenance, and Reliability

- Corrosion control techniques: cathodic protection, inhibitors, coatings
- Material maintenance strategies: cleaning, monitoring and periodic replacement
- Asset integrity management and lifecycle considerations
- Risk assessment and cost-benefit analysis for material selection and protection
- Emerging technologies and innovations in corrosion prevention
- **Final exercise:** designing a corrosion prevention plan for an industrial system

#### ❖ 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 01<sup>st</sup> 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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