Training program: MCI-Awareness

"INCREASING THE INTEGRITY OF YOUR INDUSTRIAL INSTALLATIONS"

DAY 1 – MATERIALS SCIENCE

This day forms the foundation of the training and focuses on understanding material behaviour in relation to degradation and failure within industrial installations. From this basis, participants develop essential insight required to recognize and explain damage mechanisms in practice.

Topics:

- Production and manufacturing of steel and the influence on material properties
- Structure of metals and basic principles of metallurgy
- Physical and mechanical properties such as strength, toughness, hardness, and creep
- Relationship between microstructure and failure behaviour under operational conditions
- In-depth understanding of carbon steel, cast iron, stainless steel, and duplex materials
- Introduction to non-ferrous metals and their areas of application
- Continuous connection between theory and practical failure examples

Throughout the day, specific attention is given to the properties, applications, and limitations of commonly used materials, continuously linking theory to recognizable degradation mechanisms and practical situations within industrial installations.

DAY 2 – CORROSION

Corrosion is one of the most dominant degradation mechanisms within industrial installations and is often directly related to loss of integrity and unplanned downtime. This day focuses on understanding, recognizing, and controlling corrosion processes in practice, continuously building upon the materials science foundation established on Day 1.

Topics:

- The fundamentals of electrochemistry form the basis of corrosion. This theory, often perceived as complex, is explained in a clear, concise, and understandable manner.
- Recognition and classification of corrosion mechanisms such as uniform corrosion, pitting corrosion, crevice corrosion, MIC, stress corrosion cracking, high-temperature corrosion, etc.
- Influence of process conditions, environment, and design on corrosion behaviour
- Relationship between material selection, microstructure, and corrosion susceptibility
- Prevention and mitigation strategies within operational installations
- Practical failure cases and root cause analysis
- Corrosion Under Insulation (CUI): mechanisms, risks, and critical evaluation

Throughout this day, the theory from materials science is actively applied to corrosion-related challenges, demonstrating how material structure and properties are directly connected to degradation behaviour. This integrated approach enables participants not only to recognize corrosion, but also to fundamentally understand and effectively control it within industrial practice.

MATERIALS + CORROSION INVESTIGATIONS

DAY 3 – FAILURE INVESTIGATIONS

This day focuses on the systematic analysis of practical failure cases, with the objective of identifying root causes and structurally preventing recurrence. The knowledge and insights from Day 1 (materials science) and Day 2 (corrosion) are strongly integrated throughout this module.

Topics:

- Structure and methodology of failure investigations within an industrial environment
- Analysis of failure mechanisms such as fatigue, fracture, wear, creep, and corrosion
- Interpretation of damage patterns in relation to operating conditions and load history
- Root cause analysis and translation into technically substantiated conclusions and corrective measures
- Practical examples and case studies, including input from participants own working environments

Throughout the day, continuous links are made to the fundamental material knowledge and corrosion mechanisms discussed during the previous days. Participants learn to view damage not as an isolated event, but as the result of the interaction between material behaviour, environment, and loading conditions. This integrated approach enables technically substantiated conclusions and the definition of effective preventive measures.

DAY 4 (OPTIONAL) – WELDING & WELD-RELATED PROBLEMS

This advanced module focuses on the influence of welding on the structural integrity of installations and components. Welded joints often form critical zones where local material properties change, potentially leading to stress concentrations and accelerated degradation when execution or material selection is not optimized.

Topics:

- Basic principles of welding processes and their influence on material behaviour
- Metallurgical changes in the weld and heat affected zone (HAZ)
- Weldability of different materials and associated limitations
- Typical welding defects and their formation mechanisms in practice
- Damage and degradation around welded joints
- Prevention and quality aspects within fabrication and maintenance
- Repair strategies and welding repairs, including technical consideration

During this day, the knowledge gained from materials science, corrosion, and failure investigation is explicitly integrated. Participants gain insight into how welding directly affects microstructure, stress distribution, and corrosion susceptibility, and how this translates into practical failure mechanisms. They learn to assess welded joints holistically and make technically substantiated decisions regarding design, inspection, and repair.

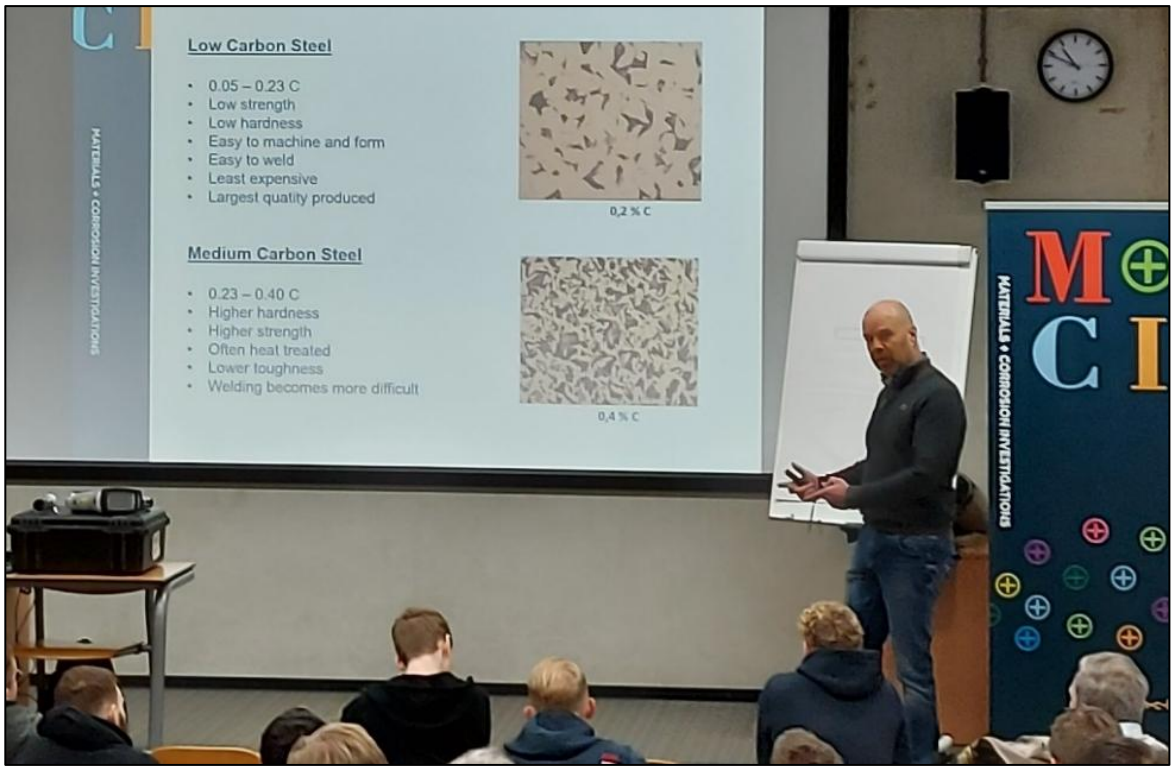
RESULT OF THE TRAINING

After completing the training, participants will be able to identify material degradation and failure mechanisms within industrial installations at an early stage, systematically analyse them, and translate findings into effective preventive measures.

Participants will gain the insight required to make more technically substantiated decisions regarding inspection, maintenance, and engineering challenges, shifting from reactive problem solving toward proactive asset management.

This results in a measurable improvement in the integrity and reliability of installations, as well as a structural reduction in unplanned downtime and associated costs.

"Those who understand how materials behave can recognize damage earlier, better understand root causes, and more effectively prevent downtime. This training provides the knowledge and practical tools to shift from reactive repair toward proactive control, resulting in more reliable installations, better substantiated technical decisions, and greater control over technical risks."



For more information and registration: **www.m-c-i.nl/en/academy**

MATERIALS + CORROSION INVESTIGATIONS