API 571 Damage Mechanisms Affecting Fixed Equipment in the Refining Industry

TRAINING METHODOLOGY

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

50% Lectures
30% Workshops, Group Work & Practical Exercises
20% Videos & Software

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WHO SHOULD ATTEND

- Plant inspection engineer and managers, Inspection personnel, plant operating engineers and others who are involved in inspection, RBI, FFS and fixed equipment reliability programs. API 571 is a based document to understand other API documentation such as API 653, API 570, API 510, API 580 and API 579.
  It is the foundation!
- QA/QC engineers, Maintenance engineers and technicians and people involved in trouble shooting of plant operations.
- Corrosion Engineers will benefit from this course in terms of identifying, understanding, prevention and mitigation of corrosion mechanisms and related damages of plant & equipment involved in petrochemical & resources industry.

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Course Objectives

- This course helps the participants to understand easily the various degradations and damages on equipment and how to detect, evaluate. It covers the 64 corrosion mechanisms documented in the API 571 and review the basic process flow that affects corrosion mechanisms. Consequently it will help them to pass the API 571 certification exam.

- The first step in safety and reliability of refinery equipment is identifying and understanding the relevant damage mechanisms in the refining industries. API 571 document contains practical information and guidance on damage mechanisms that can affect process equipment, assistance regarding the type and extent of damage, and how this knowledge can be applied to the selection of effective inspection methods to detect size and characterize damage.

- API 571 Supplementary Certification is meant for assessing the candidates for their knowledge level of damage mechanisms which is important when implementing the API inspection Codes 9API 570, API 653) and in conducting risk based inspection per API 580 and API 581.

Failure of critical components like pipelines, tanks, pressure vessels, boilers and related equipment, heat exchangers often result in operating down time, loss of production, environmental pollution and in some cases, loss of human life.

The course provides participants with the knowledge necessary:

- To gain a detailed background on the scope, organization and use of API 571.
- To know how to detect, evaluation, and prevent degradations and damages of Refinery Equipment.
- To present typical corrosion failures and to illustrate the inter-relationship between corrosion mechanisms and associated metallurgy.
- To identify various inspection techniques for different metallurgies and corrosion mechanisms.
- To grasp the advanced information in preventive as well as predictive maintenance of equipment
- To present different forms of degradations and various mechanisms and related environmental factors
- To know the factors contributing the damage, the correct monitoring & inspection of damage, prevention/mitigate of damage mechanisms.
- Help participants to pass the certification examination successfully.

API 571 Damage Mechanisms Affecting Fixed Equipment in the Refining Industry

DAY 1

Refinery Materials of Construction

1. Steel
2. Carbon Steel
3. Cast Iron
4. C-Mo Steel
5. Cr-Mo Steels
6. Killed Steel
7. Stainless Steels
8. How Steel and Cast Iron Differ
9. Stress Relieving
10. Annealing and normalizing
11. Dehydrogenation

Break

1. How Steel and Cast Iron Differ
2. Stress Relieving
3. Annealing and normalizing
4. Dehydrogenation
5. General Corrosion Tips
6. Glossary of Terms

DAY 2

Amine Treating

1. Corrosion mechanisms:
2. Wet H2S damage
3. Ammonium Bisulfide
4. Erosion/Erosion Corrosion
5. Amine Cracking
6. Amine Corrosion
7. Titanium Hydrating
8. Cooling water corrosion

Fatigue, Stress Corrosion Cracking (SCC) & hydrogen

A. Fatigue

Thermal Fatigue, Mechanical Fatigue, Vibration Induced Fatigue, Corrosion Fatigue

B. Stress Corrosion Cracking

1. Chloride SCC
2. Caustic SCC (Caustic Embrittlement)
3. Ammonia Stress Corrosion Cracking
4. Liquid Metal Embrittlement (LME)
5. Polythionic Acid SCC
6. Amine SCC
7. Carbonate SCC

C. Hydrogen Cracking

1. Hydrogen Embrittlement
2. High Temp H_2/ H_2S Corrosion
   Wet H_2S Cracking
3. Hydrogen Induced Cracking 9HIC)
4. Stress orientated HIC (SOHIC)
5. Sulfide SCC (SCC)
6. Hydrogen Stress Cracking—HF
7. HTHA

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DAY 3

High Temperature Corrosion, 400+ ^{0}F (204 ^{0}C)+

1. Sulfidation
2. Carburization
3. Decarburization
4. Metal Dusting
5. Oxidation
6. Fuel Ash Corrosion
7. Nitriding
8. Graphitization
9. Softening (Spheroidization)
10. Temper Embrittlement
11. Strain Aging
12. 885 ^{0}F Embrittlement
13. Sigma Phase Embrittlement
14. Brittle Fracture
15. Creep / Street Rupture
16. Short Term Overheating—Stress Rupture
17. Titanium Hydriding

General Damage Mechanisms—All industries

Steam Blanketing
Dissimilar Metal Weld Cracking
Thermal Shock
Erosion / Erosion—Corrosion
Cavitation
Refractory Degradation
Reheat Cracking

DAY 4

Uniform or Localized Loss of Thickness

1. Galvanic Corrosion
2. Atmospheric Corrosion
3. Corrosion Under Insulation (CUI)
4. Cooling Water Corrosion
5. Microbiologically Induced Corrosion (MIC)
6. Dealloying
7. Graphitic Corrosion
8. Boiler Water condensate Corrosion
9. CO2 Corrosion
10. Flue Gas Dew Point Corrosion
11. Soil Corrosion
12. Caustic Corrosion

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DAY 5

General Damage Mechanisms - Refining Industry

1. Amine Corrosion
2. Ammonium Bisulfide Corrosion (Alkaline Sour Water)
3. Ammonium Chloride Corrosion
4. Hydrochloric Acid 9HCl) Corrosion
5. High Temp H2/H2S Corrosion
6. Hydrofluoric (HF) Corrosion
7. Naphthenic Acid Corrosion
8. Phenol (Carbonic Acid) Corrosion
9. Phosphoric Acid Corrosion
10. Sour Water Corrosion (Acidic)
11. Sulfuric Acid Corrosion
12. Titanium Hydriding

Dress Code:
Smart casual wear is suggested along with a sweater or jacket in case the conference room is cool.

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Payment must be made prior to the event or admittance will not be permitted. A tax invoice and confirmation letter will be emailed to the attendee upon completion of a valid registration. Payment may be made by EFT, cheque or credit card.