

# € TRAINING

Petrochemical and Petroleum Damage  
Mechanisms API 571





# Petrochemical and Petroleum Damage Mechanisms API 571

## Introducion:

This program is designed to prepare participants for the certification exam only.

This training program provides a comprehensive understanding of deterioration processes prevalent in the petrochemical and petroleum industries. Through it, participants will gain valuable knowledge and skills essential for maintaining safe and efficient operations within these industries.

## Program Objectives:

At the end of this program, participants will be able to:

- Gain comprehensive knowledge of all 66 damage mechanisms outlined in API 571 Recommended Practices, along with various corrosion and cracking mechanisms.
- Develop the ability to differentiate and assess the type, extent, and severity of damage mechanisms encountered in plant facilities.
- Acquire predictive skills to anticipate equipment susceptible to specific damage mechanisms under various design and operating conditions.
- Learn effective inspection techniques for detecting damage mechanisms and understand recommended inspection methods.
- Understand strategies for preventing the occurrence of well-known damage mechanisms.
- Prepare thoroughly for the API 571 exam, equipped with the necessary knowledge and skills to attain the API 571 Inspector certificate.

## Targeted Audience:

- Asset Integrity Engineers.
- NDT Engineers & Technicians.
- Mechanical Engineers.
- In service inspector.
- Professionals who aim to register for API 571 exam.

## Program Outline:

### Unit 1:

#### Mechanical and Metallurgical Failure Mechanisms:

- Introduction to API 571 Damage Mechanisms & Corrosion Basics.
- Overview of various failure mechanisms such as graphitization, temper embrittlement, and brittle fracture.
- Explanation of stress-related failures including creep, stress rupture, and thermal fatigue.
- Identification of specific issues like steam blanketing, DMW cracking, and thermal shock.
- Understanding erosion, cavitation, and mechanical fatigue in relation to failure mechanisms.
- Discussion on gaseous oxygen-enhanced ignition and combustion.

### Unit 2:

#### Mechanical and Metallurgical Continued & Uniform or Localized Loss of Thickness:

- Continued exploration of failure mechanisms including refractory degradation and reheat cracking.
- Steps for Examination of corrosion phenomena like galvanic corrosion, atmospheric corrosion, and CUI.
- Overview of corrosion in specific environments such as cooling water, boiler water condensate, and CO<sub>2</sub>.
- Discussion on corrosion-related issues like flue-gas dew-point corrosion and microbiologically induced corrosion.
- Explanation of high-temperature corrosion mechanisms like oxidation, sulfidation, and carburization.
- Understanding corrosion phenomena such as metal dusting, fuel ash corrosion, and nitriding.

### Unit 3:

#### Uniform or Localized Loss of Thickness Continued & High Temperature Corrosion:

- Further exploration of corrosion phenomena including soil corrosion, caustic corrosion, and dealloying.
- Steps for Examination of specific corrosion types such as graphitic corrosion and oxidation.
- Overview of environmental-assisted cracking mechanisms including chloride stress corrosion cracking and corrosion fatigue.
- Discussion on stress corrosion cracking phenomena such as caustic stress corrosion cracking and ammonia stress corrosion cracking.
- Understanding issues related to liquid metal embrittlement, hydrogen embrittlement, and ethanol stress

corrosion cracking.

- Explanation of sulfate stress corrosion cracking and carbonate stress corrosion cracking.

#### Unit 4:

##### Environmental Assisted Cracking & Uniform or Localized Loss in Thickness Phenomena:

- Overview of corrosion phenomena like amine corrosion, ammonium bisulfide corrosion, and hydrochloric acid corrosion.
- Steps for Examination of specific corrosion types such as hydrofluoric acid corrosion and high-temperature H<sub>2</sub>/H<sub>2</sub>S corrosion.
- Discussion on localized corrosion issues like naphthenic acid corrosion and phenol corrosion.
- Understanding corrosion phenomena such as phosphoric acid corrosion and sour water corrosion.
- Explanation of stress corrosion cracking mechanisms including polythionic acid stress corrosion cracking and amine stress corrosion cracking.
- Exploration of wet H<sub>2</sub>S damage phenomena and hydrogen stress cracking.

#### Unit 5:

##### Uniform or Localized Loss in Thickness Phenomena Continued:

- Continued exploration of corrosion phenomena including sulfuric acid corrosion and aqueous organic acid corrosion.
- Steps for Examination of specific corrosion types such as carbonate stress corrosion cracking.
- Overview of stress corrosion cracking mechanisms including wet H<sub>2</sub>S damage.
- Discussion on hydrogen stress cracking phenomena related to HF.
- Understanding corrosion issues such as phosphate corrosion and chloride stress corrosion cracking.
- Explanation of unique corrosion phenomena including alkali corrosion and acidic corrosion.
- Prepare for the certification exam.

**Note:** This program is designed to prepare participants for the certification exam only.