API

API-571

Corrosion and Materials Professional

For More Information – Visit link below:

https://www.examsboost.com/

Product Version

- ✓ Up to Date products, reliable and verified.
- ✓ Questions and Answers in PDF Format.

Latest Version: 9.1

Question: 1

Cooling water corrosion of exchanger tubes is typically increased by:

A. Increasing the passivation layer.
B. Decreasing the process temperature.
C. Increasing the oxygen content.
D. Decreasing the cooling water outlet temperature.

Answer: C

Explanation:
According to API RP 571, under the section "Corrosion in Aqueous Environments – Cooling Water Corrosion", one of the key contributors to corrosion in carbon steel and other materials used in heat exchangers is the presence of dissolved oxygen. API RP 571 states:
"Oxygen is a primary contributor to corrosion in cooling water systems. Systems open to the atmosphere are typically more corrosive than closed systems due to the continual replenishment of oxygen."
"Corrosion rates are highest where oxygen concentration is the greatest, especially in systems using untreated or poorly treated water."
"Carbon steel corrodes in the presence of oxygen and water, forming corrosion products that may or may not adhere to the surface."
(Reference: API RP 571, Section 4.3.1.1 – Cooling Water Corrosion)
Therefore, increasing oxygen content directly increases corrosion activity in exchanger tubes, making option C the correct and documented answer.

Question: 2

Which of the following is the main concern for the potential of brittle fracture in typical process service?

A. Start-up and shutdown of equipment
B. Overpressure during abnormal operation
C. Abnormal, transient stresses on typical process piping
D. Cyclic or intermittent services

Answer: A

Explanation:
According to API RP 571, under the section "4.2.1.2 Brittle Fracture", the following conditions are explicitly identified as most critical for brittle fracture risk:

"Most processes run at elevated temperature, so the main concern is for brittle fracture during startup, shutdown, hydrotest, or other situations where equipment may be exposed to low temperatures."
"Equipment fabricated from materials susceptible to brittle fracture (e.g., carbon steel) is most vulnerable when exposed to low temperatures combined with high stress or pressure."
"A brittle fracture is characterized by a sudden and rapid crack propagation with little or no plastic deformation."
(Reference: API RP 571, Section 4.2.1.2 – Brittle Fracture)
Thus, while other options represent stress events, the main concern specifically noted by the standard is during start-up and shutdown—especially due to cooling and repressurization at low temperatures— making option A the most accurate choice.

Question: 3

Which of the following is a critical factor for chloride stress corrosion cracking?

A. Presence of nickel content less than 8%
B. Presence of oxygen
C. Presence of nickel content higher than 35%
D. Use in an alkaline pH region

Answer: B

Explanation:
According to API RP 571, in the section on "Chloride Stress Corrosion Cracking (Cl-SCC)", several critical factors are outlined that contribute to the initiation and propagation of this mechanism. The document states:
“Critical factors include the presence of chlorides (even at ppm levels), oxygen, elevated temperatures, tensile stress, and susceptible materials such as austenitic stainless steels and some nickel alloys.”
“Oxygen is an accelerant and promotes pitting that can lead to SCC initiation.”
(Reference: API RP 571, 3rd Edition, Section 4.2.2.2)
Therefore, the presence of oxygen is a well-documented critical factor in Cl-SCC. It acts in conjunction with chlorides to initiate localized pitting, which then progresses into cracking. Hence, option B is the correct choice.

Question: 4

Caustic corrosion is most often associated with:

A. Boilers and steam generating equipment
B. Caustic treaters
C. Caustic injections in crude units
D. Caustic storage tanks (non-postweld heat treated)

Answer: C

Explanation:
API RP 571, under "Caustic Corrosion" (also referred to as Caustic Stress Corrosion Cracking or Caustic Cracking), notes that this form of damage is:
“Most commonly associated with the injection points of caustic (e.g., NaOH) in crude units, particularly upstream of desalter vessels and heat exchanger circuits.”
“This damage occurs due to the combination of caustic environment and tensile stress, especially in carbon steel and low alloy steels.”
“Stress relief heat treatment of welds can mitigate susceptibility.”
(Reference: API RP 571, 3rd Edition, Section 4.2.2.3)
Thus, among the options, caustic injections in crude units are the most typical area of concern, making option C the correct answer.

Question: 5

Carbonate stress corrosion cracking and alkaline stress corrosion cracking are:

A. Not preventable by post-fabrication stress relieving of weldments.
B. Closely related corrosion mechanisms.
C. Mechanisms that affect carbon steels and austenitic stainless steels.
D. Different only in the level of alkalinity needed to initiate attack.

Answer: B

Explanation:
In API RP 571, Carbonate SCC and Alkaline SCC are both discussed under mechanisms that occur in basic
(high pH) environments, often with similar contributing conditions and prevention methods. The document highlights:
“Carbonate SCC is considered a subcategory of alkaline stress corrosion cracking. It results from the concentration of alkaline carbonates under thermal insulation or deposits.”
“Both mechanisms involve the same key parameters: elevated temperatures, tensile stress, and high pH solutions.”
(Reference: API RP 571, 3rd Edition, Section 4.2.2.4 and 4.2.2.3)
Because these mechanisms share similar material susceptibility and operating conditions, they are indeed closely related—option B is therefore the accurate and supported answer.