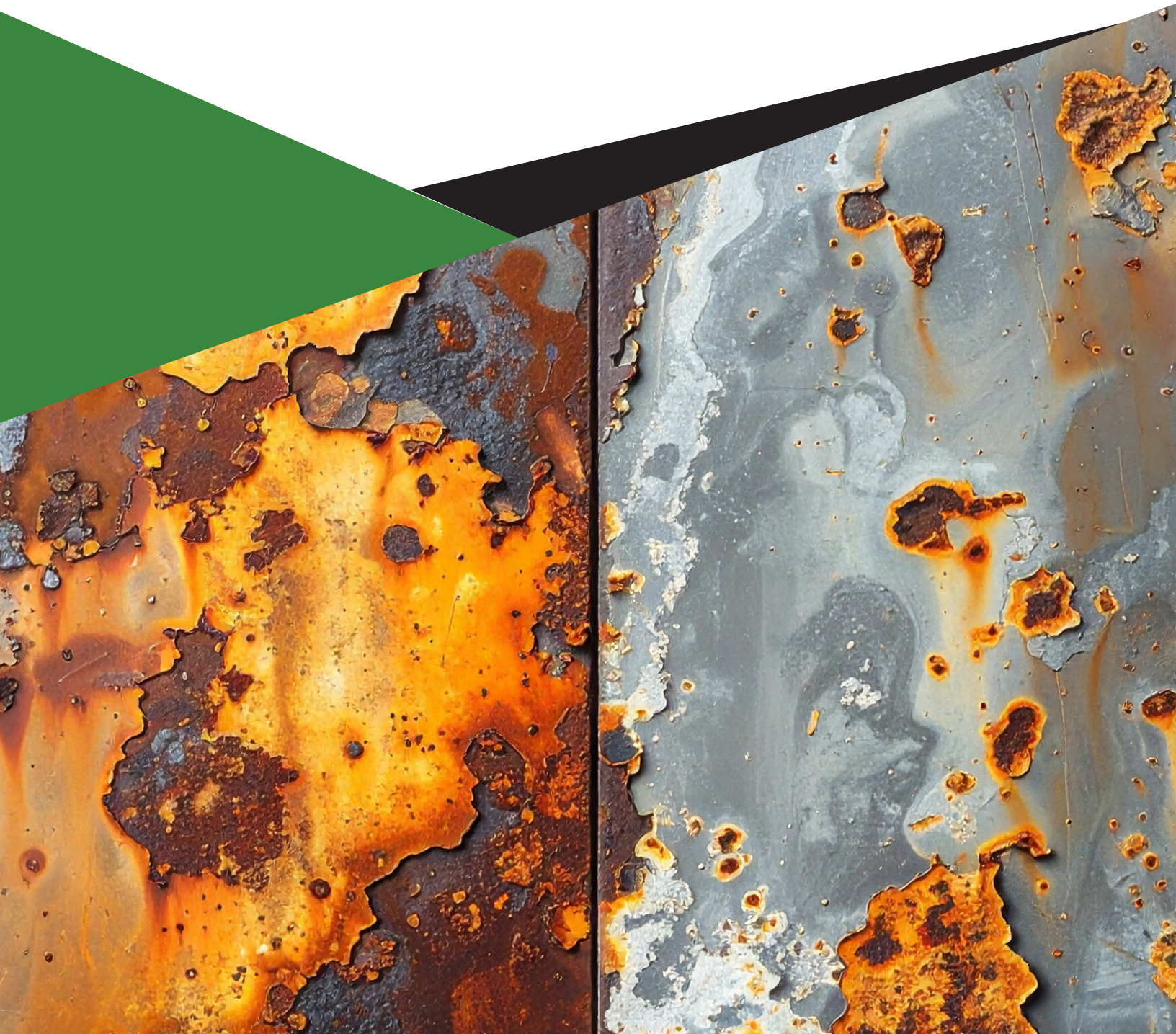
FORREST
Technical Coatings

General vs. Localized Corrosion:
Why Damage is Often Hidden





Not all corrosion behaves the same way. In many cases, corrosion damage is not evenly distributed across a surface. Instead, it concentrates in specific locations, often out of sight. This distinction between general corrosion and localized corrosion explains why many components fail earlier than expected, even when overall material loss appears minimal.

Understanding how corrosion concentrates is critical to managing risk and preventing premature failure.

General (Uniform) Corrosion

General corrosion, sometimes called uniform corrosion, occurs when metal loss is relatively evenly distributed across a surface. While this type of corrosion may appear severe over time, it is often the least threatening from a structural standpoint.

Because metal loss occurs at a predictable rate across a large area, general corrosion allows for:

- Estimation of service life
- Scheduled maintenance and replacement
- Visual detection during inspections

For this reason, general corrosion is usually manageable when anticipated and accounted for in design and maintenance planning.



Predictable Does Not Mean Harmless
Uniform corrosion still reduces material thickness over time, but its predictability makes it easier to manage than localized attack.

Localized Corrosion

Localized corrosion occurs when corrosion activity is concentrated in specific areas while the surrounding surface remains relatively unaffected. This type of corrosion is far more dangerous because it can cause rapid penetration and failure with little visible warning.



Common forms of localized corrosion include:

- Pitting corrosion
- Crevice corrosion
- Under-deposit or poultice corrosion
- Cavitation and impingement corrosion
- Fretting corrosion

In many cases, penetration rates from localized corrosion can exceed those of general corrosion by a factor of ten or more.

Small Area, Big Consequences
Localized corrosion removes small amounts of metal very quickly, often leading to leaks or rupture before surface damage is obvious.



Pitting Corrosion

Pitting is one of the most common and destructive forms of localized corrosion. It occurs when small areas of the metal surface become anodic relative to surrounding areas, leading to the formation of pits that deepen over time.

Pitting often develops:

- In stagnant or slow-moving liquids
- In the presence of chlorides
- Beneath surface deposits or coatings

Because pits may be narrow at the surface and wide beneath, they are difficult to detect visually and can progress unnoticed until failure occurs.







Crevice and Under-Deposit Corrosion

Crevice corrosion occurs in shielded areas where moisture and contaminants become trapped. Common locations include:

- Bolted joints
- Gaskets
- Lap joints
- Areas beneath surface deposits

Under these conditions, differences in oxygen concentration create localized corrosion cells that aggressively attack the metal inside the crevice while the surrounding surface remains relatively intact.

Hidden Geometry Creates Risk
Any feature that traps moisture or restricts oxygen flow can become a site for aggressive localized corrosion.

Subsurface and Crack-Related Corrosion

Some forms of corrosion do not produce obvious surface damage at all. Instead, metal loss occurs along grain boundaries or through the metal structure itself.



These mechanisms include:

- Intergranular corrosion
- Transgranular corrosion
- Stress corrosion cracking
- Hydrogen-induced cracking



In extreme cases, cracks propagate through the material, resulting in sudden rupture or perforation. These failures are particularly dangerous because they may not be detected through routine visual inspection.



Why Localized Corrosion Is So Difficult to Manage

Localized corrosion is challenging because it:

- Develops beneath coatings or deposits
- Occurs in hard-to-inspect areas
- Progresses rapidly once initiated
- Often shows minimal external warning

As a result, failures caused by localized corrosion are frequently perceived as sudden or unexpected, even though the damage has been developing over time.

Most Corrosion Failures Are Localized
In practice, many corrosion-related failures result from localized attack rather than uniform metal loss.

Implications for Corrosion Control

Because localized corrosion drives many early failures, effective corrosion control strategies must focus on:

- Minimizing moisture retention
- Reducing surface contamination
- Eliminating crevices where possible
- Applying protective barriers that remain continuous and intact

Protection strategies that only address average corrosion rates may overlook the areas where damage is most likely to initiate.



Key Takeaway

General corrosion is visible and predictable. Localized corrosion is concentrated, frequently hidden, and far more likely to cause premature failure. Understanding the difference between these two forms of attack is essential for selecting protection strategies that address real-world corrosion risks, not just average conditions.

About Forrest Technical Coatings

For more than 50 years, Forrest Technical Coatings has manufactured specialty coating systems designed to perform in demanding service environments. Based in the United States with a global customer footprint, Forrest works closely with equipment manufacturers, engineers, and operators to address corrosion, heat, and environmental exposure challenges across a wide range of industries.

Forrest's portfolio includes industrial and high-temperature coating systems for applications such as biomass processing, exhaust and thermal equipment, power generation, and other corrosion-prone environments. Products such as the INFERNEX® high-temperature coating systems are engineered to withstand elevated temperatures, aggressive atmospheres, and real-world operating conditions.

As a manufacturer, Forrest focuses on understanding how the environment, substrate, and service conditions interact, and on formulating coatings that align with those realities.

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