

Corrosion — Another Hidden Threat

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▲ **Figure 1.** Corrosion has been the cause of many past process safety incidents. Image (a) adapted from U.S. Chemical Safety and Hazard Investigation Board (CSB) Report No. 2012-03-I-CA.

In Figure 1a, an older section of piping had corroded, but a decision was made to continue operating until the next inspection. The piping failed, releasing hot, flammable liquid that formed a vapor cloud. It ignited and caused a large fire. There were no fatalities.

In Figure 1b, a spherical tank in liquefied natural gas (LNG) service was being hydro-tested. Water, which has a specific gravity of 1.0, was used as the test material, but it is over twice as dense as LNG, which has a specific gravity of 0.45. The legs of the sphere were fireproofed, and no one recognized that corrosion had occurred under the fireproofing. The additional load of the water caused the legs to fail. One person was injured, and another was fatally injured.

Did You Know?

- Corrosion can occur inside and outside of process equipment and on support structures.
- Corrosion is a reaction between a material, usually metal, and its environment. The most familiar is the corrosion of iron or steel, which forms iron oxides, or rust.
 - There are many mechanisms for corrosion. Figure 1 shows only two.
 - Most corrosion mechanisms are slow and take years to cause equipment failure. However, under some conditions, corrosion can be surprisingly fast.
 - Corrosion rates are typically stated as milli-inches per year or micrometers (μm) per year (1 milli-inch = 25.4 μm). When reviewing corrosion data, it is important to know which units were used to measure the corrosion rate.
 - Concrete can be corroded by acidic materials. This can degrade the effectiveness of containment systems for tanks, piping, and loading/unloading operations.
 - Not all corrosion involves metals. Gaskets, O-rings, and other non-metal parts can fail from material attack.

What Can You Do?

- When making rounds, watch for signs of corrosion, such as discolored insulation, damaged concrete, or stains on equipment, piping, or structures.
 - Watch for places where insulation has been damaged and water can saturate the insulation or fireproofing.
 - Material dripping from insulated lines may indicate that the insulation has been damaged, but it could also be a leak. Treat all drips with care and report them to your supervisor. Do not try to identify the leak without proper personal protective equipment (PPE).
 - When opening piping and equipment, examine the gaskets and O-rings. If they show signs of attack, such as discoloration or cracks, point this out to your supervisor. This may indicate that the gasket or O-ring material is not suitable for the present service.

Corrosion — it's inside, outside, and all around your plant.