



Safety Alert No. 493

January 23, 2025

BSEE Investigation Determines Corrosion Caused Pipeline Explosion



Figure 1. 8-inch bi-directional gas pipeline failure and damaged grating.

The Bureau of Safety and Environmental Enforcement (BSEE) recently investigated an explosion involving an 8-inch bidirectional gas pipeline, which significantly damaged life-saving equipment, wiring, and grating (Figure 1). The explosion ignited a fire that spread approximately 80 feet to the bottom of the production deck. In response, personnel activated the emergency shutdown system and instructed other platforms in the field to shut in. Additionally, all nonessential personnel mustered on the bridge-connected platform to ensure safety.

While the fire from the damaged pipeline burned for several minutes before the gas pressure bled down, boards under the wet oil tank and other items continued smoldering, requiring soaking with water from firefighting hoses.

At the time of the event, winds exceeded 28 mph, and sea conditions were from 11 to 20 feet. These conditions kept the flames away from the platform and may have prevented severe or catastrophic damage.

BSEE's investigation determined the explosion occurred due to a pipeline flange failure caused by severe outside diameter (OD) corrosion. The corrosion led to significant wall material loss and material strength degradation, resulting in a circumferential brittle failure of the flange. The applied loads on the flange were unknown, but external loads on the flange likely increased as corrosion reduced the flange's wall thickness, ultimately causing failure.

The OD corrosion was driven by high concentrations of chlorine (12,000 parts per million) in an oxygen-containing environment. High chlorine concentrations are known to dramatically accelerate the corrosion rates of carbon steels. Although the flange had been painted for corrosion protection, the coating was not properly maintained, allowing corrosion to develop over time. Following the facility's Level I inspection after the incident, a mechanical integrity inspection of the pipeline segment was conducted.

BSEE recommends that operators and their contractors, where appropriate, do the following:

- Verify mechanical integrity tests of pipeline segments comply with industry standards. This pipeline segment had a five-year requirement but exceeded industry standards by three years.
- Ensure Level I inspections include a review of original design information, maintenance, repair, and operational history. Inspections should assess pipeline conditions, including corrosion evaluation, maintain accurate documentation of findings, and any corrective maintenance.
- Monitor pipeline wall loss and proactively address potential issues using non-destructive testing techniques to measure wall thickness along gas pipelines.
- Maintain protective coatings over time to prevent corrosion of exposed underlying steel.
- Consider utilizing chlorine gas detectors within bi-directional gas pipelines to continuously measure chlorine concentrations and provide early warnings of potential leaks.

– BSEE –

A **Safety Alert** is a tool used by BSEE to inform the offshore oil and gas industry of the circumstances surrounding a potential safety issue. It also contains recommendations that could assist avoiding potential incidents on the Outer Continental Shelf.

Category: Explosion, Fire, Personnel Safety