MARINE MINERALS ADMINISTRATION

SAFETY ALERT

Safety Alert No. 530
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Monitor Liquid Nitrogen Tank Vents to Prevent Deck Damage



Figure 1: Liquid Nitrogen Storage Tank and spill area adjacent to vent line. Cryogenic shock damaged the deck plating and coating.

Background:

An uncontrolled release of liquid nitrogen from a storage tank spilled onto the deck, causing extensive damage to the steel deck plating and structural members. The tank was out of service, and workers were preparing it for transport off the facility.

Incident:

Workers were preparing a 488-barrel liquid nitrogen storage tank (Figure 1) previously used for purging and leak-testing operations for transport off the facility. Workers opened a vent line as part of planned depressurization preparations then left the area for a break while the vent line remained open and unattended. During the break, workers reported hearing a loud bang near the tank. When they returned to the area, they found ice, vapor, deck coating damage, and cracks in the main deck plating beneath the tank vent.

The investigation found that liquid nitrogen spilled from the vent line onto the deck. The extreme cold, approximately minus 320 degrees Fahrenheit (minus 196 degrees Celsius) made the steel brittle and caused it to crack. The release caused extensive damage to the deck plating and coating (Figure 2). A physical inspection found cracks in structural members beneath the affected area and in an adjacent structural skid beam. Fortunately, there were no injuries as a result of the incident.

The nitrogen storage tank vendor recreated the incident scenario under controlled conditions at a shore base facility.

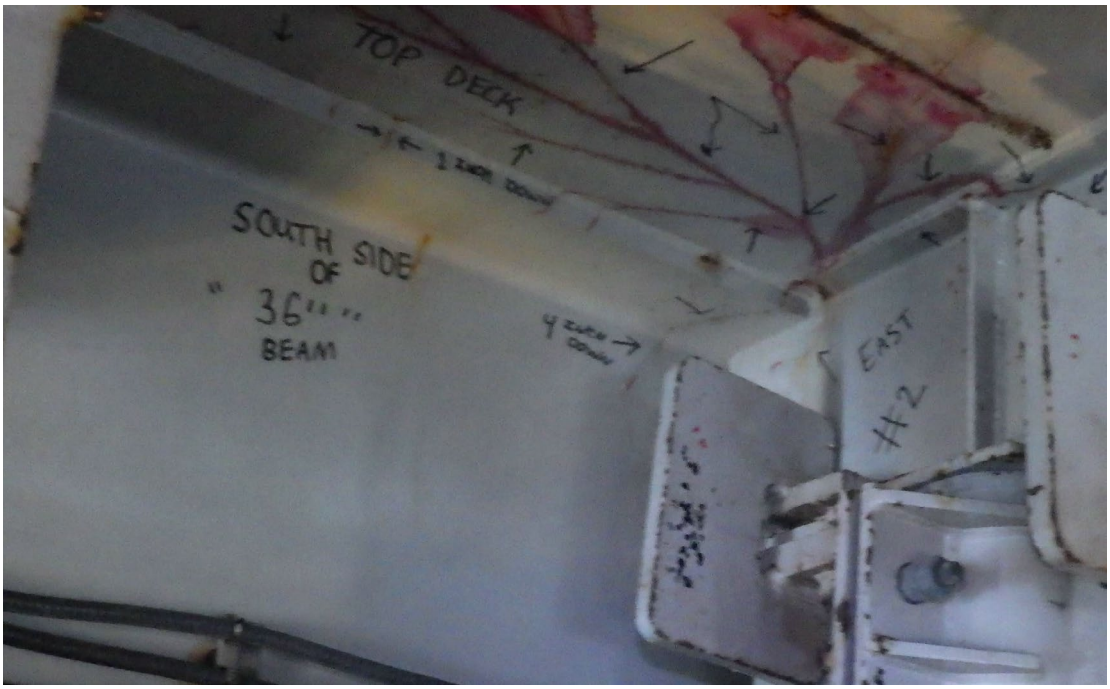


Figure 2: The cryogenic shock of the liquid nitrogen caused extensive cracks in the deck plating and support beams.

CATEGORY: Chemical Exposure, Structural

Incident Findings:

- Liquid nitrogen flowed through the vaporizer and out the vent piping. The open vent likely created a Venturi effect (a suction or siphon effect) that diverted liquid into the vent piping. During normal operations, the liquid returns to the tank.
- Workers left the vent open and unattended during depressurization, with no one present to monitor the tank or secure the release.
- The cryogenic exposure from the liquid nitrogen caused multiple cracks in the deck plating, damage to the deck coating, and cracks in several structural members beneath the affected area and an adjacent skid beam.
- The facility had no secondary containment to keep released liquid nitrogen from reaching the deck.

Therefore, operators and their contractors consider the following, as appropriate:

- Ensure personnel understand the hazards of liquid nitrogen and other cryogenic liquids, remain aware of required or needed personal protective equipment (PPE), and follow safe storage and handling practices.
- Review procedures for using liquid nitrogen and other cryogenic liquids to ensure safe storage and handling.
- Follow written procedures when venting and depressurizing cryogenic tanks, while monitoring open vents throughout the operation.
- Consider placing additional containment, such as water pans made of materials suitable for cryogenic temperatures, under all valves, pumps, and vents to limit damage from liquid nitrogen releases.
- Evaluate the placement, design, and operation of vaporizers and piping systems.
- Fully understand where vent lines run and terminate to ensure discharges are directed away from structural steel.
- Review and update vaporizer specifications to ensure they adequately address maintenance, cleaning, and testing of vaporizers and vent piping.

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As of July 10, 2026, the Department of the Interior has reunified the Bureau of Ocean Energy Management and the Bureau of Safety and Environmental Enforcement into the Marine Minerals Administration, which will oversee the responsible development of the nation's offshore energy and marine mineral resources with an integrated focus on safety, environmental protection and efficient oversight. For more information, visit Transition to the Marine Minerals Administration | U.S. Department of the Interior.

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

CATEGORY: Chemical Exposure, Structural