Compressed Gas Association
The Standard For Safety Since 1913

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SAFETY ALERT

HAZARDS OF LIQUID NITROGEN IN THE FOOD FREEZING INDUSTRY

Liquid nitrogen is widely used in the food processing industry to freeze a variety of foods, such as meat, poultry, seafood, fruits, vegetables, baked goods, and prepackaged meals.

The Compressed Gas Association (CGA) has been notified of customer-related incidents involving the use of liquid nitrogen in the food freezing industry. These incidents involved the release of liquid nitrogen, which resulted in an oxygen-deficient atmosphere that led to death or permanent disability.

This Safety Alert is being issued to provide information about the hazards of liquid nitrogen and recommended practices for the safe use and handling of liquid nitrogen in the food freezing industry.

Liquid nitrogen shall only be used in areas that are monitored for oxygen concentrations with alarms that activate when the concentration is less than 19.5% [1].

Only people with training and knowledge of all hazards associated with liquid nitrogen use and the safety precautions to be taken if an alarm activates shall be involved in processes that use liquid nitrogen.

Liquid nitrogen is a cryogenic fluid and simple asphyxiant. At room temperature, it quickly turns to a gas and expands. One cubic foot of liquid can expand into 700 cubic feet of gas. As liquid nitrogen rapidly vaporizes it generates a large volume of cold gas quickly displacing ambient air and creating a risk of an oxygen-deficient atmosphere and asphyxiation [1]. Liquid nitrogen can present a hazard in both indoor and outdoor areas. Never use liquid nitrogen in an inadequately ventilated area or room.

Inhalation of nitrogen in excessive concentrations can result in dizziness, nausea, vomiting, loss of consciousness, and death. Death can result from errors in judgment, confusion, or loss of consciousness, which prevents self-rescue. At low oxygen concentrations, unconsciousness and death can occur in seconds without warning. A risk assessment shall be performed to determine if an oxygen-deficient atmosphere can occur in the workplace.

Liquid nitrogen is an extremely cold liquid (–320 °F [–196 °C]) and generates very cold vapors. Extensive tissue damage or burns can result from exposure to liquid nitrogen or cold nitrogen vapors. Use appropriate personal protective equipment (PPE) to prevent direct contact with the skin and to protect the body from splashing or spraying of liquid or cold vapors [2].

Mitigate the hazards of liquid nitrogen by:

- Ensuring a risk assessment has been performed for areas containing liquid nitrogen;
- Installing fixed area oxygen monitors with visual and audible alarms to alert people if the oxygen concentration is less than 19.5%;
- Using personal oxygen monitors;
- Verifying proper oxygen monitor function by using a remote sensing oxygen monitor that measures an area's oxygen concentration after an alarm has occurred;
- Using adequate ventilation/air exchanges per hour (at least 6 exchanges per hour);
- Ensuring the use of clearly marked emergency stop devices inside and outside of the area that would safely stop liquid nitrogen supply to the equipment;

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- Posting warning signs at entry points to notify people that they are entering an area that has the potential for a hazardous atmosphere; and
- Ensuring people are trained in the safe handling and use of liquid nitrogen prior to working in areas where liquid nitrogen is present.

Never enter a room where nitrogen could create a risk of an oxygen-deficient atmosphere and asphyxiation. Some indications of these hazards are:

- Audible alarms and/or visual lights are activated indicating the area's atmosphere has an oxygen concentration of less than 19.5%;
- People are visibly seen in the prone position or unconscious; and
- Vapor clouds are seen in the area.

If an oxygen monitor alarm activates, people shall *immediately* leave the area.

- Notify other people in the area to evacuate immediately if it is safe for you to do so as you exit the area.
- Only personnel and emergency responders, trained in entering compromised atmospheres, with adequate atmospheric testing equipment and supplied air respirators should re-enter a room with a known or suspected oxygen-deficient atmosphere.
- Perform a headcount of people to ensure everyone has left the area. Notify emergency personnel and management of missing people.
- Investigate the condition using local emergency response procedures.

For more detailed information on the properties, safe handling, and use of liquid nitrogen and other cryogenic liquids, refer to the supplier's safety data sheet and CGA P-12, *Guideline for Safe Handling of Cryogenic Liquids* [3].

References

Unless otherwise specified, the latest edition shall apply.

[1] CGA P-76, *Hazards of Oxygen-Deficient Atmospheres*, Compressed Gas Association, Inc. www.cganet.com

NOTE—This publication is part of an international harmonization program for industry standards. The technical content of each regional document is identical, except for regional regulatory requirements. See the referenced document preface for a list of harmonized regional references.

[2] CGA P-44, *Selection of Personal Protective Equipment*, Compressed Gas Association, Inc. www.cganet.com

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[3] CGA P-12, *Guideline for Safe Handling of Cryogenic Liquids*, Compressed Gas Association, Inc. www.cganet.com

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