

Lesson Learned Briefing

No.: LL17-0015

Title: Working with Cryogenics

Event: Other Facility Event

Event Date:

Category: ESH-Cryogenics - Cryogen Handling

Summary:

Concern Statement: There have been two recent incidents involving liquid nitrogen, one resulting in an injury and another in a near miss. The main hazards in handling cryogenic materials are extremely low temperatures (on the order of -200 degree C or lower), which can lead to tissue damage, and volumetric expansion, which can result in an uncontrolled release of pressure.

Incident: In the first incident involving liquid nitrogen, a near miss, an employee was filling a four liter dewar bottle. After stopping the flow of liquid nitrogen to check how full the dewar was, the employee opened the liquid flow valve to continue filling. Restarting the flow of liquid nitrogen resulted in liquid nitrogen splashing out of the dewar. The researcher thought that he had been splashed in the left eye. Upon medical investigation, there was no evidence of a liquid nitrogen burn.

In a second case, an employee received first and second degree contact burns to her left hand when she tried to shut the liquid flow valve on a 200-liter liquid nitrogen dewar after filling a four liter dewar bottle.

Cause: In both situations, the root cause is staff not wearing the proper personal protective equipment. In the case of the potential eye injury, the researcher was not wearing safety glasses with side shields. The employee injured while attempting to close the liquid flow valve on the 200 liter liquid nitrogen dewar was bare-handed: not wearing loose fitting gloves that provide protection against very low temperatures.

Recommended Actions

* Researchers and staff must be vigilant in wearing appropriate

personal protective equipment while handling cryogenic liquids. Requirements vary, depending on the operation being performed. Appropriate eye protection includes safety glasses with side shields (when working with small volumes of cryogenic liquids) and safety glasses with side shields plus face shield (when dispensing cryogenic liquids from pressurized lines to an open dewar). Employees should wear insulated gloves that provide protection against very low temperatures when handling cryogenic liquids or anything that could be at cryogenic temperatures, such as valves and tubing. Insulated tools may be used without insulated gloves when fine dexterity is needed. Closed-toe shoes and long pants are always required. Depending on the operation being performed, a lab coat (or long sleeved shirt) is also required.

* There are additional precautions that staff should take when using cryogens. Use of cryogenic liquids in unventilated spaces can, depending on room configuration and ventilation, create an oxygen deficiency condition. Oxygen displacement creates an asphyxiation hazard for occupants. Prior to transferring cryogens with hoses or tubing, employees should verify that there are pressure relief devices between all valves.

* Due to the volumetric expansion of cryogenic liquids when they evaporate, uncontrolled pressure build-up is a potential hazard. Proper use of portable dewars, storage dewars, and installed cryogenic liquid distribution systems will prevent pressure build-up.

* All employees working with cryogens must complete cryogen safety EHS0170 before handling these materials.

Any additional assistance or questions regarding these incidents or the lessons learned may be directed to Alyssa Brand (x7246).

Lessons Learned are part of the ISM Core Function 5, Feedback and Improvement. Applicable Lessons Learned are to be considered during working planning activities and incorporated in work processes, prior to performing work.

Please contact the following subject matter experts if you have any questions regarding this briefing.

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