

Yellow Alert: Worker Splashed With Nitric Acid

Identifier: 2004-OH-FCP-0001

Date: 7/26/2004

Lessons Learned Statement:

It is imperative to have the right equipment for the job. In this case the adaptor attached to the dispenser was not compatible with the acid bottle - lack of sufficient thread engagement. In advance of the need, obtain correct dispensing adaptor for the acid bottle. Additionally, configuration of the work needs to be reviewed. The selected receiving container was taller than the staged acid dispensing configuration and unnecessary movement of the 2-liter nitric acid bottle within the fume hood occurred. Operations should be setup so acid bottles used for dispensing are stationary during lab work. Finally, it is important to wear all of the required PPE, even for quick jobs. Laboratory coat, smock, uniform, or other protective clothing should be worn as required. Additional direction was given to add long gauntlet gloves and acid apron when dispensing acids within fume hoods until other methods are approved. Proper reaction can prevent further or serious injury.

Discussion of Activities: (Discussion and Analysis)

On June 1, 2004, at approximately 1735 hours, a chemist was working alone in Analytical Laboratory. He was preparing to make up a 1% nitric acid solution using a 250 mL graduated cylinder containing 230 mL of DI water. He placed the cylinder in a fume hood where a 2 L nalgene bottle of concentrated (70%) nitric acid fitted with an adjustable pipet bottle-top dispenser was staged. The graduated cylinder is 13.35 inches in height, whereas the spigot of the dispenser was only 10 inches above the working surface inside the fume hood. The bottle was staged inside a large nalgene lid used as secondary containment. Intending to lift the bottle of nitric acid and dispense the necessary 5 mL of acid into the cylinder, the chemist grabbed the dispenser (attached to the bottle) with his right hand. As he lifted the bottle, the dispenser came off of the bottle, and the bottle fell, probably hitting the counter and then falling to the floor to his right side. The chemist was splashed with nitric acid on his right forearm, as well as his right hip and leg, and in small spots above his right eye and cheek. He was wearing safety glasses, wrist-length nitrile gloves, a short-sleeved T-shirt and full-length jeans. The position of the sash of the fume hood at the time of the event could not be determined. The chemist immediately sensed tingling above his right eye and on his right forearm. He ran to the safety shower in the room, approximately 12 walking-paces away, removing his shirt on the way. Turning on the shower, he then lowered his pants and continued to wash and disrobe. After approximately 15 minutes, he stopped the shower and called the Communications Center to report the event. He then got back in the shower and awaited assistance.

The chemist's major burn areas were a first degree burn on the right posterior forearm and a first degree with two small blisters of second degree on the right hip. There were a few first degree splash areas on his right upper quadrant of the abdomen and left forearm. Small-reddened areas above the right eye and cheek were barely visible. Treatment was provided for the burns to the right forearm and right hip in the form of wrapping the areas with bacitracin/adaptic.

This event occurred as the result of a combination of several factors:

- The adaptor attached to the dispenser was not compatible with acid bottle - lack of sufficient thread engagement
- The selected receiving container was taller than the staged acid dispensing configuration
- Unnecessary movement of the 2-liter nitric acid bottle within the fume hood
- Handling acid bottles with one hand
- Handling/picking up acid bottles by the dispensing attachments
- Possible lack of correct placement of the fume hood sash to ensure protection of body parts not protected by PPE
- Not wearing all of the required PPE - laboratory coat, smock, uniform, or other protective clothing
- Failure to follow procedural requirements

Several positive noteworthy events assisted in mitigating the seriousness of this event.

- The employee's self-control to perform all the correct steps to mitigate the acid burns by the immediate action of going to the shower and removing clothes.
- Staying in the shower until emergency assistance arrived
- Prompt request for emergency assistance
- Work being performed within a fume hood enclosure minimized acid exposure to employee
- The close proximity to the shower from the fume hood
- The PPE worn by the employee reduced the potential for additional injury

Recommended Actions:

- In advance of the need, obtain correct dispensing adaptor for the acid bottle

- Modify procedures for obtaining, selecting and using pipet dispenser to ensure that all components are compatible with each other
- Modify procedures as needed to ensure that containers are not moved/handled by the dispenser/adaptor apparatus
- Operations should be setup so that acid bottles used for dispensing are stationary during lab work.
- Modify procedure to ensure that acid will be dispensed into a container that fits under the tip of the dispenser, or to ensure that a compatible, extended discharge tube must be used.
- Increase PPE- Add long gauntlet gloves and, acid apron when dispensing acids within fume hoods until other methods are approved.
- Ensure that the fume hood sash is down as far as possible during operations.
- Required reading of the site or lab's chemical hygiene policy and safety policies applicable to laboratory operations.
- Analytical Laboratory personnel should conduct an inventory on spill response kits periodically. In addition, spill kits and other emergency supplies and locations should be reviewed with AEDO's and other responding groups.
- The response time and/or methods to obtain emergency response forces and monitoring team support for an emergency event should be reviewed.

Priority Descriptor: Yellow / Caution

Work / Function(s): Analytical Laboratory Operations

Hazard(s): Chemical/Physical

ISM Core Function(s): Analyze The Hazards; Perform work within controls

Originator: Fernald Closure Project/Fluor Fernald, Inc.; David L. Jackson, Fluor Fernald Safety, Health & Quality Director, (513) 648-4036

Contact: Fluor Fernald, Inc., Amy Meyer, Analytical Services Manager; (513) 648-7502

Authorized Derivative Classifier: Not required

Reviewing Official: None provided

Keywords: nitric acid, personal protective equipment (PPE), acid splash, Chemical burn

References: FCP-EDR #04-06-192