



The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces
through safety and health research



Worker Dies After Lifting Access Cover on Acid Reclaim Storage Tank in Virginia

FACE 8726

Introduction:

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR) is currently conducting the Fatal Accident Circumstances and Epidemiology (FACE) Project, which is focusing primarily upon selected electrical-related and confined space-related fatalities. The purpose of the FACE program is to identify and rank factors that influence the risk of fatal injuries for selected employees.

On December 14, 1986, a shift supervisor (the victim) at a synthetic fiber manufacturing plant was in the process of thawing out a frozen pipe to a 6100 gallon acid reclaim storage tank. After lifting the tank access cover the victim collapsed on top of the tank with his head down inside the access hole. The victim was removed from the top of the tank to an adjacent tank and resuscitation efforts were attempted by the fire department rescue squad. The victim was pronounced dead at the scene by the local medical examiner.

Another confined space-related fatal accident occurred within the same plant approximately one month prior to this accident. A separate evaluation of that accident is given in FACE report 87-25-II.

Contacts/Activities:

Officials of the Occupational Safety and Health Program for the Commonwealth of Virginia notified the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR) of this fatality and requested technical assistance. This case has been included in the FACE Project. On February 9, 1987, a DSR research team (two research industrial hygienists and a safety engineer) met with the compliance officer conducting the investigation for the Commonwealth, a company representative, and the company safety officer. Comparison workers were interviewed and photographs were taken of the accident site.

Overview of Employer's Safety Program:

The employer in this incident is a synthetic fiber manufacturing plant that has approximately 1,200 employees consisting mainly of maintenance and production workers, pipefitters, mechanics, and machinists.

The company has a plant safety program. New employees receive a basic plant safety orientation from the safety training supervisor and a handbook which discusses general employee safety. All production employees receive fork lift truck safety training. New employees also receive on-the-job training for specialized procedures required in certain manufacturing processes. There is a written hazard communication (i.e. right-to-know) program that addresses various department-specific hazards throughout the plant and a written policy on confined space entry procedures. All employees working in or near confined spaces are expected to be familiar with the confined space entry procedures; however, there does not appear to be an effective means to make employees aware of the potential hazards associated with these tasks.

Safety meetings are conducted monthly among company management to discuss problems and to reinforce existing safety programs; however, safety meetings are not conducted regularly within the various plant departments.

Synopsis of Events:

On December 14, 1986, at about 9:30 a.m. two workers, under the direction of the shift supervisor (the victim), were attempting to thaw an above-ground pipe line. The frozen line ran from an acid sump tank at ground level to a 6100 gallon fiberglass acid storage tank at the top of a six-story building. This closed system contained a "raw acid" solution (approximately 9% sulfuric acid, 23% sodium sulfate, 1% zinc sulfate, and 66% water) which comes from the spinning operation of synthetic fiber production. Also present in the tank are hydrogen sulfide (by-product) and carbon disulfide (used in the manufacturing process) gases. Starting from the acid sump tank on the ground and working towards the acid storage tank on the roof, the two workers and the victim began thawing the frozen solution in the pipe by opening the pipe at various access points and running steam lines through the pipe. During this procedure, the acid storage tank was still in use, receiving acid from the fiber spinning process from other pipe lines.

The victim and a worker climbed on top of the storage tank in an attempt to thaw the section of pipe entering the storage tank. Although the workers and victim had been instructed previously that day by a management official of the company not to go on top of the acid storage tanks without the protection of safety harnesses and respirators, neither employee was equipped with a respirator or a safety harness. The victim removed the tank access cover and stuck his head down inside the hole, apparently to determine if the pipe was frozen where it entered the tank. One of the workers pulled the victim back by the collar and warned him not to lean into the tank. The victim and worker then climbed down from the tank and began disconnecting and thawing other sections of the pipe. A short time later the victim climbed back up on top of the storage tank and, although there were no eyewitnesses, apparently attempted to thaw the pipe where it entered the storage tank from inside the tank. Approximately 15 minutes later the two workers noticed that the victim was not present and after a brief search they found the victim lying on top of the storage tank with his head down in the tank access hole. One of the workers pulled the victim from the top of the storage tank to the top of an adjacent tank and checked him for a pulse, but found none. The other worker called the local fire department rescue squad which arrived approximately eight minutes later and attempted to resuscitate the victim. The victim was pronounced dead at the scene by the local medical examiner.

An atmospheric test of the acid storage tank was conducted by the employer shortly after the accident. This test revealed levels of hydrogen sulfide greater than 1000 parts per million and carbon disulfide greater than 600 parts per million.

Cause of Death:

The medical examiner's autopsy report lists the cause of death as hydrogen sulfide and carbon disulfide poisoning.

Recommendations/Discussion:

Recommendation #1: The employer should initiate comprehensive policies and procedures for confined space entry.

Discussion: All employees who work in or around confined spaces should be aware of potential hazards, possible emergencies, and specific procedures to be followed prior to entering a confined space. Although the employer does have written policies and procedures for confined space entry, they should be expanded to include all required aspects of a

confined space entry program. These procedures should minimally include the following:

1. Posting of all confined spaces.
2. Air quality testing to determine adequate oxygen supply, adequate ventilation, and the absence of all toxic air contaminants;
3. Monitoring to determine a safe oxygen level is maintained inside the confined space;
4. Employee and supervisory training in confined space entry;
5. Employee and supervisory training in the selection and usage of respiratory protection;
6. Emergency rescue procedures;
7. Availability: storage, and maintenance of emergency rescue equipment.

Current written confined space procedures of the employer do address items #2 and #3 above; however, these procedures were not followed in this incident. Current written confined space procedures do not adequately address the other requirements listed above. The present procedures should also be carefully reviewed and modified as necessary in order to reflect sound confined space entry practices.

Recommendation #2: The employer should insure that employees are trained in hazard recognition and safety awareness for all potentially hazardous tasks.

Discussion: Although the employer has a written hazard communication program and safety policy (including confined space entry procedures) there appears to be no effective means of communicating hazard recognition and safety awareness to employees. When confronted with potential on-the-job hazards, employees should be able to recognize these hazards and take appropriate corrective actions.

Recommendation #3: The employer should implement and enforce its safety program.

Discussion: Although the employer has a written safety policy (including written confined space entry procedures), it appears that these policies and procedures were not being followed by supervisory personnel. Management should ensure that its safety policies and procedures are put into practice by all department supervisory personnel as well as plant laborers and enforcement procedures should be implemented to improve employee compliance with the safety program.

Recommendation #4: The employer should implement an improved housekeeping program.

Discussion: Section 5.5 of the employers safety policy states, "Housekeeping is often a barometer of attitudes concerning safety, quality and cost." Maintaining work areas in a clean and orderly condition will improve worker safety. Procedural references to housekeeping in the safety policy should be strictly followed.

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