



The National Institute for Occupational Safety and Health (NIOSH)

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# Truck Driver Dies While Cleaning Out Inside of Tanker in South Carolina

FACE 8727

## 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 August 20, 1986, a truck driver (the victim) for a liquid chemical transport company entered a 6500 gallon cargo tank mounted on an 18 wheel tractor/trailer to wash out the inside. Within a minute the victim was observed lying unconscious inside the tank. The victim was removed from the tank by the local fire department rescue squad and rushed to a nearby hospital where he was pronounced dead on arrival.

## Contacts/Activities:

Officials of the Occupational Safety and Health Program for the State of South Carolina notified the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR) concerning this fatality and requested technical assistance. This case has been included in the FACE Project. on March 3, 1987, a DSR research team (a research industrial hygienist and a safety engineer) met with the compliance officer who conducted the investigation for the state, a company representative, and the company safety officer. Comparison workers were interviewed and photographs were taken of a tanker identical to the one involved in the accident.

## Overview of Employer's Safety Program:

The employer in this incident is a liquid chemical transport company that has approximately 735 employees, consisting mainly of truck drivers and truck service personnel. The company has a main corporate office with numerous trucking terminals distributed throughout the eastern United States. The company has a written safety program. There is a safety officer and five other employees with full-time safety and training responsibilities. A safety committee (management personnel, the safety officer, and employees representing all job responsibilities within the company) meets quarterly. The various trucking terminals are required to conduct monthly safety meetings to discuss problems encountered on the job and to reinforce the existing safety program. There is a written safety policy that emphasizes driver safety training and includes some general safety procedures for truck drivers. New employees receive job-specific training on the job from supervisors and co-workers and complete a three day job training and safety orientation consisting of formal instruction from

professional safety personnel. Truck drivers are also trained on the job by personnel from a chemical manufacturing company concerning loading, handling, transport, and delivery of the chemicals that are hauled by the chemical transport company. General safety rules and a truck driving safety manual are handed out to new drivers. Written confined space policies and procedures were developed some time after the accident and distributed to all truck drivers and truck service personnel. A signed statement indicating that the employee has read, understands, and agrees to follow safety rules and confined space entry procedures is kept on file by the employer.

NOTE: The field evaluation of this incident was delayed for approximately 7 months. During this delay many areas of the safety program were developed or refined.

## Synopsis of Events:

On August 20, 1986, a 26 year-old truck driver (the victim) for a chemical transport company delivered approximately 4,000 gallons of sodium hydrosulfite to a customer. The liquid chemical was being hauled in a 6500 gallon cargo tanker truck with a nitrogen blanket (the space above the liquid in the tank had been filled with nitrogen gas) to preserve the quality of the product. As the chemical was off-loaded, the tank was filled completely with nitrogen gas in anticipation of returning to the chemical manufacturing plant to pick up another load of sodium hydrosulfite. This was the standard operating procedure at the trucking terminal which routinely hauls this product.

The victim had hauled sodium hydrosulfite with a nitrogen blanket many times during his 18 months of employment with the company; however, this time on his return trip, he was instructed to pick up a load of clay slurry. In order to haul the clay slurry it was necessary to first rinse out the residual sodium hydrosulfite in the tank. Company owned truck wash terminals are equipped with mechanical wash/rinse nozzle arms that reach inside cargo tanks; and under normal circumstances, company drivers go to these facilities to clean their cargo tanks. Not being near one of these company facilities, the victim stopped at a nearby truck wash facility owned by another company. This facility does not have a mechanical tank washing device. Instead, a truck wash worker was responsible for washing out tanker trailers manually. The truck wash worker had previously entered cargo tanks on a routine basis (approximately five per month). (According to the compliance officer's report, the truck wash worker did not test or ventilate the atmosphere inside the tanks prior to entry and did not wear a respirator or any personal protective equipment.) The victim was informed by the truck wash manager that the person responsible for washing out tanker trailers (the truck wash worker) was not there. The victim responded that he would wash out the cargo tank himself, a task which he had not previously attempted.

The victim opened a four inch drain valve on the back of the cargo tank, climbed on top of the tank with the truck wash manager, opened the hatch (20 inches in diameter) on top of the tank, and inserted a wooden ladder belonging to the truck wash facility. The victim climbed down inside the tank with a hand spray gun attached to the end of a rubber hose. Pressing the hand valve on the spray gun activated the release of steam and hot water (with or without detergent) from a steam compressor located at the other end of the hose. Once inside the tank, the victim handed the ladder back up to the manager who then climbed back down from the tank onto the ground. Approximately one minute after the victim entered the tank, the manager noticed that the steam compressor was not running and became concerned. He called to the victim, but received no response. The manager climbed back up on top of the tank, looked inside the tank through the top hatch, and noticed the victim lying unconscious at the bottom. The manager attempted to climb down into the tank to rescue the victim, but was too large to fit through the 20 inch diameter tank hatch opening.

The manager called the local emergency medical service (EMS) and then the victim's supervisor at the trucking terminal office. (The victim's supervisor told the manager that he should remove the victim from the tank immediately and not wait for the EMS to arrive.) The local EMS and fire department rescue squad arrived on the scene approximately 20 minutes after being notified. Fire department personnel donned self-contained-breathing apparatus, entered the cargo tank through the top hatch, and removed the victim from the tank by a rope around his chest. EMS personnel began cardiopulmonary resuscitation (CPR) at the accident site. The victim was rushed to the nearest hospital where he arrived approximately one hour after the accident occurred and was pronounced dead by the attending physician.

## Cause of Death:

The autopsy report lists the cause of death as anoxia due to containment in a nitrogen rich atmosphere.

## 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 did develop written policies and procedures for confined space entry some time after this accident, 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 hazard recognition and 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.

Newly written confined space procedures of the employer do address items #2, #6 and #7 above; however, ventilation procedures are not adequately addressed in item #2 and the other requirements listed above (#1, #3, #4, and #5) are not addressed at all.

### **Recommendation #2: Employers should ensure that employees are properly trained in hazard recognition and safety awareness for all potentially hazardous tasks they are assigned.**

Discussion: Although the chemical transport company now has a written safety policy and some safety training, it appears that the victim and his supervisor (and although not employees of the transport company, the truck wash manager and the employee responsible for washing out cargo tanks as well) were not aware of the hazards associated with entry into a confined space with a nitrogen rich atmosphere. When confronted with such potentially hazardous on-the-job tasks, employees should be able to recognize these hazards and take appropriate preventive and corrective actions. The victim's supervisor and the truck wash manager were also not aware of appropriate emergency rescue procedures. The only factor that prevented this accident from resulting in a second fatality was the physical size of the truck wash manager, since the victim's supervisor instructed the truck wash manager to remove the downed employee. If the manager had been able to enter the confined space, without following proper rescue procedures he probably would have died also.

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