The National Institute for Occupational Safety and Health (NIOSH)

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Farm Owner and Son Asphyxiated in Manure Waste Pit–Minnesota

FACE 9229

SUMMARY

A 43-year-old dairy farm owner (victim #1) and his 23-year-old son (victim #2) died from asphyxiation after entering one of two adjacent 8-foot-deep manure-waste pits that were connected by a tunnel. The pits were located under each half of the end of a dairy holding barn and were connected so that both pits could be pumped from one side. The incident was unwitnessed but evidence suggests the following sequence of events. The two victims were pumping the manure from the pit into a manure spreader tank using a pump located outside the barn that was being driven by a tractor's power take-off. The workers had pumped the manure from the pit containing the pump intake hose; however, the manure from the adjacent pit could not be pumped because the tunnel connecting the pits was obstructed. The father removed a steel grate cover and descended an aluminum ladder into the nearly empty pit. As he began to clear the tunnel of obstruction, the father was overcome. The son entered the pit in an attempt to rescue his father and was also overcome. The victims were discovered 22 hours later by the farm owner's wife, and the mother of the 23-year-old victim. NIOSH investigators concluded that, to prevent future similar incidents, employers should:

- **identify manure waste pits as confined spaces and post hazard warning signs at all entrances**
- **instruct farm employees never to enter manure waste systems unless absolutely necessary and only when following safe entry procedures**
- **instruct farm employees never to enter a manure pit, or any other confined space to attempt a rescue operation without proper consideration for their own safety**
- **install manure waste systems in such a manner that the need for entry is eliminated**
- **equip manure waste systems with some type of powered ventilation system.**

Additionally, manufacturers of equipment designed for use in manure waste pit systems should:

- **include warnings on the potential hazards associated with these systems.**

INTRODUCTION

On August 11, 1992, a 43-year-old dairy farm owner (victim #1) and his 23-year-old son (victim #2) died when they were asphyxiated after entering a manure pit. On August 12, 1992, officials from the Minnesota Fatality Assessment and Control Evaluation (FACE) program notified the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), of these fatalities, and requested technical assistance. On September 3, 1992, a DSR safety specialist and

the FACE field investigator from Minnesota contacted the spouse of the deceased farm owner for permission to conduct an on site investigation. Although the spouse spoke to the Minnesota FACE investigator concerning the incident, her anguished emotional state precluded a site visit. The investigators reviewed the incident with the county sheriff's office, the county coroner, the fire department rescue squad, and the county agricultural extension agent, and obtained their reports.

The incident occurred on a family-owned dairy farm operated by a father and his two sons. The farm had no structured safety program or written safety policy, and training was conducted on the job. There were no previous fatalities on the farm.

INVESTIGATION

Two adjacent manure waste pits had been installed at the end of a dairy barn, one under each half of the barn. The pits, 8 feet deep, were connected by a tunnel that allowed manure from both pits to be pumped from the same side. A portion of both pits was located outside the barn. An outdoor pump, powered by a tractor's power take-off, was located in an opening in the concrete top of one of the pits. The manure could be pumped directly into a spreader tank or into a large holding pond.

On the day of the incident, the wife and mother of the victims last saw the workers at 4:30 a.m. when she left the farm to travel to the city. She returned home at 6:30 p.m. and noticed that the cows were making an unusual amount of noise. She noticed that they had not yet been milked, a task that was usually performed at 3:30 p.m. She walked to the barn and found her son lying at the bottom of the pit, but she could not locate her husband. She called the county sheriff's office, who in turn dispatched the emergency medical service and the fire department. When the sheriff's deputy arrived at the scene, he found that the steel grate cover for the inside opening of the manure pit had been removed, an aluminum ladder had been placed into the pit for access, and that both workers were lying at the bottom of the pit. Upon their arrival, fire department personnel removed the victims from the pit.

Fire department personnel and the deputy coroner stated that one of the pits had been pumped out and that the tunnel connecting the two pits was obviously blocked. Although the event was unwitnessed, it is assumed that when the manure from the second pit failed to flow through the tunnel, the father removed the steel grate covering the entrance of the manure pit being pumped and placed the aluminum ladder into the pit. He then descended the ladder into the pit and walked a short distance to the tunnel. When he bent over to clear the tunnel he was overcome in the oxygen deficient atmosphere and collapsed. The son entered the pit in a rescue attempt and was also overcome. The son was found lying on top of his father.

After examining the victims, the deputy coroner established the time of death to be approximately 4 p.m.

CAUSE OF DEATH

The coroner listed asphyxiation due to hypoxia as the cause of death for both victims.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should identify manure waste pits as confined spaces and post hazard warning signs at all entrances.

Discussion: Manure waste pits, by their design, meet the NIOSH definition of a confined space. A space is considered "confined" if it: 1) has limited openings for entry and exit; 2) has unfavorable natural ventilation which could contain or produce dangerous air contaminants; and 3) is not intended for continuous employee occupancy. Entrance into a confined space, as described in this incident, is addressed in NIOSH Publication No. 80-106 (Working in Confined Spaces). Ideally, a manure pit should be ventilated, and the atmosphere within the pit tested prior to entry and monitored continuously while work is being performed. Self-contained breathing apparatus should be utilized by those entering the pit if an oxygen-deficient and/or toxic atmosphere is found to exist. Although such specialized equipment and training in the use of this

equipment may not be readily available to many farm workers, these workers should be made aware of potential hazards associated with manure waste pits, such as oxygen-deficient or toxic atmospheres. Signs to alert farm workers of the hazards associated with manure waste pits should be posted at all entrances. These signs should be understandable to workers who may not be able to speak or read English. In some areas, signs in more than one language may be necessary. NIOSH has prepared an Alert detailing the hazards associated with manure waste pits on farms (NIOSH Publication No. 90-103). Additionally, NIOSH requests the assistance of agricultural extension agents, farm journals, agricultural associations, and farm equipment manufacturers in alerting farm workers to the hazards associated with manure waste pits.

Recommendation #2: Employers should instruct farm employees never to enter manure waste systems unless absolutely necessary and only when following safe entry procedures.

Discussion: In this incident, the manure pit was entered by the first victim on numerous occasions without incident. Previous uneventful entries may lead farm workers to feel safe about entering these pits. Because dangerous gases may be present, a manure pit should never be entered unless absolutely necessary. If entrance into the pit is necessary, workers must follow safe confined space entry procedures (See NIOSH Publications 80-106 and 90-103). Additionally, a standby person(s) with the capability to remove the person from the pit, if necessary, should be stationed outside the pit. Visual and/or audible contact must be maintained with the person in the pit at all times. If the standby person(s) is not physically capable of removing the person from the pit, then some sort of mechanical lifting device (a winch, hoist, etc.) should be in position over the pit. Anyone entering the pit to perform any work should wear a safety belt or harness and have a lifeline attached to a lifting device outside the pit. This would enable a standby person(s) to remove someone from the pit without entering the pit. Details of a rescue plan must be developed and implemented before entry. Should an emergency develop, a short delay caused by lack of preparation could be fatal.

Recommendation #3: Employers should instruct farm employees never to enter a manure pit, or any other confined space to attempt a rescue operation without proper consideration for their own safety.

Discussion: Farm workers should never, under any circumstances, enter a manure pit to attempt a rescue operation unless properly equipped and trained in the use of the equipment and methods required for rescue. The agent that caused the victim(s) in the pit to be overcome will have the same effect on any would-be rescuer, and the rescuer(s) themselves may become a victim. Farm workers should be instructed that if anyone is observed unconscious or ill inside a pit, they should immediately contact the local fire department or emergency rescue squad. These squads will have the training and equipment needed to accomplish a rescue without further endangerment to life.

Recommendation #4: Employers should install manure waste systems in such a manner that need for entry is eliminated.

Discussion: In this incident, the tunnel connecting the adjacent pits allowed both pits to be pumped simultaneously without having to make any additional connections; however, the tunnel posed a need for entry if it became obstructed. A “Y” connection equipped with shut-off valves at each branch of the “Y” located at the pump intake would allow either pit to be pumped by opening or closing the valves. During installation of any manure waste system, and whenever possible, any component of that system that might require service should be located outside of the manure pit.

Recommendation #5: Employers should equip manure waste systems with some type of powered ventilation system.

Discussion: Ideally, manure waste systems should be equipped with both supply and exhaust ventilation to eliminate the accumulation of gases. In the case of explosive gases such as methane, the system should be of sufficient size to prevent the gas from reaching its explosive limits and should be of explosion-proof design as defined in the National Electrical Code, Article 100-A. The system may be composed of portable fans, but must be of sufficient capacity to ensure constant circulation of fresh air throughout the waste system, and be of explosion-proof design.

Recommendation #6: Manufacturers of equipment designed for use in manure waste pit systems should include warnings on the potential hazards associated with these systems.

Discussion: Manufacturers of this type of equipment should provide purchasers with information concerning the potential hazards that may be encountered when using this equipment in manure waste systems. Where possible, information (such as diagrams, etc.) on how to install this equipment so that it can be serviced without requiring workers to enter the pit should also be provided.

REFERENCES

NIOSH [1979]. Criteria for a recommended standard: working in confined spaces. Morgantown, WV: U.S. Department of Health, Education, and Welfare, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 80-106.

NIOSH [1990]. NIOSH Alert: Request for assistance in preventing deaths of farm workers in manure pits. Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 90-103.

National Electrical Code: ANSI/NFPA 70. An American National Standard. August 14, 1992.

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