

## MANURE PIT SAFETY

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**July 26, 1989.** A 65-year-old male dairy farmer, his two sons (37 years old and 28 years old), his 15-year-old grandson, and his 62-year-old nephew died when they entered a manure pit with an oxygen-deficient atmosphere. On the day of the incident, it is believed that the 28-year-old son entered the manure pit to replace the shear pin on the agitator shaft, which is used to break up large clumps of manure so that it can be pumped out. The farmer's 15-year-old grandson was with his uncle. The grandson's 8-year-old brother heard his brother yell for him to get help, because their uncle had fallen into the pit. The 8-year-old ran to the farmhouse for help. Meanwhile, the 15-year-old grandson, the farmer, his 37-year-old son and his nephew all entered the pit to attempt a rescue. All five victims were found collapsed inside the manure pit. EMS personnel arrived on the scene and began resuscitation efforts. The nephew was pronounced dead at the scene. Four victims were transported to the hospital. The farmer and the youngest son were pronounced dead upon arrival. The elder son died one hour later in the emergency room. The grandson was transferred by helicopter to a major trauma center and was pronounced dead upon arrival six hours after being removed from the pit. The cause of all deaths was asphyxiation due to methane gas.  
*Source: FACE 8946.*

### MANURE PITS

Manure pits are above-ground or below-ground storage facilities used to temporarily contain and decompose animal waste, and are common on dairy, beef, and swine confinement operations. The physical design and exposure of manure pits varies with each production facility. While most manure pits are located outside the confines of a building or

structure, a significant number of manure pits are located directly below barns and buildings. In either case, there are significant dangers that have taken the lives of many farmers, farm workers, and family members.

### INVISIBLE HAZARDS

Manure pit facilities are designed to decompose and agitate the material in preparation for pumping and disposal. This process releases several toxic gases and creates an oxygen-deficient and potentially explosive atmosphere. Without proper ventilation and breathing apparatus, farmers entering this toxic environment to make repairs to agitation and pumping equipment can be overcome in a matter of seconds.

Below-ground, confined, and covered manure pits present the greatest hazard due to poor ventilation and buildup of gases such as hydrogen sulfide, methane, ammonia, and carbon dioxide. Thus, the most dangerous storage facilities are pits located under buildings or directly beneath livestock. Gas levels are also higher during the summer months with high temperatures and high humidity. Following is a description of gases that accumulate within manure pits.

**Hydrogen Sulfide** is the most dangerous of all manure gases. It is a highly toxic gas that is heavier than air. At low concentrations it will smell like rotten eggs and can cause dizziness and nausea. At high concentrations, hydrogen sulfide deadens the sense of smell so that no odor can be detected. The result is unconsciousness and even death.

**Methane** is a highly flammable and explosive gas that is lighter than air. Since it is colorless and odorless, it cannot be detected without gas detectors. Methane also displaces oxygen in confined spaces. It usually accumulates during hot

weather and in poorly ventilated storage facilities or buildings.

**Ammonia** gas has a strong bleach-like, pungent smell and is lighter than air. It can cause severe burns to the eyes, throat, and lungs when the gas combines with mucous membrane moisture and forms an alkaline base. Excessive ammonia concentrations are likely in poorly ventilated manure storage facilities and buildings.

**Carbon Dioxide** is an odorless, tasteless gas that is heavier than air. Because it displaces oxygen in the atmosphere, high concentrations can cause unconsciousness and death. Carbon dioxide levels can only be detected using gas detection equipment. Being heavier than air, carbon dioxide will concentrate near the bottom of manure pit facilities.

Outdoor and open-top manure storages are also potential drowning sites for humans and animals. This typically occurs when someone or an animal enters the manure pit, is overcome by toxic gases, falls, and drowns.

## **SAFETY PRECAUTIONS**

Fatalities involving manure pits can be avoided if the hazards are known and precautions are taken to avoid exposure to toxic gases.

Never enter a manure pit unless absolutely necessary and only after proper safeguards have been taken. You should:

- Always have a standby person located outside the manure pit who maintains visual and auditory contact at all times.
- Always wear a harness or safety belt with a lifeline when entering a manure pit.
- Secure the lifeline to a mechanical lifting device outside the pit. The safety belt with lifeline is the only means for a standby person to rescue a worker from the pit in the absence of proper respiratory equipment.

Treat all manure pits like any other confined space. Manure pits should be well ventilated to prevent buildup of toxic gases. The atmosphere within the pit should be tested before entry. A standby person should be in constant contact and have the proper safety rescue equipment available.

A positive-pressure, self-contained breathing apparatus (SCBA) should be used by individuals entering the pit if an oxygen-deficient or toxic atmosphere is detected.

Post hazard and warning signs on all manure pits. The signs should be understandable to workers who cannot speak English or read. Signs in more than one language may be necessary in some areas. Warn visitors and guests of the hazards of manure pits. You are legally responsible for their safety while they are on your property.

Make sure manure pit facilities are of sound structure and safe design. Manure pit systems should be designed such that maintenance can be performed outside of the manure pit. Keep the agitator below the liquid surface. Greater volumes of gas are released with vigorous surface agitation.

Pumping equipment should be constructed of materials that are corrosion-resistant, thereby eliminating frequent entry to repair problems. Ventilation systems should be properly maintained, and provide maximum ventilation when agitating or pumping manure from the pit. In addition, do not fill the pit completely. Allow space above the manure for gasses to escape.

Methane and hydrogen sulfide present an explosion hazard. Thus, never lower a fan into the pit. A small spark could create an explosion. Also, do not permit smoking, open flames, or spark-producing equipment in the immediate vicinity of the manure pit. Keep all pump guards and safety shields in place on pumps, pump hoppers, tank wagons, and power units, and maintain electric motors, fixtures, and wiring in good condition.

Do not leave temporary access ladders on the outside of above-ground storage areas. Permanent ladders located on the outside of above-ground storage areas should not extend within the reach of people, or they should have locked entry guards. Also, maintain permanent fences surrounding the manure pit to keep children out.

Finally, resist the urge to rescue fallen victims without the aid of safety lines and proper self-contained breathing apparatus. Multiple deaths are associated with manure pit accidents. A significant number of attempted rescuers fall prey to the toxic gases in a matter of seconds.

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