

Dairy worker safety and health: Manure pit safety

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Storage of cow manure is a common practice on dairy farms. Each additional installation of a manure pit increases the probability that a fatal accident will result.

Tragically, experiences in several states indicate that when an accident does occur, it is likely to involve two or three fatalities. Also, there have been several cases of large numbers of livestock perishing due to manure gases.

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There are various types of manure storage systems on dairy farms, and some are more hazardous than others. Below-ground storages, or pits, are more hazardous than aboveground storages.

Editor's note: [Click here](#) to view a related video interview on manure pit safety with Dennis Murphy from 2012.

Systems that are substantially covered by slotted floors, or have storage lids or caps, are more hazardous than those that have no type of top covering. Thus, storages that are potentially the most dangerous utilize pits within buildings or directly beneath livestock. Pump-out pits with lids or caps can also be very hazardous.

Manure storage hazards include gases that are toxic (hydrogen sulfide), corrosive (ammonia), asphyxiant (carbon dioxide), and explosive (methane). Drowning is also possible.

All of these hazards exist with covered or non-covered pit type storages. Danger is most severe when manure is being agitated or pumped out, and after emptying if the pit is covered.

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At other times, gas production is very slight and ventilation from fans or natural air movement usually prevents hazardous buildup of the gases. Because open storages and aboveabground tanks are not covered, oxygen depletion and toxic and explosive gas buildup is less likely to occur.

Therefore, the most common hazard normally associated with these systems is drowning. The use of gypsum in bedding may increase hydrogen sulfide levels under some circumstances though these circumstances are not well understood.

Hydrogen sulfide is the most hazardous manure gas. It is colorless, heavier than air, and can cause death within seconds at high concentrations. Hydrogen sulfide is identified by a rotten egg odor and can be detected at low levels.

However, the sense of smell is deadened from concentrations much less than that which is lethal. Additionally, the smell is often masked by many other smells common to livestock facilities.

The amount of the gas can be increased a thousandfold during agitation and emptying. Hydrogen sulfide is associated with most of fatalities from manure storages.

Carbon dioxide is a non-toxic gas, but it does replace oxygen and, therefore, can asphyxiate humans and animals. Because it is colorless and odorless, carbon dioxide is impossible to detect without gas detection equipment.

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Since it is heavier than air, it usually accumulates near the bottom of the storage. Carbon dioxide does not usually build up to the point that it becomes lethal unless all ventilation into and around the pit has been eliminated for a few hours.

Ammonia can cause severe damage to the eyes, throat, and lungs. This gas combines with moisture in the eyes and respiratory tract to form an alkaline base, which results in severe burns.

Ammonia is lighter than air and has a strong bleach-like smell. Because of its irritating nature, people usually leave the area quickly. Therefore, it is not suspected to have caused any human deaths.

However, constant low-level exposure to ammonia can have a discomforting effect on humans and livestock. Methane is a highly flammable and explosive gas. Methane is also odorless and colorless, and impossible to detect without gas detection instruments.

Methane is lighter than air and readily rises out of storage areas. It can collect under hoods, roof ridges, and corners. Methane will most likely accumulate during hot weather if ventilation is poor. There have been a few methane explosions resulting from lighting torches and sparks from a shorted electrical wire.

There are several things an operator can do to minimize hazards associated with stored manure. However, none is more important than keeping people and animals out of buildings and providing strong, constant ventilation during agitation and emptying.

Continue to ventilate for a few hours after pumping has stopped. Ventilation systems for manure storages should be designed to meet ASABE Standard S607, Ventilation systems for animal quarters should be equipped with alarms to warn of failure, and auxiliary ventilation should be available in case of power failure. Another recommendation is not to fill your storage to capacity.

Allow one to two feet of air space to accommodate concentrations of gases. Also, always keep the agitator below the liquid surface; use gas traps in pipelines emptying into storages to keep gas from flowing back into buildings; and forbid smoking, open flames, or spark producing operations in the immediate vicinity of the storage area.

Rescuing a person from a pit is a no win operation. Unfortunately, when someone collapses in a pit, gases are so high that it is literally suicide for anyone else to enter without a self-contained breathing apparatus.

The only reasonable action that can be taken is to provide ventilation into the storage and wait for rescue personnel with the proper equipment. Barn fans and silo blowers are sources of ventilation that may be used. However, do not lower fans into the pit because of possible methane gas buildup.

Uncovered storages at ground level should be fenced to keep people and animals off the crust-like surface that normally develops. The surface crust may harden in very dry or extended cold periods, but the hardening will be uneven. As the crust softens with changing weather conditions, a person or animal can suddenly break through.

Do not leave ladders leaning against aboveground tank storages. A person who accidentally falls into the tank will be trapped because he or she will be unable to climb the smooth surface.

Warning signs should be placed near open storages and aboveground tanks, and a rescue pole and rope should be appropriately located in the area. Remember to warn visitors and guests of the hazards or manure storages because you are legally responsible for their safety while on your property. **PD**

Those with specific questions about complying with health and safety regulations can leave a comment below or [click here](#) to email Douphrate directly.

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