COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF AGRICULTURE

Date: September 25, 2012

To: Pennsylvania Certified Manure Haulers and Brokers

From: George D. Grieg
Secretary of Agriculture

Subject: Manure Storage and Handling Safety Concerns

As you may have recently heard, two young children in Montour County lost consciousness while riding their tricycles near an open manure storage tank that was being agitated for pump out. Both children later regained consciousness and were treated and released from a local hospital. The Sept. 22 Lancaster Farming story is attached.

This incident is a reminder of just how dangerous some aspects of our farms can be for those who live or work on them. As a certified manure hauler or broker, you work in potentially dangerous situations as you provide vitally important and beneficial services to our livestock and poultry farms across the state. Please continue to stay informed about the hazards you face and be prepared to prevent and avoid those dangers.

In reviewing the Montour County incident, the U.S. Department of Agriculture Natural Resource Conservation Service state officials have indicated that the use of gypsum in the dairy's bedding system may have been a contributing factor and that further study and research regarding this potential link is necessary to help ensure farmers can use these products safely and effectively.

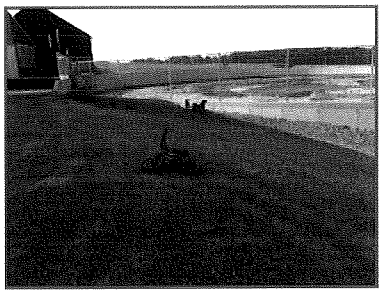
More information on gypsum bedding and basic safety precautions for working in and around manure storages is attached, and can be found on NRCS website, www.nrcs.usda.gov search "manure management" and click on the document titled, "Manure and Nutrient Management." Scroll to the bottom of the page and click "Safety and Health – Manure Storage Pits."

Also attached is a Penn State Extension Open Air Manure Storage Safety Tips fact sheet that provides general safety precautions for working in and around open manure pits. This document can also be found at: www.agriculture.state.pa.us, "search manure tips."

During this busy fall harvest season, I urge you to take a few minutes to review the attached safety information and review your safety procedures and equipment to help ensure a safe and productive season.

Dairy Farmer's Boys Have Close Call With Manure Gas

9/22/2012 7:00 AM
By Chris Torres Staff Writer



DANVILLE, Pa. — Monday was a harrowing day for dairy farmer Dennis Beachel of Danville, Montour County.

Just as he was starting to stir his 124-foot-wide, 12-foot-deep, 1.2-million-gallon concrete manure pit late Monday morning, he saw something no parent would ever want to see.

"We had just started to stir the pit and within two to three minutes, I turned around and both of the boys laid beside their bicycles," Beachel said.

The boys, 4-year-old Denyn and 2-year-old Denallen, who had just celebrated his birthday the week before, were found face up and unresponsive. The younger boy's face had turned blue, and his eyes had rolled back into his head.

The boys were playing next to the large manure pit when Beachel and his father starting prepping it to be emptied.

Aware of past accidents involving manure gas on dairy farms, Beachel feared the worst.

"They looked like they were dead. I feared they were when I first picked them up," he said.

But unlike other incidents, the kids weren't found in the pit itself; they were found aside the pit.

It's something Beachel never thought would happen, especially considering the pit was built this past winter to replace an old earthen pit.

"Everybody is baffled how it could've happened," he said.

In fact, the incident has raised the eyebrows of several people with the state office of the Natural Resource Conservation Service (NRCS), which helped design the pit.

Hosea Latsaw, state conservation engineer, said that although the cause of the accident hasn't been determined, he is concerned that Beachel's use of gypsum for bedding might have contributed to the accident.

"It's very difficult to pinpoint the exact cause. We think this has the potential for the gypsum to be the problem here," he said.

Gypsum, a sulfate-based material, is one of the main ingredients in drywall. But it can also be used as an alternative bedding amendment in barns.

Latshaw said the material, when mixed with water in an anerobic setting, can produce an unusually high amount of hydrogen sulfide, a deadly gas.

Still, he said the incident is highly unusual, given the fact that other farms also use gypsum and no other similar incidents have ever been documented.

"What we want to get out right now is there might be something here that hasn't been studied enough," Latsaw said. "This is something different at the Beachel farm that needs to get out."

Beachel had received a government grant to build the structure

Concrete pits, which range in size depending on the size of a dairy herd, have become increasingly popular on farms as government agencies see them as safer and better for the environment compared with old earthen pits.

The pit, which takes manure from the adjacent 250-head dairy farm, was built adjacent to the barn, which allows Beachel to simply scrape

manure into it.

Most of the pit is above ground with fencing. But a large area of it was built at ground level, with a lane running next to it.

Beachel said his younger son, who was playing with a tricycle, was a mere two feet from the side of the pit where it was ground level when the side-mounted manure pump was turned on. His older boy was about 15 feet from the pit on a bicycle.

Winds, Beachel said, were calm at the time of the accident.

"There is a driveway right there and the kids are always there," he said.

Beachel called 911 and moved the boys away from the pit. An ambulance was on scene within 15 minutes.

Both boys were taken to a nearby hospital, where Denyn was released at 3 p.m. Monday afternoon.

Denallen, the 2-year-old, was kept overnight for observation and was released Tuesday morning. Beachel said doctors told him the boy was likely minutes from not being able to breath when emergency responders arrived at the farm.

Beachel said an NRCS engineer, who was working at his brother's farm three miles away, showed up at the farm within a few minutes of the accident occurring. He was told the accident may have resulted from the release of hydrochloric sulfide as the crust was being broken and that the lack of wind may have kept a plume of gas in the air close enough for his sons to breath in.

Beachel said he didn't feel any effects himself when he picked up the boys and moved them to the side.

Dennis Murphy, Extension safety specialist at Penn State, said overexposure to gases, even in an open air manure storage, is possible, especially when a pit is being emptied.

"I've heard farmers say they get light headed and have to get away," Murphy said.

Hydrogen sulfide, carbon dioxide, methane and ammonia are among the gases that can be released when the crust from a manure storage pit is broken.

He said farmers can wear a single- or multigas detector, which can either be rented or purchased, on their shirt collar which will sound an alarm if a high level of gas is in the air.

Hot, humid days with no wind can be especially dangerous, he said, because it can allow gas to stay in a single place for a longer period of time.

"They have to be aware of the gases that get generated when they are emptying," he said.

Still, Murphy said he's never heard of a situation like this, since the boys weren't actually in the pit.

While he hasn't gone to the farm, Murphy said he's seen pictures of the pit and surrounding area, and thinks the boys were close enough to breathe in gas that it could have contributed to the accident.

Manure pit accidents have been on the rise, Murphy said. But he thinks people, now more aware of the dangers of manure pits, are reporting more incidents to Extension or their local authorities.

"It used to be every three or four years. Now we're hearing something every year," he said.

Latshaw said the design of the pit isn't unusual and that many pits are built within just a few feet of a barn to allow a farmer easy access to scrape in manure.

Beachel said he wished he would have known more about the dangers of gases released from manure pits prior to allowing his boys to play so close to it.

It's something he said he'll be more aware of in the future.

"It's a scary thing to see and something we never expected," he said. "More farmers need to be made aware of how serious this really is."

Penn State **Extension**

Open Air Manure Storage Safety Tips

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Injuries and fatalities occur in confined space manure storages that are enclosed, such as beneath animal quarters, or below-ground reception and pump out pits, and in non-enclosed storages, such as earthen, lined and concrete manure pits and ponds. Non-enclosed manure storages are open to the atmosphere but still meet the definition of a confined space in terms of occupational safety and health.

In the case of open air manure storage pits and ponds, some hazards can include:

- A thick liquid and floating crust that make swimming, buoyancy or even moving around very difficult.
- Steep and slippery slopes that can make getting out of manure storages difficult or impossible.
- Localized layers of hazardous gases existing above manure surfaces, especially on hot, humid days with little to no breeze.
- A speeding up of manure gas release from movement, agitation, removal, or addition of manure to a storage pond.
- Not having sufficient oxygen to breathe if a person is 'treading' in manure because of an inability to get out.
- Not being able to see into depths of manure like you can with clear water.
- A slow response time for adequate emergency actions because of site isolation and remoteness.

Safety guidelines to follow:

1. Make sure everyone that needs to be near manure storage structures understand the hazards that exist, including the effects that the various gases have on them.
2. Make sure the open air manure storage has a fence installed around the perimeter and access gates are locked to keep unauthorized personnel from entering the area.
3. The open air storage should have manure drowning hazard signs and no trespassing signs on all sides of the storage.
4. If you must go into the fenced area of the open manure storage, wearing a safety harness with life line attached to a safely located solid object or anchor will enhance your chances of rescue.
5. Never work alone. The second person's role is to summon help in an emergency and assist with rescue without entering the storage.
6. Rescue equipment, such as a flotation devices and lifelines, should be attached to every manure pump.
7. Move slowly around manure storages as the ground can sometimes be uneven and may cause a person to trip or stumble.
8. Bystanders and non essential workers should stay away from pump out or other accessible areas.
9. There should be no horseplay near the open manure pit or pumping equipment.
10. Explosive gas may be lurking near where agitation or pumping is occurring. No smoking, open flames or sparks should be allowed. If equipment malfunctions during agitating or pumping of the manure, shut all equipment off and remove it from the storage before servicing or repairing.
11. If you feel unsure or uncomfortable with what you are getting ready to do near the open manure pit, step back, contact someone and review the situation before proceeding.
12. Be prepared to call 911 if an emergency happens. Being prepared means accurately describing the incident, number of victims, and giving specific directions to the site of the emergency.

Manure Storage Safety
USDA, Natural Resources Conservation Service
September 19, 2012

Safety must be a primary consideration in managing animal waste. It must be considered during planning, siting, and designing of agricultural waste management system (AWMS) components, as well as during the actual operation of handling wastes. The operator must be made aware of safety aspects of any waste management system and the AWMS components under consideration. The potential for an accident with waste management components is always present.

On September 17, 2012, two young boys temporally lost consciousness while riding their tricycles near an open manure storage tank that was being agitated for pump out. The investigation into this event is ongoing. Additional research needs to be conducted on the use of gypsum for bedding. Gypsum is a very soft sulfate mineral composed of calcium sulfate di-hydrate. The additional sulfur may have increased the production of hydrogen sulfide in this environment. Extra caution and awareness is necessary to dairy operations that are using this type of bedding material.

A variety of gases can be generated in the operation of an AWMS that can cause asphyxiation, poisoning, and explosions. Manure gases can accumulate when manure is stored in environments that do not have adequate ventilation, such as underground covered waste storage tanks. Waste storage facilities and lagoons placed in open environments also store and release gases, especially during agitation. These gases can reach toxic concentrations and displace oxygen. The four main gases are ammonia (NH_3), carbon dioxide (CO_2), hydrogen sulfide (H_2S), and methane (CH_4).

Hydrogen sulfide is a deadly gas. Hydrogen sulfide is the most dangerous of the manure gases and can cause discomfort, headaches, nausea, and dizziness. At levels above 200 ppm, collapse, coma and death due to respiratory failure can occur within seconds after only a few inhalations (http://www.safetydirectory.com/hazardous_substances/hydrogen_sulfide/fact_sheet.htm). Humans and farm animals have been killed by this gas after falling into or entering a manure tank or being in close proximity of a manure storage facility during agitation. Although only small amounts of H_2S are produced in a manure tank compared to the other major gases, this gas is heavier than air and becomes more concentrated in the tank space over time.

Hydrogen sulfide is produced by anaerobic decomposition of organic wastes. It has the distinct odor of rotten eggs at low concentrations, but cannot be detected at higher concentrations because it overpowers the sense of smell. Hydrogen sulfide deadens the olfactory nerves (the sense of smell); therefore, if the smell of rotten eggs appears to have disappeared, this does not indicate that the area is not still contaminated with this highly poisonous gas.

Agitation of liquid wastes to facilitate transfer and other waste management functions is a common practice in an AWMS. When liquid waste storage facilities are agitated in preparation for pump out, high concentrations of H_2S can be released. As H_2S is heavier than air, it will build up in the area overhead of the mixing activities and may drift downward adjacent to the storage tank. This activity may release large quantities of noxious gases and create dangerous and possible lethal conditions even with maximum open air ventilation.

Because of the potential danger of gases around manure storage facilities, ponds, or lagoons; first aid equipment should be supplied nearby. An identified, easily accessible area should be provided for storing safety

equipment. The area should be inspected periodically to ensure that all equipment is available and in proper working condition. An emergency action plan, including telephone numbers of the local fire department and/or rescue squad should be posted near the safety equipment and near all telephones.

Safely hazards are inherent to an AWMS. Several actions and precautions to be taken when dealing with manure storage facilities include but are not limited to:

- Safety equipment can include air packs and face masks, nylon line with snap buckles, safety harness, first-aid kits, flotation devices, safety signs, and hazardous atmosphere testing kits or monitors. All family member and employees should be trained in first-aid, CPR techniques, ad safety procedures and policies.
- Do not enter a manure pit unless absolutely necessary and only then if the pit is first ventilated, air is supplied to a mask or a self-contained breathing apparatus, a safety harness and attached rope is put on, an there are two people standing by.
- Do not attempt without assistance to rescue humans or livestock that have fallen into a manure storage structure or reception pit.
- For open storage facilities, put a fence around it and post "Keep Out" signs.
- Signs should be prominently posted and maintained that warn of the hazard. Children and those that cannot read must be given special instruction to assure that they are aware of the hazard.
- To minimize hazards, agitation of manure is best done on windy days.
- Impoundment type facilities present a drowning hazard. Crusts that are formed on the surface and slime formation make waste impoundments more hazardous. Crusts have the appearance that they would support a person's weight; however, they often will not.
- Everyone working around or near manure storage facilities must understand the health hazards that exist, including symptoms and effects from the gases produced.
- During pump out operations, ensure non-essential workers or bystanders are away from the manure storage facility.

Additional information regarding AWMS safety issues can be found in the following references:

Agricultural Waste Management Field Handbook Chapter 3, section 651.0303 *Effects of animal waste on the air resource*. http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=31441.wba

Agricultural Waste Management Field Handbook Chapter 10, section 651.1008 *Safety*. http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=31529.wba

Agricultural Waste Management Field Handbook Chapter 13, section 651.1303 *Safety*. http://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=31482.wba

(This document can be found at NRCS's Website http://nitcnrcsbase-www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1048954.pdf)