

Manure Gas Safety a Priority for Community Group

BY STEPHANIE LEONARD

Clinton County cattle feeders and commercial haulers are promoting safety awareness as they plan for spring manure pumping.

Sherril and Jason Johnson (Johnson Valley Beef, Andover) organized the grass roots group after incidents involving cattle deaths occurred in Iowa, Illinois, and Wisconsin during manure handling activities last fall.

Johnsons lost 23 steers while pumping the deep pit under their own 720-head confinement unit in October, the result of hydrogen sulfide (H₂S) gas released during manure agitation.

Hydrogen sulfide is produced during bacterial digestion of stored manure or other organic matter. In undisturbed liquid manure, the gas remains in solution.

But things change fast when manure is stirred or agitated. The result is comparable to what happens when you shake or drop a bottle of pop or beer: gas bubbles combine and

erupt through the surface of the liquid.

During agitation, H₂S concentrations in air can increase to several hundred parts per million (ppm) or higher within seconds, resulting in dangerous conditions for animals and people. H₂S is invisible and has no odor warning qualities at dangerous levels.

Predicting when and under what circumstances concentrations will reach lethal levels is impossible.

In many cases involving human fatalities related to manure storage and H₂S, the victim had been doing a job they had done on other occasions - without problems - in the past. Many incidents have involved unprotected, well-meaning rescuers - typically family members or coworkers - who also became victims when they were exposed to the same conditions that rendered the first person unconscious.

Until recently, more H₂S-related livestock and human deaths in the Midwest have involved swine and dairy confinement opera-

tions. But events last fall in Iowa, Illinois, and Wisconsin involved cattle feeding operations with deep pit or open lagoon storage.

Johnsons and the Andover community are among those too-familiar with the dangers of H₂S.

In 2005, Dwight Johnson, 52, (Sherril's husband/Jason's father) was overcome by H₂S when he entered a pit to retrieve a chain that had fallen; his employee, Justin Faur, 23,



Connor Jargo shows the manure gas warning signs he's recommending for confinement structures.

Safe Manure Handling

- Post warning signs and train employees/family members about the hazards.
- Treat all manure transfer operations, pits, and tanks, and lagoons as potentially dangerous, even if the structure has been pumped on other occasions without problems.
- Make sure employees, custom haulers, and applicators are aware of H₂S hazards, particularly when manure may contain elevated sulfur due to distiller product feed rations.
- Plan to pump when outdoor conditions are cool with wind speeds of at least 6 mph.
- Don't work alone; have a spotter/safety partner.
- Remove animals.
- Cordon off the pit opening or cover it with grates to prevent falls into the pit.
- Wear personal H₂S gas monitors to alarm of dangerous concentrations. Use an area monitor at the pump-out; concentration readouts are useful to adjust agitation and minimize H₂S release.
- Start agitation after a 1-2 foot headspace is cleared between the manure surface and bottom of slats.
- Make slow changes in agitation speed, direction, and depth to control gas release.
- Keep pump jets and nozzles submerged below the manure surface. Avoid directing nozzles toward walls or corners, which

increases manure churning and gas release. Stop agitation when the bottom nozzle is less than 6" below the manure surface.

- Stop agitation and get out of the area if H₂S monitor levels rise rapidly, if livestock nearby show distress, or if personnel experience nausea, dizziness or headache.
- H₂S gas can remain in low areas of empty pits and tanks even after manure is pumped. Never enter the pit being pumped without a self-contained breathing apparatus (air pack). Particulate filter and gas cartridges respirators will not protect against H₂S.

MANURE GAS SAFETY

ran to call for help and was then overcome when he attempted to save his boss. Firefighters retrieved both men, who died days later.

When H₂S struck again in October, Johnsons and their veterinarian Mike Slattery wasted no time taking action. They contacted specialists at the University of Iowa (UI) and Iowa State University (ISU) for help in monitoring conditions to safely complete pumping. They organized and hosted an impromptu meeting to share information about the hazard and discuss best practices to protect personnel and livestock.

Over 80 neighbors, cattle feeders, and commercial applicators in the region attend-



Sherril Johnson (center), Jason Johnson (right), Steph Leonard (UI Great Plains Center for Agricultural Health) and Dan Andersen (ISU Ag & Biosystems Engineering) monitored H₂S concentrations at Johnson Valley Beef.

ed the meeting in their farm shop.

Increasing awareness of the hazard is the number one priority for Sherril Johnson, whose mission is to make sure others don't have to share their experiences.

At a follow up meeting in February, the local group, which includes ISU extension and UI specialists, discussed ongoing prevention activities, including recommendations to post signage, cover pit openings, continue gathering data on H₂S levels during pumping, and share information on gas monitor resources and availability. Everyone in the group has purchased and uses gas monitors during manure handling activities.

They are considering a summer field day to share safety information, and plan to encourage confinement building contractors to include signage and warning information

on new structures.

Connor Jargo, easily the youngest group member at 13 and a seventh-grader at Easton Valley School, presented information on signage to help increase awareness of manure gas dangers. Jargo bought 50 signs with his own money to increase awareness of manure gas hazards; the magnetic signs can be posted on metal doors or building exteriors and moved as needed. He has distributed signs to area producers; others who are interested in purchasing them at his cost can email rmjar-go@netins.net.

go@netins.net.

For more information, visit:

- <http://www.agronext.iastate.edu/immag/hot-topics.html>
- <http://themanurescoop.blogspot.com/2016/10/manure-agitation-tips-for-hydrogen.html#gpluscomments>
- <http://www.public-health.uiowa.edu/gpcah/manure-gases/>

Stephanie Leonard is an industrial hygienist and safety specialist at the University of Iowa. Contact her at stephanie-leonard@uiowa.edu or 319-335-4432.

Personal gas monitors

Personnel involved in manure pump-out, hauling and transfer, or equipment maintenance activities should wear personal single-gas H₂S monitors during these activities.

Monitors provide a low- and high-alarm visual, audible, and vibrating alarm when H₂S levels exceed set points.

Low maintenance H₂S monitors, such as SGC-Plus or BW Clip Real Time have a 24 month internal battery requiring no charging or replacement. The service life can be extended by putting the unit into "rest" mode during periods when the monitor will not be needed.

When no gas is present, these monitors display months-of-life remaining; in the presence of gas, the monitors display concentration in ppm. The highest concentration displayed is 100 ppm, but actual concentrations may be higher. Users should exit the area when alarms activate and return only when alarms stop and concentrations read below target set points.

H₂S monitors are available online from numerous vendors including PKSafety, Gassniffer, Zoro, and Grainger, or at local industrial safety supply stores. Prices range from around \$160-200.



Curt Dyson and Jason Johnson, (Johnson Valley Beef); Dan Andersen (ISU Ag & Biosystems Engineering). Dyson and Johnson wear H₂S monitors during pumping.