

November 2018 Update from the Field: Manure Gas Safety

Investigation of a Worker Death While Agitating Manure in a Non-Enclosed Storage. (2018). Shutske JM, Shaefer D, Larson R, Erb K, Skjolaas C, Leonard S, Nelson J, Binversie E, & Rifleman S. *Journal of Agromedicine*, 23, 10-19.

An in-depth investigation of an unusual, non-enclosed manure storage hydrogen sulfide-induced fatality on a Holstein beef production operation is presented. The case involved several factors that likely played a role in the young farmer's death. These included zero wind movement, a reported temperature inversion in the area, relatively cool late summer outdoor temperatures on the morning of the incident, higher outdoor temperatures the week prior, and a high by-product steer ration containing ingredients that contributed significant sulfur content to the stored manure. Recommendations are offered for future research to determine the combinations of conditions and inputs that have potential to increase human and animal risk around manure storage structures. Based on this case and others recently documented showing unsafe levels of hydrogen sulfide being released from similar outdoor storages, it is critical that agricultural industry experts and input suppliers continue to analyze risk and consequences associated with new management practices, processes, inputs (including feed ingredients and animal bedding), machines, and other technology developed to support animal agriculture. Production practice and educational guidance are also offered based on this case and published literature.

Evaluation of Low-Cost Hydrogen Sulfide Monitors for Use in Livestock Production. (2017). Beswick-Honn JM, Peters TM, Anthony TR. *Journal of Agricultural Safety and Health*, 23, 265-279. Direct-reading gas monitors warn workers of the risk of potentially fatal hydrogen sulfide (H₂S) exposures that may arise during manure handling. Low-cost, low maintenance H₂S monitors are available from many manufacturers, but differences in their features and performance make selection challenging for farmers. Moreover, little information is available on the practical maintenance and performance of these devices in agricultural environments. The objective of this study was to provide information to agricultural workers to aid in the selection, maintenance, and use of low-cost H₂S monitors. This laboratory study evaluated the performance of several low-cost monitors over a simulated period of use of one year in a swine barn. Four models were exposed to H₂S concentrations of 1 to 10 ppm over 18 weeks to examine the drift in reported concentration and changes in the alarm reaction time. Over the simulated barn year, the performance of alarm-only monitors declined faster than that of monitors displaying the H₂S concentration. Of concern was the high-level (20 ppm) alarm failures after an equivalent of 139 days (Altair) and 289 days (BW Clip) in a swine barn, well within the monitor's reported shelf-life. Models displaying concentration exhibited fewer failures but were inaccurate in the displayed concentration when challenged with 20 ppm of H₂S. The T40 Rattler provided consistently higher readings (+2.3 ppm), and the Pac 3500 showed consistently lower readings (-3.4 ppm) when challenged with 20 ppm. This study confirms the need for routine bump tests for these low-cost monitors to ensure that the monitor reacts to the presence of H₂S, even if the manufacturer does not recommend this procedure. Most importantly, agricultural workers should inspect and bump test these monitors prior to any potentially high-risk activity, such as manure agitation, pumping, or pressure washing, to ensure that the monitor appropriately detects and warns users.

Manure Storage Pit Dangers: Identifying Hazardous Gases – Technical Guidance for Selection and Use of Monitors to Assess Air Hazards. *Great Plains Center for Agricultural Health*, available from http://www.public-health.uiowa.edu/gpcah/wp-content/uploads/2015/08/Manure-Pit-Gas-Selection_Use-7_31_15.pdf.

People entering manure pits without taking proper precautions are at risk of dying from high exposures to hydrogen sulfide gas. Guidance on manure pit operations from ASABE specify the need to monitor these spaces prior to entry. This alert provides general guidance on why and how to monitor.