



SWINE EXTENSION

*Providing educational resources and applied research to assist Minnesota's pork producers and allied industry.*

## **SAFETY MEASURES TO PREVENT BARN EXPLOSIONS DURING PIT PUMPING**

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During pit pumping this past fall, there have been several incidents in Minnesota and Iowa where explosions or flash fires have occurred in livestock buildings with manure pits. The explosions have, to date, mainly resulted in building damage, with few animal losses and no personal injuries or fatalities reported. Agricultural engineers, animal scientists, and an industry consultant recently developed recommendations to help producers deal with the potential for danger.

When liquid manure is agitated to suspend the settled solids and create a pumpable slurry, numerous gases are released into the air. Some of these gases are hazardous to people and animals (hydrogen sulfide and others), but methane, which is very flammable, is also released. If the methane concentration in the barn/pit reaches its explosion threshold of 4 to 5 percent (40,000 to 50,000 ppm) and there is an ignition source (such as a pilot light on a heater) in the barn/pit space, an explosion will likely occur.

Some key suggestions that will help address this problem include:

### **Provide continuous ventilation to prevent a gas build-up and increased ventilation during agitation to quickly dissipate released gases.**

Sufficient ventilation or exchange of air in the barn is essential in all cases to keep the concentration of methane below its explosive threshold. An estimate of what is sufficient air exchange in a barn while agitating and pumping its manure pit, is at least 2 to 3 times the minimum ventilation rate (or around 10 air changes per hour) for the barn. If the pit is full or nearly full, do not rely only on pit fans to supply this airflow rate, since these fans may be severely restricted. In fact, it may be better to use only wall fans to supply this air exchange while agitating/pumping the barn's manure pit since methane gas is lighter than air. Also, make sure your normal ventilation inlets are open and operating properly to ensure good air distribution in the barn. This is also important in preventing animal deaths (if animals must be present in barns) during agitation and pumping of the manure pit.

### **To prevent igniting an explosive concentration of methane, turn off heater pilot lights and other non-ventilation electrical systems (such as the feeding system) that might produce an ignition spark.**

Not providing supplemental heat in the barn may be problematic for cases when there are no animals in the barn or there are only small animals that require warmer inside temperatures. This

may restrict when you pump manure from such a barn to warmer days or a warmer part of the day.

**When pumping pits that are close to being full, pump without agitation until manure is about 2 feet below the slats.**

This will allow pit fans (if available and used) to perform properly during agitation and provide more dilution space for methane and other gases that are released.

**Foaming of manure pits is a growing and significant concern that may be related to the explosion incidents.**

Some of the recent cases have reported “foaming” or extensive bubbling on the manure surface prior to the explosions. There are reports where several feet of foam can develop in a matter of days in a building. Some barn manure pits will foam while others do not. Currently there is no consistent solution to controlling this foaming in livestock manure pits and we do not understand all of the factors (diet, manure pH, others) that cause this problem. More relevant information is being collected in addition to preliminary field measurements in producers’ barns to see what techniques and products are effective at reducing foam levels.

**Additional information on this issue can be found at the following websites:**

University of Minnesota Extension’s swine website:

<http://www.extension.umn.edu/swine/porkcast/barnventilation.html>

Iowa State University press release

<http://www.extension.iastate.edu/news/2009/oct/060901.htm>

Minnesota Pork Board website: <http://www.mnpork.com/producers/index.php>

