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Pit pumping-explosion release10-16-09 (docx)

Current Understanding of Manure Pit Foaming, Barn Explosions, and Safety Precautions

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Foam Coming Through Slats

Foam Coming out of Pumpout

Barn Explosion (fall, 2009) in same barn

More on Foaming

- Occasional reports of foaming in last 3 to 4 years
- In past year (since summer, 2009) more reports of foaming in Midwest states
- Is foaming related to recent explosions/fire?
  - Barn explosions during past yr in IA, MN, IL.
  - Some had manure pit foam some did not
  - Flash fires reported at other sites some with

4 feet of foam
More on Foaming

- Reduces manure storage volume
- Pigs get dirty
- Foam captures methane . . . Methane is flammable

Dangers of Foam

- Methane is always produced during anaerobic breakdown of manure in deep (6 to 8 ft) pits.
- Foam captures methane and when bubbles are broken, through agitation or other means, it RAPIDLY releases methane.
- Methane concentrations inside the foam is 60-70% which is above explosive concentration
- When foam bubbles are broken, methane dilutes in barn space above pit and becomes explosive
- Dilution of methane to 5-20% concentration makes it flammable (explosive).

Precautions and Management

- Foam Disruption releases methane (and H2S)
  - Agitation releases both H2S and methane
  - Spray washing
  - Sprinkling
  - Pig activity
- Ignition sources – welders, heaters, cigarettes

Importance of Ventilation

- This situation often has occurred with low animal numbers or empty barns
- Minimum ventilation (5-10 cfm/pig space) may or may not dilute the methane to below explosion limits. To provide some margin of safety, provide 20 to 30 cfm/pig space of ventilation with wall fans.
U of MN's BBE Dept actions since fall-2009

- Funding received from U of MN Exp. Station's RARF to determine cause and find solution to problem (regional effort – IL, IA, NE, SD):
  - Manure pit foaming sites visits
  - Surveys of contract finishers for several midwest pig finishing companies
  - Manure analysis from foaming and non-foaming sites

Information gathering approaches

- Visited several MN sites that have experienced manure pit foaming and/or explosions/fires
- Distributed Mail/Online surveys to several Midwest pig producers networks/companies
  - Used following questionnaire during both site visits and surveys

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Summary of Paper Survey: Grower Group N3
- 66 producers out of 73 possible: 90% response rate
- Information on 155 rooms

- 18 producers have foam (26%)
- 43 rooms have foam (26%)
- Most farms that have foam have it in all rooms: of the farms that reported foam, 17 had foam in all rooms while 1 had rooms with and without foam.
- 3 producers reported 6" or more of foam in 6 rooms
- 2 producers reported foam when pumping
- Only one feed spill reported and there was no foam or fire in the room/building

- 1 fire
- The fire occurred in a room with 4" of foam.

Summary of Online Survey: Grower Group Z2
- 28 producers participated out of 80 possible: 35% response rate
- Information on 83 rooms

- 7 farms have foam (25%)
- 21 rooms with foam (25%)
- 8 rooms had 6-18" of foam
- 13 rooms had 2-6" of foam
- Most farms that have foam have it in all rooms: of the farms that reported foam, 5 had foam in all rooms while 2 had rooms both with and without foam.
- Two feed spills reported, both 4-5 tons of feed. There was no foaming, crusting or fires in either room.

- 2 fires: one fire, one explosion
- Both fires occurred in rooms with 6-18" of foam.

Survey results from Grower Groups Z2 and N3: Number of rooms with foam by county

Survey Results from Grower Group N3: Partial Correlation Chart
Fa\[y Acid Profiles of Manure with DDGS and without DDGS

Fa\[y Acids (by Carbon Number)
**Bottom Line**

- Be extremely cautious when foam is being broken.
- Good ventilation with and without pigs (with or without foam).

**Other comments?**

- There are no current recommendations to permanently prevent foam formation.
- De-foaming agents will work but not permanently.
- The causes and control of foaming continues being investigated by researchers at the University of Minnesota, Iowa State University, University of Illinois, and other institutions and organizations.
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