Manure, Foam, Methane, Fire, Explosions and Safety

David Schmidt

Larry Jacobson

University of Minnesota

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Barn Explosion in SE MN

Foam Coming Through

Foam Coming out of Pumpout

More on Foaming

- Reports of foaming for several years
- Recently more reports of foaming (Iowa, Illinois, Minnesota)
- Is foaming related to recent explosions/fire
  - Barn explosions in Iowa (3) and Minnesota (3)
  - Some had foam some did not
  - Flash fires reported at other sites some with crust, some with clear surfaces

More on Foaming

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

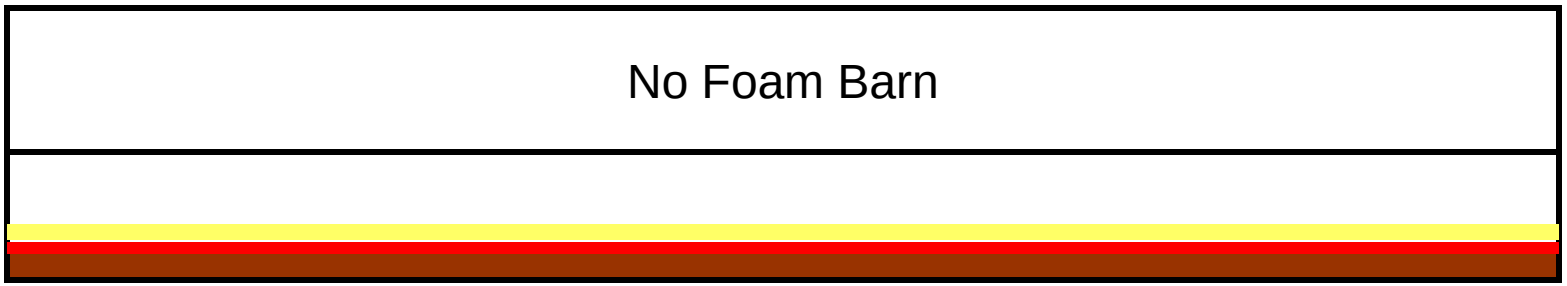
More on Foaming

- Often occurs in one pit or barn but not in others on the same production site
- Becomes a problem over time (1-2 years)
  - once established can be very fast growing
- Microbial imbalance in manure pit possibly related to diet, water source, climate, and many other factors

Dangers of Foam

- Methane is always produced with anaerobic breakdown of manure
- Foam captures methane and when bubbles are broken, through agitation or other means, it releases methane
- Methane concentrations in foam are 60-70% which is above explosive concentration
- Methane dilutes in space above manure and becomes explosive
- Dilution of methane to 5-20% concentration makes it flammable (explosive)

Foam Disruption



Brown = manure
Red = methane at high concentrations
Yellow = methane at flammable concentrations

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

Conclusions: Foaming and Fires

- Question: Do you need foam to have a fire?
- Answer: No, but it helps . . . and the explosion is bigger.

Importance of Ventilation

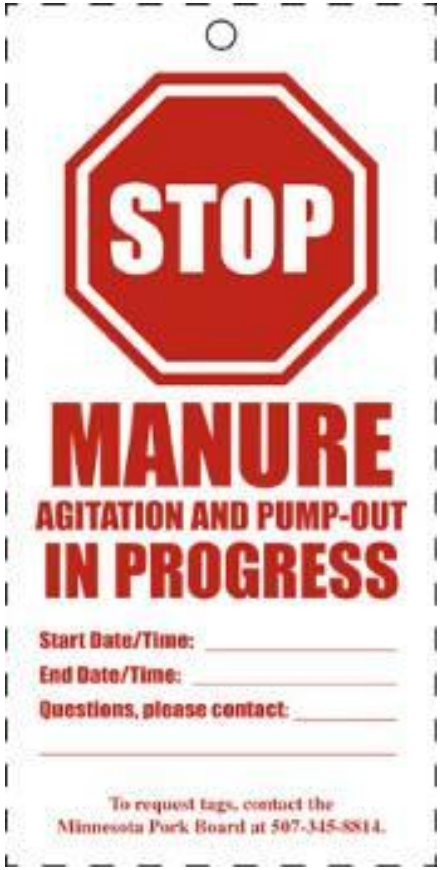
- This situation often has occurred with low animal numbers or empty barns
- Minimum ventilation (4 ACH) rates may or may not dilute the methane to below explosion limits

Bottom Line

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

Best Management for Pit Pumping

- Keep people out of building
- Ventilate properly
  - Fans on
  - Curtains closed if wind not blowing
  - Ceiling inlets open
  - Pumpouts sealed
- Mixing fans if available
- No rooster tailing
- No agitation until manure is 2’ below slats
- If possible, agitate intermittently



Other comments?

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

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Manure Management and Air Quality
www.manure.umn.edu