



Use of Micro-Aid[®] to Limit Gas Problems in Waste Management Systems

Gas Problems

Flash fires, explosions, and accidental death to animals or humans overcome by toxic gases originating from a livestock building's waste management system are just a few of the risks during manure handling. These concerns are even greater when agitating and pumping manure from pits beneath buildings. In a typical pit, microorganisms slowly digest manure under anaerobic conditions (i.e., without oxygen), which creates several gases including ammonia (NH₃), methane (CH₄), and hydrogen sulfide (H₂S). While small (generally safe) amounts of gas bubble out of stored manure on a daily basis, lethal levels can be reached during times when manure is stirred or agitated for purposes of removal. This increase is especially true for hydrogen sulfide as concentrations of 200 to 300 ppm have been reported in hog buildings after just a few minutes of manure pumping, while concentrations as high as 800 ppm can be reached during vigorous manure agitation. Flammability is an added concern with methane and hydrogen sulfide.

Typically, these gases would volatilize from the pit surface and form tiny bubbles that readily burst. However, these gases can become trapped in some instances and result in foaming. The primary reason for foaming is a change in surface tension of the liquid so that the thin layer of surface liquid atoms that form the bubbles now has sufficient chemical bonding ability to cling together.

Foaming may occur all summer long; however, as pits near capacity in late fall, foam may begin to appear through the slats into the pig's area. Foaming is also likely increased in late fall because of increased biological activity in the pit due to warmer conditions and heat that has accumulated from the summer months. One would expect the foaming problem to lessen as pits cool with the return of cold weather during winter months. The foaming issue will actually be exacerbated by any factor that increases gas production and could include such examples as increased manure output as pigs mature or the use of high fiber feedstuffs.

Recent reports would suggest that the incidence of pit foaming and resulting flash fires or explosions has increased within the swine industry. Some have speculated that changes in dietary ingredients such as an increased usage of distillers dried grains with solubles (DDGS) may be a contributing factor. Research has demonstrated that 20% dietary inclusion of the high-fiber ingredient increased fecal matter output by over 40%. This increased fecal matter output would significantly impact the composition and viscosity of the slurry in the pit, as well as the microbial population present for solids digestion and breakdown.

Micro-Aid[®]

Micro-Aid[®] is an all-natural, environmentally-safe additive that is used extensively in numerous agricultural industries to maximize health and performance by creating a better environment. The phyto-genic extract used in the manufacturing of Micro-Aid[®] is a natural surfactant that reduces surface tension and the subsequent propensity for foam production in pits.

In addition to its surfactant properties, the impact that Micro-Aid[®] has on the pit microbial population is also important. Micro-Aid[®] research reports that its addition to diets containing 20% DDGS increased organic nitrogen (i.e., microbial protein) by 44% as a result of improved microbial efficiency (Figure 1). There was also a

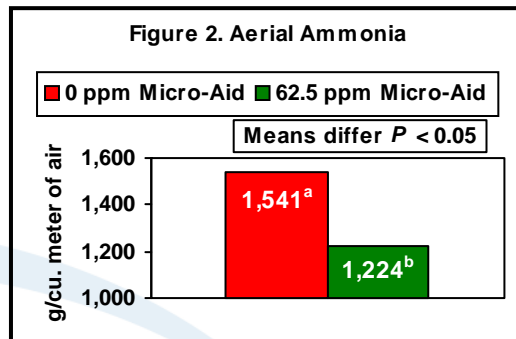
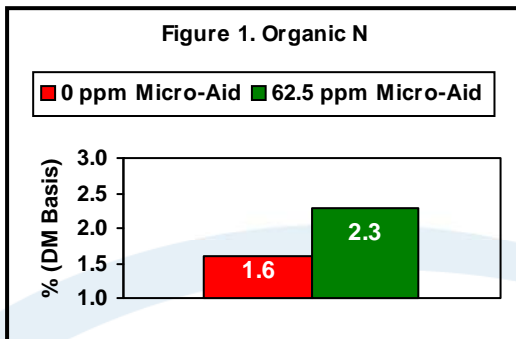


Micro-Aid[®] in all feed, all the time

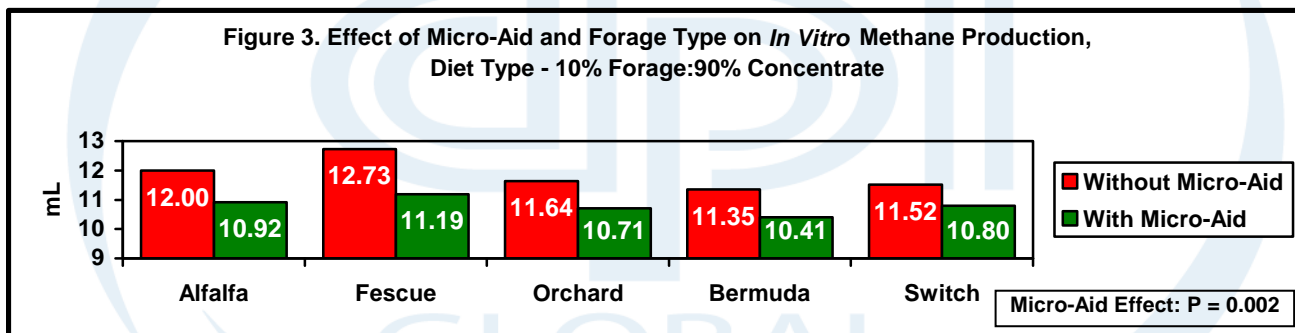


corresponding reduction in ammonium nitrogen and aerial ammonia (Figure 2). If methane and hydrogen sulfide were measured in this study, there likely would have been a reduction in these gases as well because excess carbon and sulfur compounds would have been incorporated into the microbial protein.

Other research with Micro-Aid® has also demonstrated a reduction in these carbon and sulfur compounds. Figure 3 shows that adding 110 ppm of Micro-Aid® consistently reduced ($P < 0.002$) *in vitro* methane production in a diet containing 10% forage and 90% concentrate and using several different forage types.

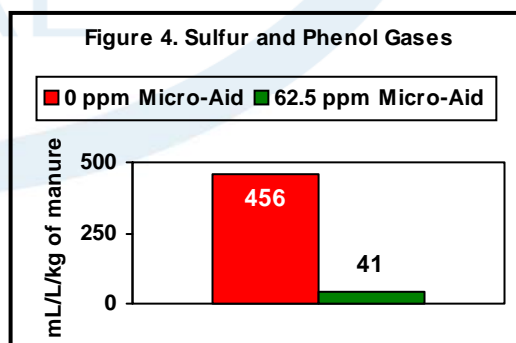


Other swine research demonstrated that Micro-Aid® reduced sulfur and phenol gas production by over 90% (Figure 4). The reductions in gas production in both of these studies are again due to the effect Micro-Aid® has on the microbial population to promote the better utilization of these nutrients and convert them into microbial protein.



Key Technical Points

- Pit foaming results from a change in surface tension and a trapping of gases such as methane and hydrogen sulfide. Agitation or pumping when these gases are in excess is a serious health risk for animals and workers.
- Increased usage of DDGS in swine diets is thought to be a contributing factor to foaming issues because of its impact on the slurry composition and microbial population of pits.
- Not only is Micro-Aid® a natural surfactant, but extensive research has proven that Micro-Aid® improves microbial efficiency to increase organic nitrogen (i.e., microbial protein) in manure and reduce excess gas (i.e., NH_3 , CH_4 , and H_2S) volatilization. In addition, it is more effective when high fiber ingredients like DDGS are fed.



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