

TECHNOLOGY SUMMARY

Full paper is published in the proceedings of:

MITIGATING AIR EMISSIONS FROM ANIMAL FEEDING OPERATIONS CONFERENCE

Iowa State University Extension
Iowa State University College of Agriculture
and Life Sciences

Conference Proceedings Sponsored by:

NRI Air Quality Extension & Education
Iowa Farm Bureau Federation
Iowa Egg Council
Iowa Pork Industry Center
Iowa Pork Producers Association
U.S. Pork Center of Excellence

Using Liquid Aluminum Sulfate to Reduce Poultry Housing Ammonia Emissions

Robert Burns¹, Philip Moore², Lara Moody¹
¹Iowa State University, ² USDA Agricultural Research Service

Species: Poultry (Broiler and Turkey)
Use Area: Animal Housing
Technology Category: Chemical Amendment
Air Mitigated Pollutants: Ammonia

Point of Contact:
Robert Burns
3224 NSRIC
Ames, IA 50011
rburns@iastate.edu

System Summary:

Application of liquid aluminum sulfate to poultry litter has been demonstrated to effectively reduce litter ammonia emissions in broiler and turkey production systems. Liquid alum should be applied prior to bird placement in the house. The length of ammonia emission control ranges from 2.5 to 3.5 weeks following application and increases with increasing application rate (Armstrong, et. al, 2003). In addition to reducing overall house ammonia emissions, liquid alum can be used to hold in-house ammonia levels below 25 ppm during the first two weeks of a grow-out, which is considered to have a positive effect on bird performance

Selection of a liquid alum application rate is dependent upon the amount of and length of ammonia control desired. Tested liquid alum application rates (48.5% alum Al Clear product) of 0.82 and 1.64 L/m² (0.02 and 0.04 gal/ft²), were considered low and high rates, respectively. When tested in poultry broiler production housing, the low rate suppressed in-house ammonia levels for 2.5 weeks, and the high rate suppressed ammonia levels for 3.5 weeks. In addition to reducing in house ammonia levels, there is some evidence that using liquid alum will also reduce mortalities through improved bird health and reduce propane use during cooler months because of reduced ventilation requirements.

Applicability and Mitigating Mechanism:

- NH₃ volatilization from litter is dependent on pH, moisture content, in-house air velocity, NH₄ concentration, and temperature
- Litter pH is an important factor for controlling NH₃ volatilization
- Application of liquid alum reduces litter pH and suppresses NH₃ emission
- Liquid alum is applied to the litter before birds are in place

Limitations:

- Liquid alum application loses its effectiveness ~ three weeks after initial application
- Since liquid alum begins working immediately, and birds are typically placed 1 week after application, a two week period of effectiveness can be expected once birds are placed.
- The material has a low pH and can be corrosive to handle
- Liquid alum is recommended to be applied by a commercial applicator, since transport is regulated.

Cost:

The delivered cost of liquid alum is dependent upon the proximity of the production facility to a liquid alum distributor. Distributor cost is reflective of transport and chemical costs. For the costs presented here, the production facility was 370 km (230 miles) from the distributor and the delivered cost for liquid alum was 0.16 cents/L (0.60 cents/gal). The costs associated with liquid alum as an amendment to mitigate ammonia is the cost of the material and transport plus the application fee. In this case, the application fee was \$40/house. Preparation for liquid alum placement in the house requires the same steps that are taken in preparing the production house for the next grow out, so no additional house preparation costs are incurred. The cost per 1,824 m² (20,000 ft²) production house is \$262 for an application rate of 0.82 L/m² (0.02 gal/ft²) and \$504 for an application rate of 1.64 L/m² (0.04 gal/ft²); this is equivalent to \$0.009 and \$0.017 per bird produced. In this case, the proximity of the production facility to the distributor was favorable, and the cost of applying liquid alum was less than the cost of applying the equivalent amount of dry alum.