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Ammonia Control During Cold Weather

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Ammonia management is one of the most critical environmental challenges in commercial poultry production, especially during cold weather. As temperatures drop, producers often reduce ventilation to conserve heat and reduce fuel costs. While this practice can reduce fuel costs, insufficient ventilation can lead to the accumulation of ammonia within the barn. Elevated ammonia levels negatively affect bird health, production efficiency, and worker safety, making cold weather management especially important. Ammonia levels are recommended to stay below 25 ppm in commercial poultry production facilities, regardless of time of year.

Ammonia (NH_3) is produced by the action of ureolytic bacteria breaking down nitrogenous compounds in poultry litter. In poultry, this is primarily undigested or unabsorbed proteins and uric acid. The rate of ammonia production is influenced primarily by litter moisture and pH. Wet litter promotes microbial activity, and ammonia is converted faster so to speak, while higher litter pH values, particularly 8 and above, promote the conversion of ammonium to gaseous ammonia. When running minimum ventilation, most litter has adequate moisture, a basic pH between 8 and 9, creating a perfect environment for ureolytic bacteria to produce ammonia.

Maintaining proper ventilation is crucial to controlling ammonia, especially during cold weather. Minimum ventilation is used during cold weather, to bring in cold outside air, allow that air to heat up, “dry” out and exhaust out moist air, all while maintaining warmer house temperatures. Gas exchange also occurs, as oxygen is brought into the barn while ammonia and CO_2 are removed. Balancing fan run times and house environmental conditions is crucial, too little ventilation results in excessive humidity poor air quality, while longer fan run times increase heating costs that are paid by the grower. Not an easy task.

Wet floors during minimal ventilation, are typically caused by inadequate static pressure resulting in lower incoming air speed. When colder outside air enters through the inlets, that air should travel along the ceiling to the peak of the house. As the incoming air is warmed, its relative humidity also decreases, increasing the moisture holding capacity of the air. If static pressure is not high enough and the incoming air falls to the floor before reaching the center of the house, the cold air will form condensation when it contacts the warm litter, eventually causing the floor to “slick over”. Now, the grower has chilled birds, wet floors, and more ammonia. The best way to increase static pressure is to close inlets until pressure is adequate to

move air to the peak of the house. Growers should not reduce inlet opening size, as this will just restrict air flow.

Litter management practices are equally as important as proper ventilation. Ideally, litter moisture should be maintained between 20 and 25%; growers can check this using the squeeze test. Ideally, when squeezed, litter should clump together, and slowly break apart, leaving no moisture on your hand. Growers should walk the houses and pay close attention to areas where moisture and caked litter will build up first (i.e. water and feed lines). Caked litter does not appear over night or within a few hours; this is a problem that started days or weeks before being noticed.

Beyond proper ventilation, chemical litter amendments are widely used as an additional tool for ammonia control. Acidifiers work by lowering litter pH from basic to acidic. This converts ammonia into its non-volatile form, ammonium. This reduction of ammonia release into the air can significantly improve air quality, particularly during the early part of a grow out. These amendments are applied prior to flock placement, and should last through the brooding stage.

High ammonia levels are associated with poor feed conversion, respiratory issues, higher mortality, poor growth, and can cause worker health issues. Care should be taken to alleviate ammonia production by maintaining proper litter moisture, adequate air movement during minimal ventilation, and using litter amendments when necessary.