Spring and Fall Broiler Production Presents Challenges

The cyclic up-and-down temperatures associated with spring and fall are challenging for Mississippi poultry growers. Nighttime temperatures in the 35–40 °F range mean winter isn't over just yet, but afternoon temperatures near 70–75 °F indicate that summer is fast approaching. These wide temperature swings require growers to stay alert to rapidly changing conditions, and make managing the broiler house ventilation system more challenging.

A Stable Environment Is Important

Growers must maintain a stable house environment in order to achieve optimal bird performance. Genetic changes/ improvements over the past few decades have increased the **importance of constant in-house environmental management** for today's broilers. Consequently, if ventilation and temperature are not ideal for any part of a day, the potential growth for that part of the day is lost and can never be regained (Blakely and Simpson, 2007).

Maintaining a constant in-house environment depends largely on proper management of the ventilation system. You must optimize your ventilation program to have good air quality, temperature, dust and ammonia levels, humidity, and litter quality. Most houses today have the technology (controllers and safety backups) to overcome large fluctuations in daily temperatures associated with spring and fall. However, growers must program and **manage the controller correctly** and adjust backup settings daily. This will allow the house to transition smoothly through significant outside temperature fluctuations. Failure to do so may likely impair flock performance, resulting in reduced financial returns.

When dealing with changing weather conditions, growers may face a minimum ventilation situation during cooler nighttime hours where ammonia buildup may be a concern, and then, 12 hours later, need to switch to summer cooling mode. Such wide variations in conditions make house management challenging, but spring and fall also have some of the best chicken-growing weather. During spring, the worst of winter's cold and high fuel bills are behind us and the extreme heat of summer is still months away. During fall, summer heat has passed and winter's high fuel bills are still off in the distance. If we can maintain the proper house environment during these times, **spring and fall offer the potential for maximum performance at minimum costs** (Donald et al., 1999).

When managed correctly, house controllers can transition the house from minimum to transitional to tunnel ventilation and back again, with minimum stress on the birds. However, it is the chickens that decide whether they are happy with conditions you are providing. It takes an alert grower spending time in the chicken house and continuously observing the chickens to make necessary management adjustments in a timely manner. To maintain the correct in-house environment throughout the life of a flock is a challenging goal, but it is reachable if you stay on top of things.

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Focus on Bird Comfort

The **comfort range of broilers is very narrow** (only a few degrees). This is why a controller ***slowly*** ramps house temperature down a little at a time each day as the flock ages (half a degree today, maybe a full degree tomorrow). Avoiding large changes in house temperature is important to bird health, comfort, and performance. Birds will divert feed energy from growth to maintenance if they are unhappy with house temperature. Birds use feed energy to stay warm if they are cold (reducing growth and increasing feed conversion ratio) and for evaporative respiration (panting) to assist with cooling if they are hot. Panting is work for the bird and increases the maintenance energy requirement, thus reducing the feed energy available for growth.

The **ideal temperature for the bird changes daily from placement to harvest**. Controllers are designed for this, however, and will automatically adjust the set point and minimum ventilation each day, provided the controller is programed correctly. Therefore, you must input the proper temperature and minimum ventilation settings if the controller is to function accurately.

If you accidentally program settings that are 5 °F cooler than recommended, the controller will grow the flock 5 °F cooler than recommended, which will likely have negative consequences in terms of bird health, feed conversion ratio, and performance. Make sure you have your integrator's recommended program installed correctly into your controller. If in doubt, **ask your service technician to check your programming setup**.

The controller and ventilation system maintains required house conditions through set points, brooders, fans, vent doors, tunnel inlets, and so forth. Improper ventilation (too little or too much) has detrimental consequences. Ventilating too little may result in poor air quality (higher ammonia, carbon dioxide, and humidity) and wet litter conditions, leading to health, welfare, and performance issues. Ventilating too much may cause drafty conditions and dusty litter, not to mention excessive fuel bills. It's important to realize that the **temperature the bird "feels" is more important than actual air temperature**. This is especially true for younger birds. Air moving directly over birds creates a wind-chill effect; this is what makes tunnel ventilation so effective with older birds during hot weather. However, too much wind-chill (especially on younger birds) can cause stress and discomfort (Donald, 1999).

Continuing to run in tunnel mode during the spring and fall seasons when evening and nighttime temperatures usually drop below 80 °F may prove detrimental for younger birds. **Exercise caution when running tunnel ventilation on younger birds**, especially with cooler temperatures. Generally, cooler air has a greater wind-chill effect than warmer air. That's why it is important to use minimum or transitional ventilation as long as possible before switching to tunnel mode. Tunnel ventilation works great for older birds in hot weather when maximum cooling and air movement is required. However, for much of the transitional weather common to spring and fall, maximum airflow is not needed, so **minimum or transitional ventilation may likely be a better alternative**.

Depending on air inlet location, minimum ventilation generally brings in only limited amounts of fresh air up high on the sidewall or at ceiling level (not directly over the birds) to prevent a wind-chill effect on younger birds, which could be detrimental to performance. However, at very high temperatures (near 100 °F and higher), wind-chill is less of a concern, even for young birds. The following **key points to minimum ventilation** are offered by Aviagen (2010):

- The purpose of minimum ventilation is to bring in just enough fresh air to exhaust excess moisture and ammonia in cold weather or during brooding.
- All minimum ventilation setups bring outside air in high up in the house to avoid putting cold air directly on the birds.
- To get the airflow pattern needed in minimum ventilation, the number of air inlets must be matched to the fan capacity being used.
- Using cool-weather adjustable air inlets actuated by a static pressure controller gives the best minimum ventilation airflow.
- Minimum ventilation is timer-controlled, not temperature controlled.

In between minimum and tunnel ventilation is transitional ventilation, which is often the workhorse stage during cyclic spring and fall up-and-down weather conditions. Transitional ventilation is basically **a switch from timer-driven to temperature-driven ventilation** (Aviagen, 2010). Transitional ventilation uses static-pressure-controlled air inlets (vent doors) and a portion of the large exhaust fans to remove heat and bring in additional cool air, without putting a draft directly on the birds.

In transitional mode, it is possible to remove as much heat as being in tunnel mode, while running roughly half the tunnel fans (Donald, 1999). An added advantage is that birds are not chilled because outside air is coming through the vent doors (high up on the sidewall or in the ceiling) and being directed upward along the ceiling instead of through tunnel inlets and directly over the birds. **Key points to transitional ventilation** include (Aviagen, 2010):

- Transitional ventilation is temperature driven and removes heat when needed without putting cold air directly onto birds.
- When the need for heat removal requires a higher air exchange rate than the minimum ventilation setup can handle, tunnel fans can be used to bring in large amounts of air through sidewall or ceiling inlets.
- As with minimum ventilation, the transitional ventilation inlet area should be matched to fan capacity, and inlet opening adjustments should be made by an automatic static pressure-operated controller.

Monitor Ammonia and Humidity Closely at Night

Ammonia buildup most likely won't be an issue during the day with warmer spring and fall temperatures and plenty of airflow moving through the house, but it could be a concern at night when temperatures cool down and the house transitions back to minimum ventilation. High ammonia concentrations in the house can result in bird welfare concerns, poor feed conversions, reduced bird weights, and increased respiratory problems. High ammonia levels also can affect the health and welfare of growers or other poultry house workers. Unfortunately, unlike a minimum ventilation guide for moisture removal, it is **impossible** to produce a guide to control ammonia because every house generates ammonia differently.

Ammonia production is difficult to predict because of the numerous factors involved, including management practices during and between flocks, litter moisture, downtime between flocks, litter pH, season, age, diet composition, depth of litter, and so forth. Only by closely monitoring the chicken house environment and making timely adjustments can you keep ammonia concentrations at acceptable levels. Standard minimum **ventilation settings for moisture removal only apply if ammonia levels are under control**. Otherwise, growers are forced to over-ventilate for ammonia removal, likely leading to increased fuel use and eventually increasing production costs!

Be especially aware of house conditions during your last check at night and first check early in the morning. Increased ammonia and humidity levels may indicate more run time is needed on minimum ventilation settings during nighttime hours. Ideally, ammonia concentrations should be 20–25 parts per million or less to achieve optimal bird performance and avoid human discomfort.

Humidity levels must also be kept in check inside the house to prevent damp and caked litter or dusty air conditions. Relative humidity in the 55–65 percent range is best. Humidity levels of 50 percent or less lead to excessive dust levels in the house, while levels of 70 percent or greater result in caked litter. Growers often want to reduce the ventilation rate when outside conditions are cold and damp to prevent bringing in more moisture, but this is usually the wrong thing to do.

While it is true that ventilating during damp outside conditions brings in some moisture, it usually removes, by way of the exhaust fans, more moisture than it brings in. Therefore, the overall result is a reduction in moisture level inside the house. Cold air cannot hold as much moisture as warm air. For example, 40 °F air at 50 percent humidity will hold about 3 ounces of water in every 1,000 cubic feet of air. However, 90 °F air at 60 percent humidity (typical brooding conditions) holds about 20 ounces of water per 1,000 cubic feet (Donald et al., 2009). Therefore, for every 1,000 cubic feet of air exchange at these conditions, 3 ounces of water are brought in but 20 ounces are exhausted out, resulting in a net reduction of 17 ounces of water per 1,000 cubic feet of air exchange.

Summary

Large, cyclic fluctuations in temperatures present unique challenges to raising broilers during the spring and fall seasons. Excess heat removal may be required on warm afternoons, while minimum ventilation, and perhaps even a small amount of supplemental heat, may be necessary during chilly evenings and overnight. Wide temperature swings require growers to be more vigilant when managing in-house conditions. Most integrators provide growers with minimum ventilation guidelines for controlling moisture levels in the house throughout the flock. However, growers may need to increase minimum ventilation rates to maintain acceptable house ammonia levels.

Temperature, humidity, and ammonia levels are the most important air quality variables to control in a poultry house. Ammonia is likely more critical than humidity, so control the ammonia level first, and then work on managing humidity. Extreme seasonal variations in outside temperature conditions require that growers **keep a close watch on flocks** during the spring and fall. Providing for flock comfort is critical to performance in transitional weather situations. Proper management of the total ventilation system (minimum, transitional, and tunnel) during cyclic weather conditions will help maintain the stable, constant in-house environment that a flock needs for optimal health and performance.

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