Department of Animal Science

Time To Prepare Poultry Houses for Winter

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Winterize poultry houses well before autumn crumbles away into winter. It takes time to inspect fans, belts, pulleys, brooders, vent doors, generators, etc. to ensure everything is in working order before we find ourselves stuck in colder weather. Focus on winterization chores now, before the woods turn lovely, dark and deep, and the cold, melancholy days of winter descend upon us (Fig. 1). Between flocks is the best time to inspect equipment and address any deficiencies you may encounter. A properly working minimum ventilation system is critical to preventing excess gas usage this winter. During winter, most of the issues we receive questions about from growers, service techs and live operations personnel concern poor flock performance, wet litter, high in-house humidity, excessive ammonia levels and expensive fuel bills. These problems are often related to issues with how the minimum ventilation program is managed. Minimum ventilation may sound simple (the controller opens the sidewall inlets every five minutes and runs a few minimum ventilation fans a specified amount of time), but it's more complicated than that to maintain the desired in-house conditions while keeping fuel use manageable. And ventilation is not the only area that requires winterization efforts; other areas need attention as well, as discussed below.

***Figure 1**. Winterize poultry houses now before the dark, cold days of winter arrive.*

Minimum Ventilation

Too much moisture in poultry houses is the greatest cold weather challenge growers face, often resulting in wet litter and increased ammonia that can be detrimental in terms of animal welfare, bird health, performance and profitability (Tabler et al., 2013). Wet litter is not a new problem for poultry producers. It's been a challenge for more than 100 years. Dann (1923) indicated that "wet litter in the poultry house is a rather troublesome problem to most poultrymen." The primary goal of minimum ventilation is to remove whatever moisture the birds add to the house each day without burning excess fuel or stressing the birds in the process. If the birds add 1,000 gallons of water to the house each day through respiration and manure deposition, the minimum ventilation system needs to remove 1,000 gallons of water from the house each day. The grower must stay on top of things to make sure that happens. The only way to do that is to **spend time in the chicken house evaluating air quality and litter conditions**. Ventilation is necessary (even in winter) to provide fresh air to the poultry house and maintain a healthy environment. Ventilation also helps to maintain temperature and humidity levels in the house. In addition, ventilation helps control ammonia and dust levels in the house, which can impact the health and performance of the birds.

The respiratory system of the birds can be adversely affected by high levels of ammonia, carbon dioxide, noxious gases and dust (Clark et al., 2013). Increased levels of ammonia can blind chickens and cause damage or loss of the cilia in the respiratory tract. These cilia (small hair-like structures) are part of the defensive system of the respiratory tract. High levels of dust can result in excessive mucus production, causing the lungs to work harder and making it more difficult for the lungs to remove the mucus. Damage to the lungs and air sacs allow for an increased risk of bacterial and viral respiratory infections (Clark et al., 2013).

The amount of air that needs to be exchanged to remove moisture that the birds add to the house each day varies with inside and outside environmental conditions. Let's say the outside temperature is 40 F and relative humidity (RH) is 50 percent. A minimum ventilation rate of approximately 9,300 cubic feet per minute (cfm) would be required to remove 1,000 gallons of water with inside conditions of 80 F and 50 percent RH as determined by the University of Georgia's Poultry 411 Minimum Ventilation Calculator. However, if the weather were a mild 65 F and 50 percent RH, the minimum ventilation would need to nearly double to 17,500 cfm to remove the same 1,000 gallons of water. If the outside humidity increased to 70 percent, the minimum ventilation rate would have to more than double again to 44,500 cfm.

Minimum ventilation is **controlled by a timer and not by house temperature**. It begins on day one during brooding (or before) in cold weather with the heating system also in operation. The house controller is programmed to open the sidewall air inlets and then turn on the minimum ventilation fans for a specific amount of time every 5 minutes on a 24-hour basis. Under a typical day-one brooding situation when excess ammonia is not an issue, this might be 30 seconds ON and 270 seconds OFF out of a 300 second (five-minute) time cycle. As the flock ages and in-house conditions change, the controller gradually increases the ON time, allowing for higher rates of ventilation as the birds add increasing amounts of moisture each day. With small chicks in cold weather, it is common for the heating and ventilation systems to operate at the same time. Eventually, the birds grow large enough to produce enough heat to increase the in-house temperature above the desired set point, and the controller will then run the minimum ventilation fans on temperature control instead of on timer as the house moves into transitional ventilation.

Growers often ask, “How long should I minimum ventilate to control moisture in the house?” There is no one-size-fits-all answer to that question. Integrator programs and guidelines are a good starting point. These guidelines increase the minimum ventilation rates as the birds age. However, several days of damp, rainy weather may mean the guidelines are under ventilating the house for the current outside conditions. As a grower, you must learn to “feel” when the air in the house is too heavy and when the humidity is too high and increase the minimum ventilation rate accordingly. You can also watch the litter for signs of slicking over and cake formation (especially near the walls and under the drinker lines), and for the litter to become tacky and start sticking to your shoes or boots. However, by the time this happens and you recognize that there is a problem with the litter, it is almost too far out of hand to correct. Ventilating to stay ahead of litter problems and striving to maintain a proper RH (50 to 70 percent) will be a better strategy. **“Feeling” when house conditions aren’t right is a talent every grower must develop**. Again, this requires spending time in the chicken house and taking immediate action as conditions change. There will be times when you’ll need to run additional minimum ventilation to control humidity and ammonia.

Heating System

Unwanted heat loss can result in increased fuel usage, which in turn increases the cost associated with raising the flock. This negatively impacts profits, so anything that can be done to conserve fuel without negatively affecting flock performance will increase the profit margin. Clark et al. (2013) offer the following heating system winterization tips:

- Clean, maintain and make use of stir fans so hot air from the ceiling can be adequately mixed and recirculated to prevent temperature stratification. Taking advantage of this hot air at the ceiling level can help avoid temperature stratification and reduce fuel usage.
- Monitor the house environmental controller to know what the static pressure is when the minimum ventilation fans are running. Static pressure should be in the 0.08 to 0.12 range which indicates a reasonably tight house. Static pressure in this range will allow efficient operation of the heating and ventilation systems and uniform mixing of incoming cold air from the attic/sidewall air inlets before it falls and contacts the birds. Most modern controllers will display the static pressure on the screen when the fans are running. Take advantage of this feature to help you better manage the house environment.
- Modern poultry houses have multiple temperature sensors to monitor in-house temperatures the length of the house. Check all temperature sensors between flocks to make sure they are working properly. In addition, inspect brooders and tube heaters and make sure the igniters and electronic circuits are working properly. Brooder orifices should be checked between flocks for dirt, spider webs or other obstructions.
- Make sure there is at least 4 F difference between heating and cooling system set points. Any less and the systems will be fighting each other, resulting in excess fuel use as each system tries to dominate the other.
- The house controller should have a history feature that allows you to look back at the temperature log. Use this feature to monitor what the house temperature is doing as the flock ages. You don’t want to see big, wide temperature swings when you look back at the history. Slow gradual temperature changes are less stressful for the birds.

- Multiple houses on a farm often do not perform the same. Determine which houses use the most fuel and try to understand why. These houses may require extra effort to correct the issues.

House tightness is critical to controlling fuel use and the minimum ventilation program. Without a tight house you cannot successfully manage your fuel use or ventilation program. A house that cannot achieve a minimum of 0.13 to 0.15 inches (curtain sided) or 0.20 to 0.22 inches (solid sidewall) of water column when a static pressure test is performed will use excessive amounts of fuel to maintain the target house temperature, and you will not have a uniform environment throughout the house because of excessive air leaks, such as loose-fitting curtains, gaps along footings where the seal is not tight, leaks around entrance and loadout doors, and so forth. Sealing the house and maintaining a tight building envelope should be your highest priority heading into colder weather to properly manage winter ventilation programs and minimize fuel use.

Consider installing stir fans if your houses do not have them. In older houses, they can reduce fuel costs by 25 percent. Even newer houses can see fuel savings approaching 10 percent with stir fans (Campbell et al., 2008). Stir fans break up the temperature gradient that forms in houses without stir fans. Hot air rises, so unless you have a way to mix the air in the house, the hottest air in the house is at ceiling level doing you no good because the birds are down on the floor. Stir fans mix that hot air in the ceiling with the rest of the air in the house and break up that temperature gradient. They gently move this hot air back down across the litter to help promote drying while reducing brooder run time. Direct the airflow horizontally toward the end wall of slightly uphill toward the ceiling but not down toward the floor. Birds (especially young chicks) do not like a draft. Different growers may use stir fans in different ways. Some run them continuously during the brood period while others tie them to the controller and alternate their operation in combination with the vent doors and minimum ventilation fans. Stir fans should remain in use from the pre-heating period before chick arrival through the brooding period (10-14 days of age). After creating a tight house, stir fans may be your best energy savings investment.

Other Areas

Other areas outside of heating and ventilation also require winterization before cold weather arrives. Do not neglect items such as:

- Making sure entrance and loadout doors seal properly. Use weather stripping or spray foam insulation to seal cracks and air leaks if necessary.
- Inspect the vapor barrier in the ceiling and the sidewalls for cracks, holes or open seams. Damaged vapor barriers or sidewalls will result in heat loss and damage to insulation.
- Turn off water to the cool cells when the danger of heat stress has passed and drain the cool cell systems. Exposed pipes should be wrapped in insulation to prevent freezing.
- Disconnect any outside rubber hoses to prevent freezing.
- **Maintain a strong pest control program**. Inspect and repair all bait stations as needed. Recharge all bait stations with fresh bait since, as the weather cools down, mice and other rodents will be seeking a warm place to spend the winter. From a biosecurity and disease prevention standpoint, especially in light of the current avian influenza situation, it is important that they do not move into the poultry house.

- Use a litter amendment to help control ammonia levels early in the flock when fuel use and heating costs are at their greatest.
- **Don't forget the standby generator!** Have it serviced by a trained technician annually. Make sure the block heater, battery and battery charger are good heading into winter. Never let the fuel tank drop below half full. Winter often brings snow or ice storms (Fig. 2), resulting in power losses that require the generator to carry the electrical load until power is restored. Follow local weather forecasts and make sure you always have plenty of fuel on hand. Top off the fuel tank if a winter storm is brewing on the horizon.

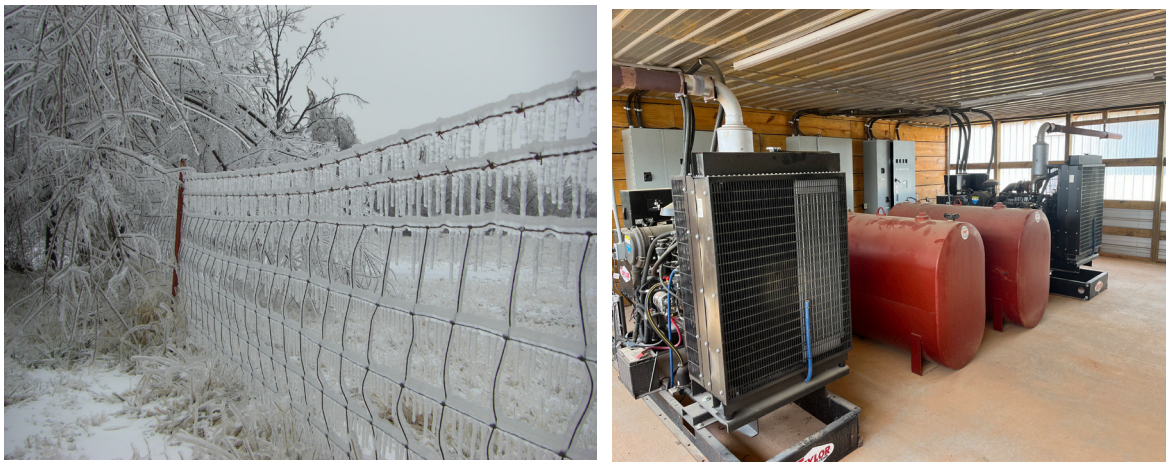

***Figure 2**. Winter snow and ice storms (a) often cause power outages, forcing the farm's standby generator(s) (b) to carry the electrical load until power crews can restore service.*

Between flocks, it is important to check all feed and water lines and make any necessary repairs. When no birds are in the house, make sure feed pans and outside feed bins are empty to prevent rodents from having access to a food supply. In addition, verify that the feed bin is secure and that the lid closes properly to prevent rainwater from entering the bin and causing mold growth in the feed. Check the bin and outside auger for feed leaks that could negatively impact feed conversion and attract rodents and wild birds. When out of birds, set the temperature control inside the house to maintain at least 36 F to 40 F to prevent inside water lines from freezing.

Summary

Don't wait until the snow flies before you prepare your poultry houses for the cold winter months ahead. Pay special attention to the minimum ventilation and heating systems which will do most of the work this winter. Moisture and ammonia are likely the two greatest challenges that growers face entering the winter season. House conditions can change throughout the day as outside weather conditions change. To maintain ideal house conditions, a grower must spend time in the chicken house, assess in-house conditions, and make the necessary adjustments to the heating and minimum ventilation programs. The controller cannot grow the chickens for you. The controller is just a tool to help you. You must grow the chickens and the only way to successfully do that is to be in the chicken house. Recognize that high ammonia levels will require additional ventilation beyond that needed for moisture removal. Use litter amendments to control excess ammonia levels early in the flock. Keep a close watch on your standby generator and its fuel supply. Don't forget that it goes through an exercise cycle each week which uses some fuel when doing so. Closely monitor the fuel level, especially if winter storms are in the immediate forecast.

References and Online Resources

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University of Georgia's Poultry 411 Minimum Ventilation Calculator app:
play.google.com/store/apps/details?id=com.ugacaes.poultry411&hl=en_US

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