The cold weather ventilation program in a broiler house is designed primarily for moisture removal. With the arrival of cooler weather, growers and integrators must once again address wintertime ventilation management.

Ventilation during cold weather is always challenging because growers do not want to burn any more fuel than necessary, but they do want to maintain a high level of flock performance. For most growers, fuel is their greatest single expense during the year. Therefore, growers tend to reduce ventilation rates during the winter in order to conserve fuel and lower production costs.

However, failure to maintain an adequate house environment can lead to poor air and litter quality. This can result in reduced flock performance that is detrimental to net returns. The goal is to have the lowest possible fuel cost that will still allow you to provide an environment that is best for the birds. This is accomplished by using a minimum ventilation rate: the quantity of fresh, outside air that must be moved through the broiler house to absorb and remove moisture.

Perhaps the key principle of winter ventilation is that warm air holds more water than cold air. Therefore, a controlled minimum ventilation rate uses limited quantities of cold, dry outside air like a sponge (as this air is heated once inside the broiler house) to absorb moisture within the house. Integrators generally provide their growers with guidelines on how to manage and control minimum ventilation rates.

However, it is impossible to control ventilation if the house isn’t tight. A house that cannot achieve a minimum of 0.13–0.15 inch (curtain-sided) or 0.20–0.22 inch (solid sidewall) of water column when static pressure-tested will use excessive amounts of fuel to maintain the target temperature. And in this situation, you still cannot maintain an optimum environment because of air entering in places you don’t want, such as loose-fitting curtains or cracks around footings, doors, and so forth. Sealing the house and maintaining a tight building envelope should be the first priority to proper ventilation during cold weather.

Some level of air exchange is necessary because the birds need fresh air to breathe and propane needs oxygen to burn. For example, for every gallon of propane burned, 850 cubic feet per hour of fresh air is consumed. In addition, 92,000 Btu of heat, 108 cubic feet of carbon dioxide, and 6.8 pounds (0.8 gallon) of water is produced for every gallon of propane burned. It’s this water that causes many of producers’ problems.

With small chicks and cold weather, moisture production can be significant. If you burn 300 gallons of propane the first few days with small chicks, that’s like adding 240 gallons of water to the brooding area of the broiler house (300 gallons × 0.8 gallons water per gallon propane = 240 gallons water). This moisture must be removed through ventilation. Otherwise, you set yourself up for wet litter, ammonia, respiratory issues, foot pad problems, increased pathogen challenge, and so forth.
One way to tighten up the house and gain better control of the amount and location of ventilation air that enters the house is to have **solid sidewalls**. Converting from curtain-sided to solid sidewall housing can dramatically reduce heat loss through conduction. For example, curtain material has an R-value of 1. However, by switching to solid sidewall construction and installing 3.5-inch fiberglass batt insulation in the wall, the R-value in the wall becomes R-11. A good rule of thumb is that when you increase the R-value of a material from R-1 to R-2, you essentially cut the heat loss through the material by half (Campbell et al., 2008). Going from R-1 to R-8 cuts the heat loss by 85 percent.

A much-underused item in many broiler houses today is stir fans. Stir fans have been around for well over 20 years now, but many houses still do not have them, even though they can reduce fuel costs as much as 25 percent in older houses. Even newer houses can see fuel savings of nearly 10 percent (Campbell et al., 2008). Stir fans break up the temperature gradient that forms in poultry houses. Warm air rises, so the hottest air in the house is at ceiling level. Stir fans mix hot air with the rest of the air. This keeps hot air gently moving back down across the litter to promote drying, and reduces brooder run time.

You may think having baffles in your high-ceiling house means you can’t use stir fans in winter, but that is not the case.

Paddle fans work well in houses with baffles and have the same benefits as the 18- to 24-inch axial fans more commonly used in low-ceiling houses. However, paddle fans should have forward and reverse speeds so that airflow can be directed upward in the winter to prevent a windchill effect on small chicks.

Direct the airflow of axial fans horizontally toward the end wall or perhaps slightly uphill toward the ceiling (not down). Growers often use stirring or mixing fans in different ways; some growers run them continuously, while others have them tied to the controller and alternate their operation with the vent doors. Stir fans should remain in use from the pre-heating period before chick arrival until the birds are at least 14–18 days old.

The American Society of Agricultural Engineers indicates a ventilation system for poultry or livestock shelters accomplishes one or more of the following (ASAE, 1993):

- Provides desired amount of fresh air, without drafts, to all parts of the shelter.
- Maintains temperatures within desired limits.
- Maintains relative humidity within desired limits.
- Maintains ammonia levels below specified levels.

Ventilation rates are designed to balance **sensible heat** (dry heat) gains and losses, as well as **latent heat** (moisture) gains and losses (Porter, 1998). Sources of sensible heat in broiler houses include bird sensible heat (body heat), mechanical heat from lights, feeder and fan motors, etc.; supplemental heat from brooders and furnaces; and solar heat gain. Sensible heat losses include heat removed by ventilation, building heat losses through curtains, doors, walls, etc.; and sensible heat used to evaporate water. Latent heat gain sources include water vapor from animals (manure and respiration); water vapor from evaporation (wet litter); and water vapor in incoming air. Ventilation removes latent heat from the broiler house.

The question is often asked, **“How long do I minimum ventilate to control moisture in the house?”** Integrator charts and guidelines are a good starting point. However, you should consider other factors, as well. Watch litter conditions for signs of slicking over in spots (especially near walls and under drinker lines), or litter sticking to your shoes or boots. Unfortunately, by the time you recognize there is a problem, it’s almost too far out of hand to fix it. Therefore, maintaining the proper relative humidity (RH) inside the broiler house may be a better option.

The RH should remain between 50 percent and 70 percent. If the RH approaches 65 percent, consider increasing the minimum ventilation rate. If the RH nears 50 percent, slightly decreasing the minimum ventilation rate may be in order to prevent the litter from becoming too dusty. An inexpensive RH meter can be purchased for around $10–20 and should be fairly accurate for up to 2 years. Also, take advantage of any occasional warm winter day. Increase the minimum ventilation rate on warm afternoons to take advantage of extra drying potential. However, remember to set the time back at night to its usual setting. So, the best answer to “How long do I minimum ventilate?” is, “As long as it takes to do the job correctly.”

Good ventilation depends on having **static pressure and vent door opening widths set correctly**. The air should enter the vent door, follow the ceiling, and flow just past the center width of the house before falling. This means ceiling vents...
Broiler House Ventilation (continued)

should open 1–2 inches, while sidewall vents should open 1.5–2.5 inches. Less than this will result in inadequate air volume to carry the air to the center of the house. This will result in cold air falling to the floor before it has had sufficient time to be warmed, creating damp litter and chilled chicks.

When the fans are running, the air pressure inside a broiler house is always less than the pressure outside. The fans move air out of the house and air rushes in through the vent doors to replace the air being removed. This is referred to as a “negative pressure” system. Static pressure is actually the difference in pressure between inside and outside air. In most cases, the static pressure in a 40-foot-wide house should be between 0.08 and 0.12 when minimum ventilation fans are running. Houses wider than 40 feet may require a higher static pressure to achieve desired results (perhaps 0.15).

A good rule of thumb is that for each 0.01 increase in static pressure, 2 feet of “throw” is added to the jet of air (0.15 = approximately 30 feet of throw). However, the higher the static pressure, the harder the fan must work to get air into the house. Fan flow rate decreases as static pressure increases. Therefore, there is a tradeoff: jet penetration length vs. fan airflow rate.

**Litter amendments** can affect ventilation rates in broiler houses, especially when chicks are small. Litter amendments allow growers to ventilate for moisture, not ammonia, greatly reducing ventilation rates. Often, ammonia concentrations of 50 ppm or higher are seen in houses with young chicks not treated with litter amendments, even though the integrator recommended guideline for ammonia may be 20–25 ppm. Ammonia concentrations of 50 ppm and higher are a serious welfare concern and can be damaging to the eyes and respiratory systems of young birds. Damage caused by ammonia cannot be corrected and will result in significant reductions in bird health and performance throughout the flock.

However, when used correctly in proper amounts, litter amendments inhibit ammonia production until the product is depleted, usually when the birds are approximately 10–14 days old. The value of the reduced ventilation rate alone typically ranges from $400 to $600 for the brooding period during cold weather.

In addition, improved environmental conditions can result in better bird health and performance (Campbell et al., 2008). Integrators often cover or cost-share the expense of litter amendments during cold weather to assist growers in providing the best environment possible for the birds.

The proper minimum ventilation program is critical to broiler production during cold weather. Even though the temptation is great to reduce ventilation to save fuel, consider how much money will be lost to poor performance, increased mortality, and reduced market weights. Providing proper minimum ventilation rates during winter months will result in an optimum environment that can maximize earning potential.

Managing Litter Between Flocks
Jennifer Timmons, Assistant Professor, University of Maryland Eastern Shore

During the winter months, the manner in which litter is managed between flocks becomes even more important. Unfortunately, litter management between flocks is often the most ignored management practice by some poultry growers. It is important to remember that the next flock begins as soon as the previous flock is moved out of the house. The layout period is an important time for the litter to release moisture and ammonia and for the reduction of organisms that can cause disease.

As longer layout times are experienced, it is a good opportunity to take advantage of this time to enhance the performance of the next flock. A longer layout can be beneficial for reducing many disease challenges. For example, in a survey conducted by Tablante and colleagues in 1999, it was reported that broiler farms that experienced an early respiratory disease challenge had a layout that was two days less compared to the layout period on broiler farms that reported no history of the disease.

In a report by Malone and Johnson in 2011, it is recommended to walk through the chicken houses soon after live haul has left the farm to observe the litter and identify areas that may have been problems during the flock. Note the
location, character and depth of caked litter through the house. This will help to determine how deep to run the equipment when crusting-out the litter.

The authors also reported that houses with proper airflow and good drinker management will have little cake underneath the drinker lines and no cake near the sidewalls. Proper drinker management will limit the amount of cake under the drinker lines. Improper airflow in houses can cause caking along the sidewalls.

If a lot of caking is found down the length of the sidewall, in the brood chamber, this may be due to poor airflow causing cold wet air to fall to the floor during brooding, condensation on concrete footers during cold weather or inadequate litter depth. When caking is found in random spots along the sidewall, cold air is hitting the floor in just that caked area. The authors suggest that this could be due to vents that are not closed tightly, air leaks along the footers, loss of insulation, improperly insulated evaporative cooling pads or poor drainage outside the house allowing water to seep inside the house.

If the litter is caked from sidewall to sidewall, proper humidity was not maintained during brooding. This is typically from new litter, insufficient litter depth, and/or poor ventilation. Observing the depth of the cake and where it is located in the house can be used as a tool to eliminate these issues during the next flock.

Another goal of the layout is to promote ammonia and moisture release from the litter. It is recommended to close up houses as soon as possible after catch to preserve as much heat as possible. Using the heat in the litter from the previous flock helps to reduce ammonia levels for the next flock. This will also help to decrease fuel usage because less fuel will be required to pre-heat the house prior to chick placement. It is also important to keep in mind that as litter temperature increases during the pre-heat period a second release or purge of ammonia will occur. This second ammonia purge should be completed before litter amendments are applied and prior to the arrival of the chicks.

There are many opinions as to the amount of ventilation needed between flocks. At the very least, some minimum ventilation is needed during layout to remove moisture and ammonia when people are working inside the chicken house. During other times of the layout period, typically fans should be run during the hottest parts of the day. However, houses may need to be ventilated more if the cake has been pulverized or windrowed between flocks because of higher ammonia levels released from the litter.

Crusting-out of the litter between flocks is still the most common litter management strategy used to prepare the litter for the next flock. Other litter management techniques include pulverization and windrowing. No matter what litter management strategy is used between flocks it is important that it is done properly and started as soon after bird movement as possible.

When birds are out of the house, it is often the misconception that management of that house stops. However, implementing proper litter management strategies and ventilation during the layout period often can have beneficial results when chicks are placed back on the farm.

The DPI membership campaign is coming to an end in and if you have not joined DPI, we hope you will soon.

DPI is the only organization working just for Delmarva’s chicken industry and our 1,800 members. As you probably know, our work includes programs on public affairs, industry advocacy, government regulatory issues, industry promotion, educational programs, tree plantings for environmental reasons, enhancing our industry’s image, preserving the history of our industry, and much more as we have shared with you in our DPI in Action newsletters and through the monthly highlights of DPI activities we distribute to members through e-mails.

Most of our work involves challenges that need to be addressed locally. We do a lot, but can only do that with member support and involvement.

If you already have not made your 2014-2015 DPI dues payment, please do so soon. You can send a check to DPI or pay with a credit card through www.dpichicken.org.
Highly pathogenic avian influenza, an illness that can have devastating consequences for Delmarva’s chicken industry, has been diagnosed in backyard and commercial poultry flocks in California, Washington, and in nearby British Columbia, Canada during recent weeks. These outbreaks have resulted in import bans against American poultry by some countries and if more flocks are found to be infected, additional import bans could be imposed by other trading partners. In addition, similar outbreaks of highly pathogenic avian influenza have occurred in Germany, Norway and Asia.

The source of infection for all of these outbreaks has been identified as wild waterfowl such as ducks and geese.

Waterfowl are the natural reservoir for avian influenza viruses. Ducks, swans, and geese serve as carriers of avian influenza viruses and do not get sick from the infection. Infected birds shed virus in their feces and contaminate areas surrounding ponds and rivers where waterfowl congregate. Because they are migratory birds, avian influenza viruses can be transported over great distances by waterfowl along their migration routes. The Atlantic Flyway covers the area from Maine to Florida, directly over Delmarva chicken farms.

For these reasons, all Delmarva growers and their hired help who have contact with live chickens should AVOID CONTACT WITH WATERFOWL OF ANY KIND. This includes hunting of ducks, geese, and swans and visits to ponds/waterways and zoos where waterfowl congregate and are displayed.

As a reminder, all commercial Delmarva chicken flocks routinely are tested for avian influenza. If a flock should test positive, all birds on the infected farm will be depopulated through humane euthanization and composted on the farm. The process of depopulation, composting, and cleaning/disinfecting takes approximately 12 weeks to complete. Thus, an avian influenza-infected farm will be out of chickens for a minimum of 3 months during which time no income will be generated. An avian influenza-infected flock is a tremendous hardship for the affected grower and a possible disaster for the entire Delmarva chicken industry. Growers play an important role in preventing the introduction of the virus into commercial chicken flocks by following proper biosecurity procedures, including avoiding all contact with ducks, geese and swans.

I am not a very good predictor of future events. In fact, I have a difficult time predicting what I will be doing tomorrow. Thank goodness I have a wife that lets me know what I need to do. Although, sometimes I am not feeling blessed about that. However, during the past few months, I have been noticing a few changes in the way environmental activists are attacking the poultry industry.

For years chicken growers have been accused of being “factory farms”. That’s something that we have become used to. But recently, I am hearing more emphasis on public health issues associated with poultry operations. Social media users are claiming higher rates of asthma, cancer rates, and even higher blood pressure for those that live close to poultry operations. This is a typical scare tactic; we must protect the children! Years ago, similar scare tactics were use in the Pfiesteria hysteria. These concerns now focus on air quality, not just water quality.

Several years ago I had a discussion with an EPA inspector on water quality issues. Her response was, “If you think water quality issues are bad, wait until air quality gets involved”. Those days are quickly approaching. Several environmental groups have sued the EPA regarding air quality issues around CAFOs.
How can the industry deal with this? Recent studies suggest that buffers are the most effective way of controlling emissions from poultry houses. There are extremely expensive filtration systems that are used in Europe, however these are cost prohibitive and require a lot of maintenance. Vegetative buffers are the simplest answer.

The planting of warm season grasses around tunnel fans is a simple endeavor that is very in-expensive and almost maintenance free. The U.S. Department of Agriculture’s Natural Resources Conservation Service has a cost share program that funds this Best Management Program, but it also has rules that need to be followed. For those that prefer not to use this government program, the cost for implementing these grass buffers is small. Thousands of warm season grasses have been planted on poultry farms on Delmarva with great success.

These grasses stop a large quantity of dust and feathers from leaving. Many farmers plant grain adjacent to their poultry houses and have found that the grasses protect the crops from damage caused by the dust and ammonia. I have had farmers so pleased with the results that they have requested more be planted on their farms.

I encourage all poultry growers to consider planting trees, shrubs and grasses on their farms. I do realize that not everyone is amiable to planting trees, however I really suggest taking the proactive stance of at least planting grasses around their fans. As I stated earlier, I am not a fortune teller, but I can read the cards and predict this is not going to get better in the near future.

Anyone interested in more information or a free consultation please call me at 302-236-0470 or email at passwaters@dpichicken.com.

New Maryland Grant Program for Manure Handling
Delmarva Poultry Industry, Inc.

The Maryland Department of Agriculture has announced that cost-share grants are available to help farmers cover the cost of injecting or incorporating manure and other eligible organic nutrients into cropland as required by Maryland’s nutrient management regulations.

Maryland’s revised nutrient management regulations require farmers to inject or incorporate manure into the soil within 48 hours of application. It is thought this action will help prevent the movement of nutrients into waters of the state.

Assistance is available to hire custom operators, rent or lease equipment, or offset operating costs associated with using secondary tillage equipment needed to incorporate or inject manure into the soil. Cost-share rates for manure incorporation and injection range from $10 to $55 an acre depending on the type of equipment or services used. Farmers who use manure injection equipment receive the highest reimbursement rates. While transportation costs are not cost-shared under this program, the Manure Transportation Program is available for eligible farms.

Grants for manure incorporation and injection are administered by the Maryland Agricultural Water Quality Cost-Share (MACS) Program. Applicants must be in good standing with MACS to participate and in compliance with the Nutrient Management Program. All work must be completed by June 2, 2015, and all claims for payment received by June 10, 2015. Other restrictions apply.

Farmers should visit their local soil conservation district office as soon as possible to apply. Applications will be accepted until all funds are fully committed. For more information, contact MDA at 410-841-5864.