

# *Poultry Engineering, Economics & Management*

Newsletter of the

## National Poultry Technology Center, Auburn University

***Critical Information for Improved Bird Performance Through Better House  
and Ventilation System Design, Operation and Management***

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## Evaporative Cooling vs. Dry Floors: A Balancing Act

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We are often asked the question, "During hot weather flocks, how can I prevent wet litter in the front of my tunnel ventilated houses using evaporative cooling?" Realistically, we have to understand that a good tunnel house using evaporative cooling just doesn't allow the air to dry the litter as well in the front of the house, so you can't totally prevent some build-up of moisture in the litter. The good news is there are steps you can take to manage the problem. However, keeping litter moisture to a minimum and making good use of evaporative cooling for best flock performance is definitely a balancing act.

For many growers it probably isn't just the cool cells wetting the litter, but a combination of factors that can create a serious front-house moisture problem. This newsletter outlines five practical tips to help growers and companies successfully address all those factors, starting with litter preparation, and including drinker maintenance, ventilation during brooding, bird migration, and finally cool cell operation.

**TIP 1. LITTER PREPARATION.** The old Mike Eckman and Jim Donald saying, "So goes the litter, so goes the flock," is just as true today as it was 25 years ago. Pre-flock litter condition sets the stage for the growth process. Starting even the best flock of chicks on poor litter will end up in unsatisfactory results.

**Step 1: Remove all cake.** All existing cake must be removed from the house, especially the front of the house where tunnel doors, corners, posts, and end walls make it hard to do so. Don't accept what is left because it will work against you during the next flock. Caked litter is already saturated and can't hold additional moisture. Get it out of the house.

**Step 2: Get adequate litter depth.** Thin litter and moisture problems go hand in hand. About 70-80% of what goes through the water meter ends up in the house and the litter. Two to three inches of litter is simply not enough to do the job of holding moisture until it can be ventilated out of the house. Thin litter can only hold so much moisture and once it is saturated it is done and the floor slicks over. Starting the flock with thin litter in the front, especially under drinkers and along sidewalls, will only cause problems later.



**WET LITTER UNDER DRINKERS**

Keeping litter adjacent to cool cells from getting too wet requires proper litter preparation between flocks, getting adequate litter depth and cake removal so it will absorb water and bird load for the duration of the flock. Proper ventilation, during and between flocks, is also extremely important in preventing front house floors from getting slicked over during the next flock.

**Step 3: Ventilate between flocks.** The only way moisture is removed from litter inside the house is by ventilation. Insufficient ventilation means little to no moisture removal and leaving the endwall doors open might not be enough to do the job. Some growers find it helpful to run a tunnel (or other fans) during the day to help dry litter between flocks. Other growers ventilate through perimeter inlets on time and temperature between flocks. Wetter litter requires more attention to detail and extra effort to remove moisture. New shavings can have excess moisture that needs to be removed prior to placing the next flock. Don't wait until day 1 to ventilate the house. Be proactive and get the moisture out of the house before chicks are placed and heaters are turned on. Notice: If you close the house up, it must be ventilated or the in-house conditions may very well corrode the equipment inside the house, causing shortened equipment life.

Think about this: In a typical 40x500 foot house growing 9 pound chickens there is often 100,000 gallons of water that enters each house. There are three places this water goes: birds, air, and litter. Once the flock is gone, the litter is holding what is left over and the only way to get it out is with a decaking machine, cleaning it out, or ventilating it out. Cake and moisture that isn't removed will magnify problems for the next flock.

**TIP 2. DRINKER MAINTENANCE.** We are often asked, "How can I tell if my drinkers need replacing?" Nipple drinker replacement depends mainly on water quality, maintenance, and output. Ideally, we only want water to pass through the nipple drinkers when a bird activates the trigger. To keep the system from becoming fouled, establish a routine maintenance and cleaning program. Once a layer of biofilm or mineral buildup has been established in water lines and drinkers it is extremely difficult to correct the problem. Don't expect to clean the system with one single effort with a chemical cleaner. There is a difference between a fouled system and one that is worn out. Take time to randomly inspect drinkers and make sure the system is clean and properly functioning. If your farm has poor water quality this should be done more frequently.

**Step 1: Clean the lines.** Make sure to clean lines with a manufacturer approved drinker line cleaner and follow the directions carefully. All lines must be flushed first, then all lines charged with the cleaning solution, drinkers activated, lines thoroughly flushed and drinkers inspected. While flushing the system, make sure flush end hoses are not kinked. We recommend activating drinkers again after flushing out the cleaner solution with fresh water.

**Step 2: Monitor dark period water leakage.** Find out how much water is passing through the water meter at night when lights are off. In a solid wall or dark-out curtain house there should be very little to no bird activity on the drinker lines. This is a great opportunity to get an idea of just how much water is wasted in the house that is not associated with bird activation. Having more than about 8-10 gallons wasted each hour of dark time is a clear sign there are leaks down line or that it is time for new drinkers.

**Step 3: Field test a new set of drinkers.** Replace one full line of drinkers with a company suggested drinker to see how they compare to existing drinkers. Do this on a line used during brooding to get the full effect. Many growers are surprised at how much water existing drinkers are wasting. Monitor their performance during one flock and then see the difference. You can't out-manage worn drinkers.

Think about this: If 100,000 gallons of water goes into the house in a 63-day old flock just for the birds, a 10% leakage factor would be 10,000 more gallons of water into the litter. That is a lot of added water the litter has to absorb during a growth cycle.



The drinkers in picture above have been exposed to water high in iron and manganese that causes them to stick shut or leak. The next picture shows the sediment left over after we caught the cleaning solution from the drinker lines into a garbage can when we flushed them and poured the water off. Poor water quality often requires more frequent inspection and cleaning to keep drinkers functioning properly.

**TIP 3. VENTILATION DURING BROODING.** Moisture removal during brooding is important in winter and in summer, too. If you are front-half brooding then there are birds in that section a minimum of 60 days each year and the water to go with it. Stay on top of removing moisture with adequate ventilation, even with litter amendments.

**Step 1: Monitor relative humidity (RH).** In-house RH should be monitored to keep moisture inside managed between 50 and 65%. A simple and inexpensive temperature and relative humidity sensor can be purchased locally and is more accurate than human estimates.

**Step 2: Use stir fans.** One of the benefits of using stirring fans during brooding is to help remove moisture from the house during the ventilation run cycles, so it is still important to use them in warmer weather too. Moisture evaporating from the litter creates a gradient with higher humidity in the very thin layer of air right next to the litter. The higher humidity of this thin layer reduces the drying effect of the air. Stir fans circulate air from the ceiling down to the litter, stripping away this thin layer and exposing the litter to the warmer, dryer air, which increases the moisture uptake from the litter.

**TIP 4. BIRD MIGRATION MANAGEMENT.** Don't forget that uniform feeder, drinker, and litter availability is one of the most important basic fundamental rules of growing a healthy, uniform flock. We don't expect perfect uniformity, but we must manage bird migration and strive to keep the flock as uniform as possible. During tunnel ventilation, birds begin to migrate toward the tunnel inlet end of the house and this causes several challenges. Feed and water availability is compromised, as well as the moisture load placed on the litter in the front of the house. Bird migration during tunnel causes non-uniformity of the flock, therefore poorer performance on the farm and problems resulting in processing downgrades.

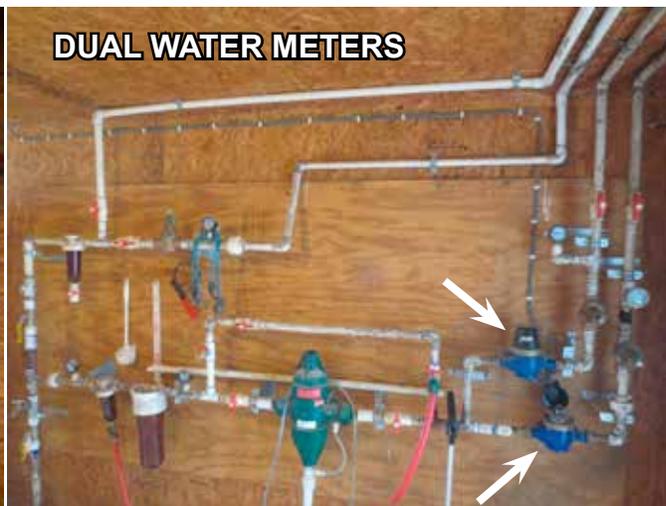
**Step 1: Install migration fences.** Most companies have either required or suggested procedures for installing and managing migration fences. Some find it best to place and maintain bird separation from day one. Others call for a certain number installed before a prescribed day-of-age after turnout. This is an extremely important litter management tool. Whatever the protocol is, follow it and maintain it throughout the grow-out.

**Step 2: Monitor dual water meters.** Many growers and companies have already been using two water meters in each house to manage bird uniformity from front-to-back. If you have not done this it can be a relatively simple and useful tool to have. The procedure involves splitting the house water system into two halves with two separate water meters, and moving the birds so as to equalize the amount of water passing through each meter. Many growers have success keeping and maintaining the difference between front-to-back house meters within about 100 gallons per day throughout the growout.

Think about this: If birds are placed at an average 1.0 density and migration causes a conservative estimated 0.90 in the front 100 feet then there are about 444 more chickens in that area. This doesn't seem like a problem when the birds are small but when they get 7 weeks and older they really take up a lot of space. We essentially have a 10% greater bird load in the front 100 feet of the house and the litter may not be able to handle it.



**MIGRATION FENCE**



**DUAL WATER METERS**

Migration fences similar to the one above can be installed to keep bird migration in check so that the equipment and litter can handle the bird and moisture load while maintaining flock uniformity. This is a useful bird management tool, especially when houses are in tunnel mode. Photo at right shows a water panel with dual water meters (blue meters at bottom right of picture) installed to help the grower manage the number of birds between the front and back of the house using water consumption. Many growers are able to keep the meter readings within about 100 gallons of each other per day during the growout.

**TIP 5. EVAPORATIVE COOLING (EC) SYSTEM OPERATION.** Good litter preparation, drinker servicing, adequate ventilation, and managing bird migration are all important factors of growing chickens that must be taken seriously. Proper management of these set the stage for the successful use of evaporative cooling, making sure litter is ready and not wet before you start. There is no one correct EC program that will fully handle all of the variables that must be managed to provide the best possible environment for the birds. The ever-changing variables of bird age, bird size, density, outside temperature, outside relative humidity, house size, windspeed inside the house, breed of bird, etc., make it impossible to prescribe a one size fits all program. However, there are some tips to follow to help manage EC systems across the Broiler Belt:

**Step 1: Don't use EC at night.** EC operation is typically programmed into the controller to operate after about 9:00 am and turned off before about 8:00 pm (or before dark) each day when needed. Although weather patterns create some exceptions, for the most part this prevents the pads from running when the humidity is high at night further reducing moisture uptake from the litter in the front of the house.

**Step 2: Keep EC operation within its zone of temperature/humidity effectiveness.** EC is most efficient and effective when outside air temperature is well above 80°F and RH is well below 80%, for example, when air is 95°F and RH at 50%. High humidity indicates high moisture in litter.

**Step 3: Try to maintain bird comfort with wind-chill before going to EC.** Turning on EC too aggressively after transition into tunnel ventilation mode often causes the house to transition totally out of tunnel mode unnecessarily. One rough rule of thumb for middle-aged birds in narrow houses is to have the equivalent number of tunnel fans running to bird age in weeks + 1 fan. Example: 4-week old birds might have 5 fans running before starting EC. Toward the end of the flock with larger birds, we suggest at least 80% of the tunnel fans running (90-100% running if wet litter is an issue) before starting EC. Remember these are starting points, carefully watch bird activity and behavior to fine tune number of tunnel fans used with EC. See Newsletter #67 on Tunnel Ventilating Younger Birds for details on young birds.

**Step 4: Don't hold additional tunnel fans back if birds are heavily panting and EC is in full operation.** Panting means birds are under stress and require additional airflow by increasing the number of tunnel fans running (if available) to bring them closer to their comfort zone.

As always, consult with your live production management team for more specific guidelines using EC programs and controller setups customized for your operation.

**BOTTOM LINE:** A good tunnel house using EC will eventually result in damp litter in the tunnel inlet end of the house. That is the trade-off we get using evaporative cooling. We are trading in-house moisture control for temperature reduction. The idea is to take the necessary steps to start the flock off with and maintain uniform dry litter as long as possible. Then when EC is used extensively, the litter is in the best shape to handle it. We hope these 5 practical tips will help you successfully achieve your goals this summer by improving litter preparation, drinker maintenance, ventilation, bird migration and EC management. Good luck this summer!

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***Our mission: To improve the bottom line profitability of the live production sector of the US poultry industry by providing timely applied research and education, resulting in increased efficiencies in housing, equipment, energy, and environmental control.***



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